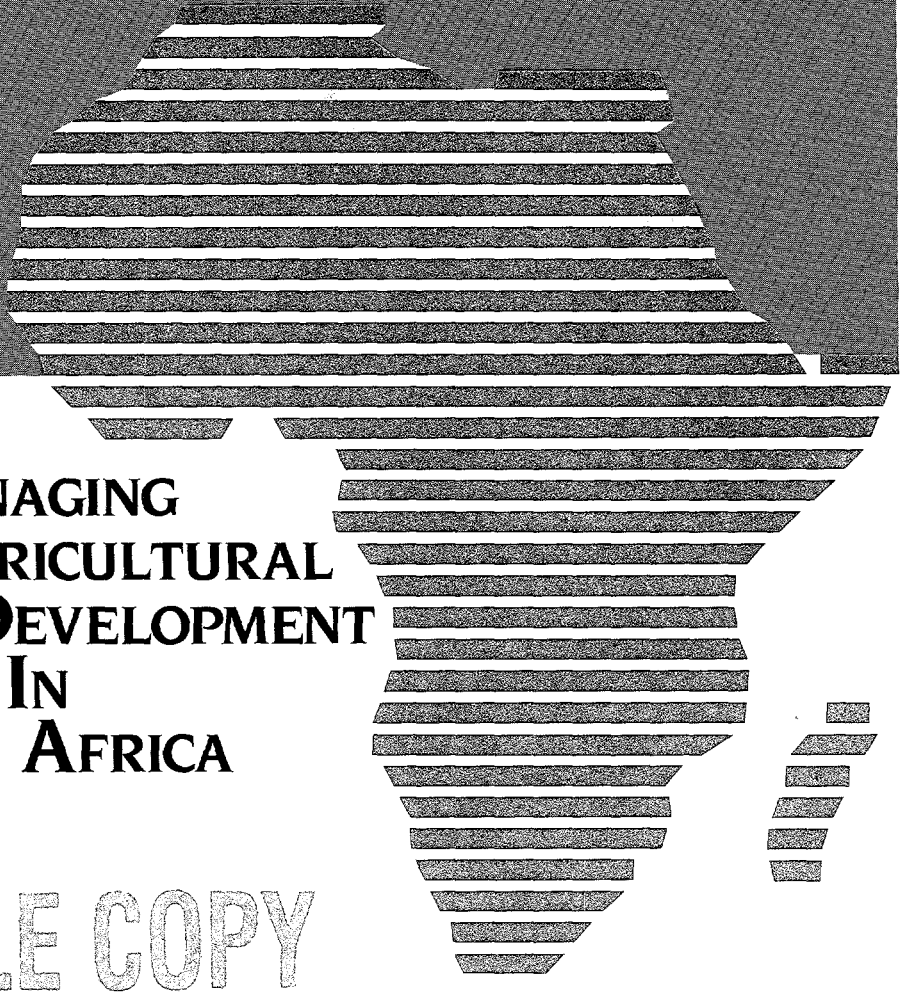
MADIA DISCUSSION PAPER 6

SMALLHOLDER AND LARGE-SCALE AGRICULTURE IN AFRICA

ARE THERE TRADEOFFS BETWEEN GROWTH AND EQUITY?

UMA LELE · MANMOHAN AGARWAL



MANAGING AGRICULTURAL DEVELOPMENT IN AFRICA

FOREWORD

The MADIA study and the papers comprising this MADIA Discussion Paper Series are important both for their content and the process of diagnosis and analysis that was used in the conduct of the study. The MADIA research project has been consultative, nonideological, and based on the collection and analysis of a substantial amount of concrete information on specific topics to draw policy lessons; it represents a unique blend of country-oriented analysis with a cross-country perspective. The conclusions of the studies emphasize the fundamental importance of a sound macroeconomic environment for ensuring the broad-based development of agriculture, and at the same time stress the need for achieving several difficult balances: among macroeconomic, sectoral, and location-specific factors that determine the growth of agricultural output; between the development of food and export crops; and between the immediate impact and long-run development of human and institutional capital. The papers also highlight the complementarity of and the need to maintain a balance between the private and public sectors; and further the need to recognize that both price and nonprice incentives are critical to achieving sustainable growth in output.

The findings of the MADIA study presented in the papers were discussed at a symposium of senior African and donor policymakers and analysts funded by USAID in June 1989 at Annapolis, Maryland. The participants recommended that donors and African governments should move expeditiously to implement many of the study's valuable lessons. The symposium also concluded that the process used in carrying out the MADIA study must continue if a stronger, more effective consensus among donors and governments is to be achieved on the ways to proceed in resuming broad-based growth in African agriculture. The World Bank is committed to assisting African countries in developing long-term strategies of agricultural development and in translating the MADIA findings into the Bank's operational programs.

Stanley Fischer
Vice President Development Economics and Chief Economist

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WASHINGTON, D.C.

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Contents

Illustrations

Tables

Figures

Note

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Introduction

In recent years as African countries have struggled with the problems of stagnant economies and declining per capita incomes, resuming growth by improving economic efficiency has understandably become a major preoccupation. To achieve this objective, they have focused on enhancing the roles of the price system and the private sector. An improved role for market mechanisms and increased efficiency are not only expected to result in an improved balance of payments but also create a more employment-oriented growth pattern.

However, policies to increase efficiency will not lead to equitable growth if the initial asset distribution is unequal, if households of different farm size have unequal opportunities to obtain resources, or if they have differing abilities to undertake risk. These concerns have led some to emphasize the need to achieve equitable growth, or "adjustment with a human face." How different is the new concern from the emphasis in the 1970s on directly promoting participation of the poor in the growth process?[1] Furthermore, do the arguments of the 1970s—that there is no conflict between increasing production and small-farmer participation—hold in the African context?

Farm-level Evidence

During the 1970s farm-level evidence, mainly from South Asia, supported the general tenet that there is an inverse relationship between farm size and per-hectare productivity, although early evidence from the green revolution led some observers to argue that the poorer access of small farmers to modern technology reflected in their lesser political power was reversing this pattern (Griffin 1978). Imperfections in the labor market and the ability of small-farm households to employ greater labor per unit of land were often offered as explanations of their higher productivity. Work on settlement schemes in Kenya (Van Arkadie 1966) and an ILO report of 1972 on employment and equity had also provided support for the belief that output per acre was higher on smallholder settlement schemes than on larger farms. In addition to productivity gains, a smallholder-oriented strategy was seen to provide stronger growth linkages with the rest of the economy, through its effect on patterns of consumption, savings, and investment (Johnston and Mellor 1961; Mellor and Lele 1973; Johnston and Kilby 1975; Lele and Mellor 1981), and these effects have been supported by the empirical evidence emanating from the MADIA study.[2]

This line of thinking led to widespread adoption of smallholder-oriented development projects in the 1970s. Evidence now indicates, however, that many of these projects have had poor returns and have failed to meet their objectives (Blackwood 1988; Lele and Meyers 1987). Furthermore, such programs have put a major strain on recurrent budgetary expenditures at a time when governments are expected to cut budgets sharply (Lele and Meyers 1987, part 2). Is there thus a need to rethink smallholders development strategies, at least as far as Africa is concerned?

Data Limitations

There have been few empirical studies of African productivity by farm size, mainly due to lack of data. One cannot, for example, directly analyze differences in factor use and productivity, because there is no systematic data on output and input levels for different farm sizes. Even aggregate data grouped on the basis of small and large farms is not always available. In some cases, data are aggregated into those for smallholdings and estates, but this distinction does not accurately reflect size differences. Furthermore, calculation of productivity from such aggregate data gives estimates for an "average" large or small farm, but, since average farm size itself has declined over time, productivity trends per hectare calculated by farm sizes provide figures which are not strictly comparable.

It is not possible to determine how productivity differentials have evolved in the West African MADIA countries because separate production and area figures for small and

large farms are not available. However, some preliminary information on the adoption of new technology by large and small farms in Nigeria suggests that large farms tend to adopt the modern technology of sole cropping, mechanization, and fertilizers to a greater extent and produce substantially higher yields relative to their smaller counterparts who tend to rely on mixed cropping technology. The nature and extent of productivity differences cannot, however, be analyzed with the information that exists. Data are more readily available for export crops in the East African MADIA countries, but even these data have limitations. For example, analysis of trends in production and yields are complicated by problems in estimating home consumption of food crops by small farmers. Furthermore, for tree crops like tea and coffee, calculations of productivity need to be adjusted for bushes of different vintages by reducing the total area under cultivation to mature equivalents. Also, labor productivity figures may be inflated because estate production budgets tend to count only the male employee, whereas other family members tend to help in picking crops such as tea.[3]

Preliminary Conclusions

In this paper, we attempt to explore the causes of productivity differences by farm size by focusing on Kenya and Malawi, which have had a superior record in maintaining agricultural data. Given the data limitations discussed above, however, we can only begin to offer a set of hypotheses and preliminary conclusions which need further exploration.

Our data show that yields per hectare are higher on large farms, which not only make more intensive use of modern inputs but also of labor. In part, this is because large farmers are better able to undertake risk. Small farmers, by contrast, have been slower to adopt modern technology. Partly, this is because they have inadequate access to modern inputs. Labor has also tended to be a critical constraint, especially in the production of export crops, which tend to demand larger labor inputs. But there are other reasons as well. For instance, in Malawi, small farmers' preference for flint maize over higher-yielding hybrids are explained by subsistence considerations, taste preferences, and processing and storability characteristics under traditional circumstances, as well as lack of access to credit and fertilizer. In Nigeria, large farmers, who are willing to follow sole-cropping practices, have been quicker to adopt new seed and fertilizer technology for maize, sorghum, and cowpeas than small farmers, who prefer to intercrop in order to spread their risks among crops and to allocate labor time more evenly throughout the season.

Nevertheless, the domestic resource costs (DRCs) of small-farm production are similar to those of large farms, so that no loss in productive efficiency results from adopting a smallholder development strategy. What then are the policies needed to foster more rapid growth in smallholder productivity? We suggest the following: (1) Because complex technological, social, and political factors have restricted the efficient operation of the labor market, policies needed to improve its functioning are less evident than those needed to increase the supply of other, especially modern, inputs. A greater knowledge of how small farmers mobilize labor through market as well as nonmarket forces is therefore essential. (2) Smallholder programs may also require governments to provide information, inputs, and credit until private markets for these services are able to develop. Given current macroeconomic circumstances, however, it is difficult for governments to provide recurrent funds to sustain smallholder efforts (Lele, Oyejide, et al. 1989; Lele 1989a). Therefore, donors urgently need to review their willingness to support the recurrent budgetary needs of smallholder programs to ensure that they are adequately funded. (3) Finally, a land policy is needed to increase the access of households to land, and a production policy is needed to ensure that all households, regardless of farm size, have a right to grow all crops, since there are usually no scale economies in production.

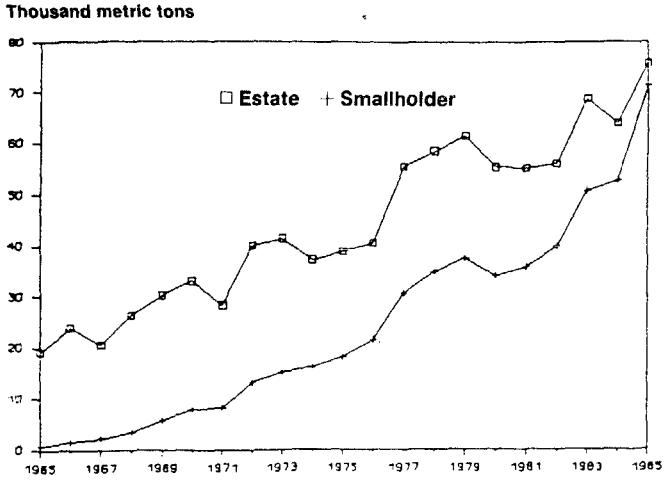
Recent Economic Developments

This section discusses recent agricultural performance and land distribution in Kenya and Malawi. Differences in productivity by farm size are analyzed in the following section, and the paper concludes with a discussion of policy implications.

Agricultural Performance by Size of Farm

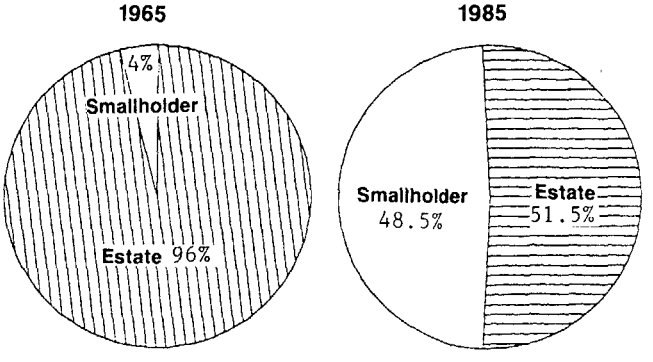
Both Kenya and Malawi experienced strong growth between 1970 and 1986. From the viewpoint of the subject matter of this paper, however, their patterns of growth differed radically. Kenya's success is significant, not only because it was one of the few African countries to gain world market shares in important export crops such as tea and coffee, but also because the share of these crops produced by small farmers increased substantially relative to large farms. (In Kenya, land and statistical records define smallholdings as those of less than 20 hectares, but in practice more than three-quarters of all smallholdings are now less than 2 hectares.) Thus, the smallholder share in tea production increased from 4 percent in 1965 to 49 percent in 1985, while total tea production increased at an average annual rate of 9.3 percent (Figures 1 through 3, Table 1). Similarly, the share of coffee produced by small farmers increased from 40 percent to 69 percent between 1965 and 1985, while total coffee production grew by 4.5 percent per annum (Figures 4 through 6, Table 2). Moreover, unlike in Tanzania, higher smallholder production did not come at the expense of the large farms; rather, small-farm production increased mainly through area expansion (with yield growth in maize and coffee only), while large-farm output expanded mainly through increased yields, which were about twice those of smallholders. Kenyan small farmers grow the same crops as large farmers and sell their output in the same auctions or to the same marketing boards at prices similar to those earned by large farms.[4]

Figure 1
Smallholder and estate tea production in Kenya, 1965-85



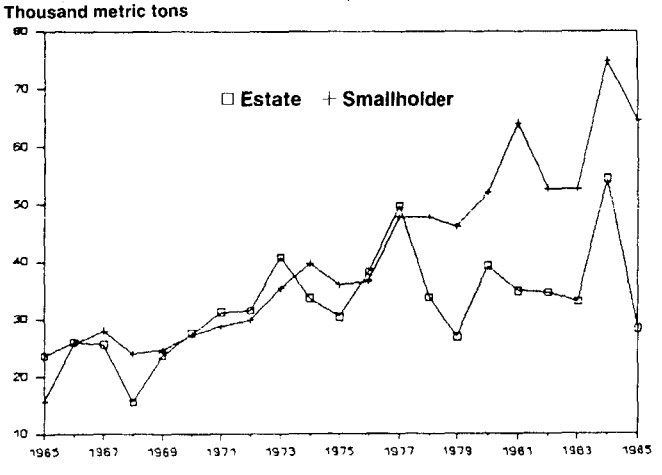
Source: Ministry of Agriculture, Kenya.

Figures 2-3
Tea production shares for smallholders and estates in Kenya, 1965 and 1985



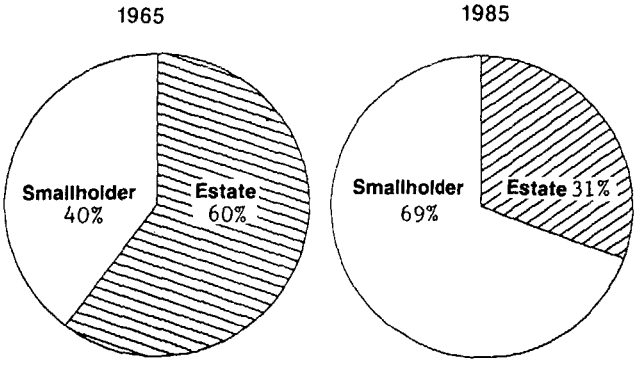
Source: Ministry of Agriculture, Kenya.

Figure 4
Smallholder and estate coffee production in Kenya, 1965-85



Source: Ministry of Agriculture, Kenya.

Figures 5-6
Coffee production shares for smallholders and estates in Kenya, 1965 and 1985



Source: Ministry of Agriculture, Kenya.

Table 1
Smallholder and estate production, area, yield of tea in Kenya, 1965-85

	Production			Mature equivalent area			Mature equivalent yield		
	Estate	Smallholder ('000 MT)	Total	Estate	Smallholder ('000 HA)	Total	Estate	Smallholder (MT/HA)	Total
1965	19.0	0.8	19.8	15.6	0.7	16.3	1.22	1.14	1.22
1966	23.8	1.6	25.4	16.5	1.3	17.7	1.45	1.25	1.43
1967	20.6	2.2	22.8	17.3	2.0	19.3	1.19	1.15	1.18
1968	26.4	3.4	29.8	18.1	2.8	20.9	1.46	1.23	1.43
1969	30.3	5.8	36.1	18.9	3.7	22.6	1.61	1.55	1.60
1970	33.1	8.0	41.1	19.6	4.9	24.5	1.69	1.62	1.67
1971	28.2	8.1	36.3	20.3	6.4	26.7	1.39	1.26	1.36
1972	40.2	13.1	53.3	20.9	8.2	29.1	1.93	1.60	1.83
1973	41.5	15.1	56.6	21.4	10.4	31.8	1.94	1.46	1.78
1974	37.3	16.2	53.4	22.0	12.8	34.8	1.69	1.27	1.54
1975	38.8	17.9	56.7	22.5	15.6	38.1	1.73	1.15	1.49
1976	40.5	21.5	62.0	22.9	19.1	42.1	1.77	1.12	1.47
1977	55.6	30.7	86.3	23.4	22.9	46.3	2.38	1.34	1.86
1978	58.6	34.8	93.4	23.7	26.7	50.5	2.47	1.30	1.85
1979	61.6	37.6	99.3	24.1	30.5	54.6	2.56	1.23	1.82
1980	55.4	34.0	89.4	24.4	34.2	58.6	2.27	0.99	1.53
1981	55.3	35.8	91.1	24.7	37.7	62.4	2.24	0.95	1.46
1982	56.1	39.9	96.0	25.0	40.9	65.9	2.24	0.98	1.46
1983	68.8	51.0	119.7	25.3	43.8	69.1	2.72	1.16	1.73
1984	63.9	52.7	116.6	25.7	46.4	72.1	2.49	1.14	1.62
1985	75.8	71.3	147.1	25.9	48.9	74.7	2.93	1.46	1.97
Growth rate	6.3%	19.2%	9.3%	2.4%	20.0%	8.1%	4.0%	-0.8%	1.2%

Source: Ministry of Agriculture, Kenya.

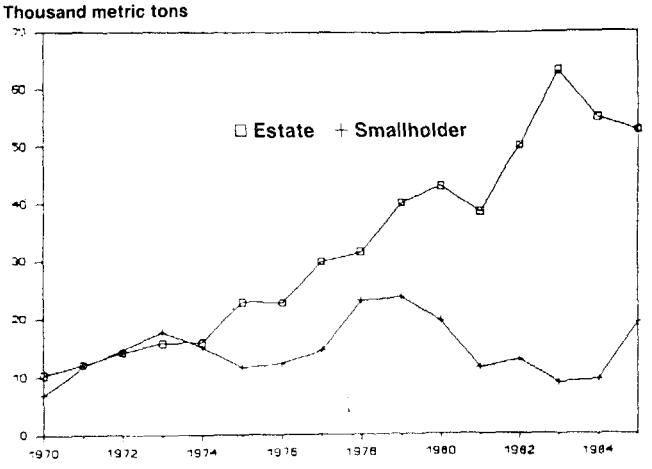
Table 2
Smallholder and estate production, area, and yield of coffee in Kenya, 1965-85

	Production			Mature equivalent area			Mature equivalent yield		
	Estate	Smallholder ('000 MT)	Total	Estate	Smallholder ('000 HA)	Total	Estate	Smallholder (MT/HA)	Total
1965	23.8	15.7	39.4	32.4	51.6	84.0	0.7	0.3	0.5
1966	26.1	26.0	52.1	32.3	53.1	85.4	0.8	0.5	0.6
1967	25.7	28.0	53.7	32.0	52.5	84.4	0.8	0.5	0.6
1968	15.4	23.8	39.2	31.2	54.1	85.3	0.5	0.4	0.5
1969	23.6	24.6	48.2	30.7	55.0	85.7	0.8	0.4	0.6
1970	27.5	27.2	54.7	29.9	54.1	84.0	0.9	0.5	0.7
1971	31.2	28.7	59.9	29.9	53.8	83.7	1.0	0.5	0.7
1972	31.4	29.7	61.2	29.5	55.6	85.1	1.1	0.5	0.7
1973	40.7	35.3	76.0	29.5	55.3	84.8	1.4	0.6	0.9
1974	33.6	39.7	73.3	29.1	55.6	84.7	1.2	0.7	0.9
1975	30.3	35.8	66.1	28.6	57.8	86.4	1.1	0.6	0.8
1976	38.1	36.5	74.6	28.6	56.6	85.2	1.3	0.6	0.9
1977	49.7	47.7	97.3	27.8	56.6	84.4	1.8	0.8	1.2
1978	33.7	47.7	81.4	30.9	56.6	87.5	1.1	0.8	0.9
1979	26.8	46.1	72.9	30.0	62.6	92.6	0.9	0.7	0.8
1980	39.1	51.9	91.0	31.2	71.2	102.4	1.3	0.7	0.9
1981	34.7	64.0	98.8	32.9	84.7	117.6	1.1	0.8	0.8
1982	34.4	52.5	86.9	33.6	97.4	131.1	1.0	0.5	0.7
1983	33.0	52.5	85.5	33.6	101.0	134.6	1.0	0.5	0.6
1984	54.3	74.7	128.9	35.7	114.2	149.9	1.5	0.7	0.9
1985	28.3	64.2	92.5	35.7	116.3	152.0	0.8	0.6	0.6
Growth rate	2.6%	6.1%	4.5%	0.5%	3.8%	2.7%	2.2%	2.3%	1.8%

Source: Ministry of Agriculture, Kenya.

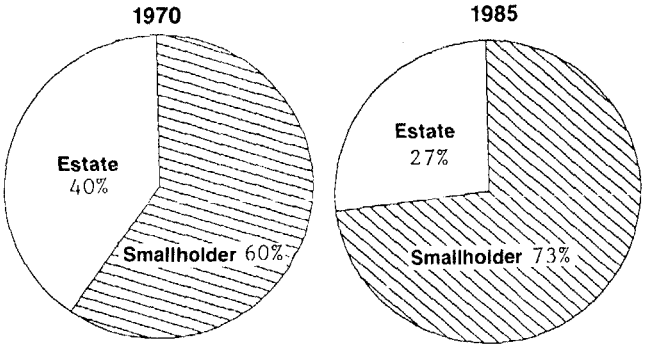
The situation in Malawi is quite different. There, estate production of major crops increased impressively, especially for tobacco (11 percent per annum) and sugar (12 percent per annum), while smallholder production stagnated, and productivity failed to increase. Per capita maize production fell, even though—because per capita output of other crops fell even faster until about 1985—smallholder crops show a net shift toward maize and away from export crops. In Malawi, the distinction between small farms and estates is based mainly on the legal right to grow certain crops (Christiansen and Kydd 1987). In the case of tobacco, for example, estates are defined as those licensed to (i) grow burley or flue-cured tobacco, mainly for export, (ii) sell output at auctions at prices close to world prices, and (iii) hire wage labor or rent land to tenants. Smallholders are permitted to grow darkfired, sun/air-cured, and oriental tobaccos on customary land, but are rarely licensed to grow burley and flue-cured tobacco. Furthermore, they are required to sell their output to the public marketing agency, the Agricultural Development and Marketing Corporation, ADMARC, at government-determined prices, which have tended to be between a third and a half of the price that estates receive for the same type of tobacco. These distinctions reflect Malawi's development strategy of stressing estate agriculture. This definition of estates, based essentially on differentiated access to factors of production, markets, and prices is important to stress as the term estate conjures up the image of larger plantations and leads to a tendency to assume that the phenomenon discussed in this paper may have no relevance to other African countries that tend to have large farms growing annual crops rather than estates and plantations. Understandably then, the share of tobacco produced by smallholders declined from 40 percent in 1970 to 27 percent in 1985 (Figures 7 through 9, Table 3) and yields average only one-fourth those on estates. Despite these official distinctions between large and small farms, there may at times be little difference in farm size, as will be shown below.

Figure 7
Smallholder and estate tobacco production in Malawi, 1970-85



Source: Government of Malawi, Economic Reports, 1970-86, 1987.

Figures 8-9
Tobacco production shares for smallholders and estates in Malawi, 1970 and 1985



Source: Government of Malawi, Economic Reports, 1970-86, 1987.

Table 3
Smallholder and estate production, area, and yield of tobacco in Malawi, 1970-85

	Estate			Smallholder		
	Production ('000 MT)	Area '000 HA	Yield MT/HA	Production ('000 MT)	Area '000 HA	Yield MT/HA
1970	10.4	9.6	1.08	6.9	31.2	0.22
1971	12.1	12.8	0.94	11.8	36.4	0.32
1972	14.1	13.6	1.04	14.6	41.2	0.35
1973	15.7	14.0	1.12	17.7	34.8	0.51
1974	15.9	16.0	0.99	15.0	34.4	0.44
1975	22.9	17.8	1.28	11.6	32.3	0.36
1976	22.8	21.7	1.05	12.2	39.5	0.31
1977	29.8	24.0	1.24	14.5	42.6	0.34
1978	31.5	28.5	1.11	23.2	48.1	0.48
1979	40.1	32.7	1.23	23.7	47.4	0.50
1980	43.0	32.5	1.32	19.5	30.7	0.63
1981	38.5	30.9	1.25	11.3	34.4	0.33
1982	50.2	37.2	1.35	12.8	29.6	0.43
1983	63.2	53.1	1.19	8.7	48.0	0.18
1984	54.9	42.2	1.30	9.3	46.0	0.20
1985	52.7	47.7	1.10	19.2	54.2	0.35
Growth rate	12.08%	10.64%	1.44%	0.99%	1.76%	-0.77%

Source: Government of Malawi, Economic Reports, 1970-86. Government of Malawi 1987.

Land Distribution Over Time

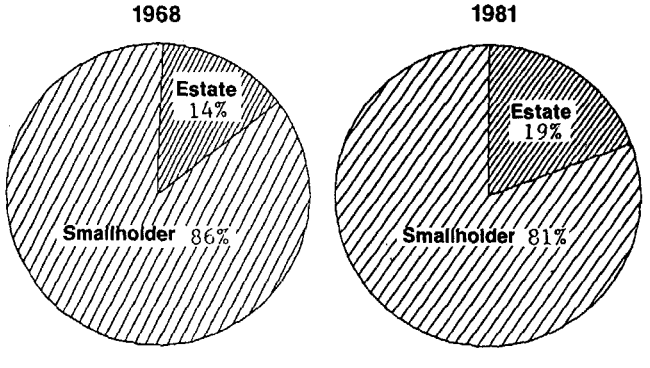
Rapid population growth, averaging well over 3 percent per year, slow growth of employment opportunities in the formal sector, and the effects of land tenure policies have created increasing land pressure in both Kenya and Malawi as shown in Table 4. In Malawi, land under estate cultivation, mainly leasehold, has grown rapidly since the mid-1960s, increasing from about 14 percent of total arable land in 1968 to 19 percent in 1981 (Figures 10 and 11). Although the average size of tobacco estates in Malawi declined, the estate sector's share in total cultivated tobacco area increased from 24 percent in 1970 to 47 percent in 1985 (Figures 12 through 14). There has been an increase in the number of smallholdings, at the same time as the amount of customary land cultivated by smallholders has declined. As a result, the average size of smallholdings fell from about 1.6 hectares in 1968/69 to about 1.2 hectares in 1980/81. Also, in 1968/69 about 63 percent of smallholdings were less than 1.6 hectares and about 19 percent greater than 2.4 hectares (Table 5). By 1980/81, as a result of rapid population growth, and limited new supplies of customary land, almost three-quarters of holdings were less than 1.5 hectares and only 5 percent of holdings were larger than 3 hectares.

Table 4
Per capita arable land in East Africa, 1965, 1985 and projected to 2000 (in hectares per capita)

	1965	1985		2000	
	Total	Total	Rural	Total	Rural
Kenya	1.34	0.86	0.73	0.60	0.42
Malawi	0.86	0.81	0.73	0.60	0.45
Tanzania	3.99	2.59	2.30	1.68	1.44

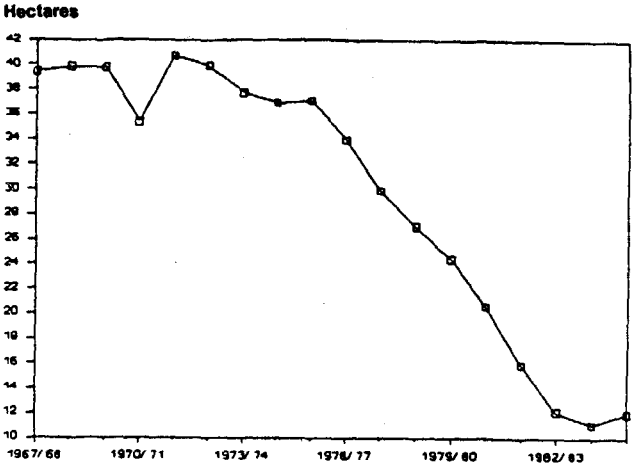
Source: Governments of Kenya, Tanzania, and Malawi. Ministries of Agriculture of Kenya, Tanzania, and Malawi.

Figures 10-11
Distribution of cultivated land in Malawi, 1968 and 1981



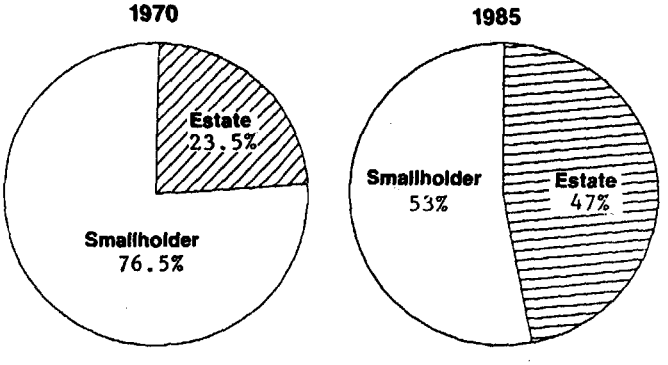
Source: Government of Malawi, Department of Lands and Valuation, 1984.

Figure 12
Average tobacco estate area in Malawi, 1967/68-1984/85



Source: Government of Kenya, Tobacco Control Commission.

Figures 13-14
Shares of tobacco area for smallholders and estates in Malawi, 1970 and 1985



Source: Government of Malawi, Economic Reports, 1970-86, 1987.

Table 5
Distribution of smallholdings by holding size in Malawi, 1968/69 and 1980/81

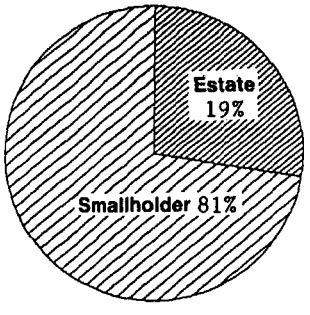
1968/69		1980/81	
Holding size (hectares)	% of holdings	Holding size (hectares)	% of holdings
Below .8	28.7	Below .5	23.5
0.8-1.6	34.1	0.5-0.99	31.4
1.6-2.4	18.4	1.0-1.49	19.0
2.4-4.8	16.7	1.5-1.99	10.7
4.8 & Over	2.1	2.0-2.99	10.4
		3 & Over	5.0

Sources: Government of Malawi 1970 and 1984.

In Kenya, 27 percent of arable land in 1978 was under large-farm cultivation (Figure 15). Although time-series data are lacking, the available informal evidence suggests that, in contrast to Malawi, the share of area controlled by large farms may have declined. As in the case of Malawi there may also have been a de-concentration of land within the large-farm sector. At the same time, rural surveys indicate a rather rapid decline in the average size of smallholdings—from about 3.4 hectares in 1970 to about 2.4 hectares at the time of the first integrated rural survey in 1974/75, to only 1.2 hectares 3 years later. There has also been a dramatic increase in the number of farms of less than 1 hectare, from about 20 percent of all smallholder farms in the late 1960s and early 1970s to more than two-thirds in the late 1970s (Table 6).

Data for the other countries in the MADIA study are far less complete. However, informal evidence for the more recent period in Senegal, Nigeria, and Cameroon suggest growth of bimodalism in each country, with the farm size in the smallholder sector declining rapidly with population growth. Trends in areas within the largeholder sector cannot be discerned, but it is clear that the large-scale sector has become the major contributor of marketed surpluses. The distribution of land between the large- and small-farm sectors and within each sector has important implications for formulating effective land policies and for future development strategies.[5]

Figure 15
Distribution of cultivated land in Kenya, 1978



Source: Republic of Kenya, 1980, 1982.

Table 6
Distribution of households by holding size in Kenya, 1970 and 1978

1970		1978	
Holding size (hectares)	**% of holdings**	**Holding size (hectares)**	**% of holdings**
Below 0.5[a]	11.7	Below 0.5[a]	46.8
0.5-0.99	15.5	0.5-0.9	20.1
1.0-1.9	24.6	1.0-1.9	15.8
2.0-2.9	16.4	2.0-2.9	7.3
3.0-4.9	13.3	3.0-3.9	3.2
5.0-9.9	11.3	4.0-4.9	1.6
10 & over[b]	7.0	5.0-7.9	2.8
		8.0 & over[b]	2.4

Source: Government of Kenya 1982 and 1970.
Notes:
[a]Holdings not operating any piece of land are included in this category.
[b]8 & Over and 10 & Over include holdings of greater than 8 or 10 hectares that were mistakenly included in the sample, but are not representative of all holdings of this size.

Productivity Differences Between Smallholdings and Estates

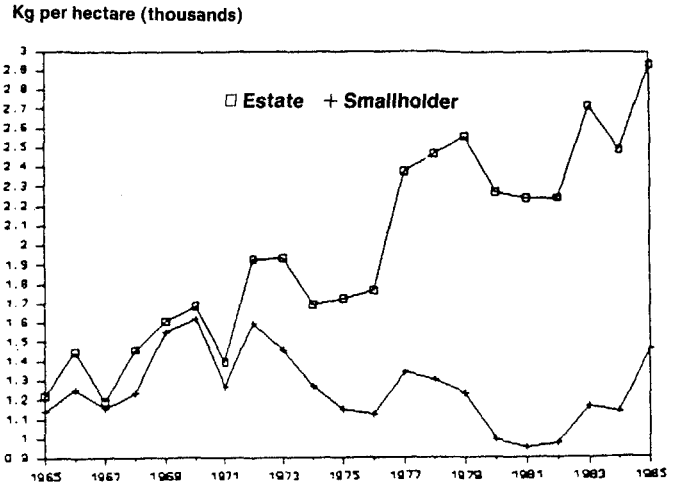
Literature on the inverse relationship between farm size and farm productivity, mainly from South Asia, suggests that the causes can be divided broadly into two categories: (i) exogenous, including institutional, factors (e.g., quality of land and performance of factor markets) and (ii) endogenous factors that depend on farmers' decisions.[6] Exogenous considerations argue that small farms may be more fertile because fertile land may undergo more subdivision (Sen 1964), whereas larger holdings may be formed through distress sales by small farmers who would tend to sell their least productive land (Bhagwati and Chakravarty 1969). Even allowing for differences in land quality in South Asia, the negative relation between productivity and farm size seems to persist.[7] In East Africa, however, these observations do not seem to apply. The original European settlement of estates seems to have occurred on the best quality land, and this has carried over into the independence era. Areas currently under large farms and under small, market-oriented farms growing export crops—as, for example, in the so called White Highlands in Kenya—are of medium to high land quality. Farms in the marginal, semiarid areas where population pressure is growing, on the other hand, tend to be larger, albeit declining in size, and of poor quality.

Other exogenous causes suggested for the inverse relationship between farm size and production include greater intensity of cropping on small farms, which is closely related to the intensity of irrigation (Saini 1971; Bhattacharya and Saini 1972). A further explanation is that the relationship reflects differences in cropping patterns, rather than yields per hectare (Rudra 1968; Chattopadhyay and Rudra 1977).

An endogenous explanation for the inverse relationship between farm size and yields in South Asia is that small farmers use more inputs—especially family labor—per unit of land. This greater intensity of labor use results from the operation of a dualistic labor market (Sen 1966 and 1975), farmers' goals of maximizing output rather than profits (Sen 1964 and 1975), and limited opportunities for finding off-farm employment (Mazumdar 1965 and 1975). The higher output per unit of land on small farms would, therefore, reflect the higher labor/land ratio on these farms, a result which would follow in a two-factor neoclassical production function.[8] However, the greater use of labor would also mean that labor productivity is lower on small farms.

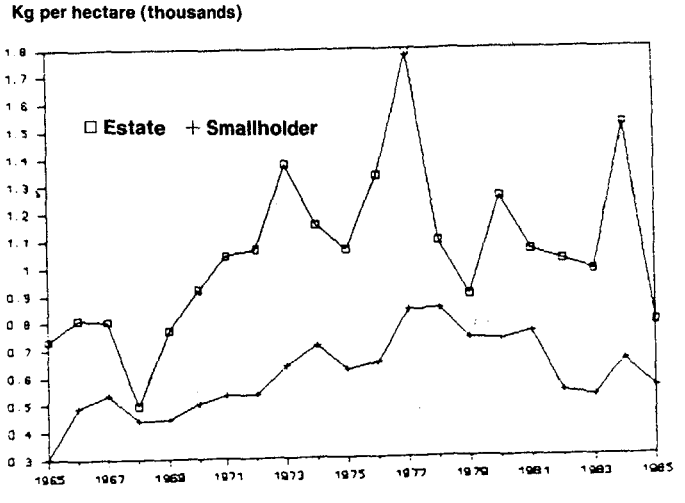
The process of modernization of agriculture seems to have changed the productivity picture significantly. With the introduction of new technologies following the green revolution, the productivity differential in South Asia between small and large farms decreased considerably and in many cases was reversed. This phenomenon is mirrored in the cases of Kenya and Malawi when productivity per hectare for export crops is higher on large farms than on small (Figures 16 through 18). Thus, in Kenya, mature-equivalent yields of tea on smallholdings have remained virtually constant, while those on estates have more than doubled, so that the differential has actually grown despite the sustained efforts of the Kenya Tea Development Authority, KTDA, to make technology and inputs accessible to small farmers. In the case of coffee, mature-equivalent

Figure 16
Kenya: Mature equivalent tea yields, smallholders and estates, 1965-85



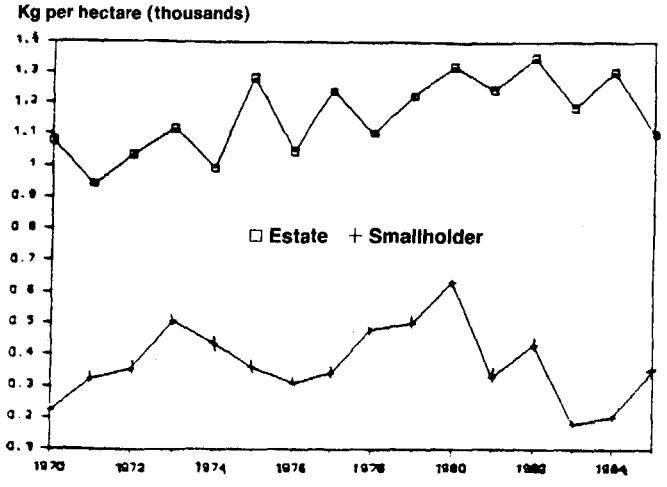
Source: Ministry of Agriculture, Kenya.
Notes: Estate growth rate = 3.96% p.a.
Smallholder growth rate = .82% p.a.*
* = not statistically significant at .05 level.

Figure 17
Kenya: Mature equivalent coffee yields, smallholders and estates, 1965-85



Source: Ministry of Agriculture, Kenya.
Notes: Estate growth rate = 2.17% p.a.
Smallholder growth rate = 2.32% p.a.

Figure 18
Malawi: Tobacco yields, smallholders and estates, 1970-85



Source: Government of Malawi, Economic Reports, 1970-86, 1987.

Notes: Estate growth rate = 1.44% p.a.
Smallholder growth rate = .77% p.a.*
* = not statistically significant at .05 level.

yields on smallholdings are about half those on estates, though they have increased at roughly the same rate as on estates. In the case of sugar, yields were initially higher on smallholdings, but yields on estates increased over time while those on smallholdings decreased, so that now yields are greater on estates (Lele and Meyers 1987). In Malawi, yields on smallholdings of tobacco have been stagnant, while they have increased on estates, although yields on both have fluctuated considerably.[9] One cannot generalize on the basis of experience in East Africa and South Asia, however. In Malaysia for example, smallholder rubber yields grew considerably faster than on estates, during 1960-75 so that now the productivity differential has almost been eliminated (Table 7).[10]

Table 7
Rubber yields for smallholders and estates in Malaysia, 1960, 1970, and 1975

	Production ('000 T)		Area ('000 Acres)		Yield (T/Acre)	
Year	Estate	Smallholder	Estate	Smallholder	Estate	Smallholder
1960	420	276	1,405	1,563	0.30	0.18
1970	621	594	1,346	1,954	0.46	0.30
1975	599	818	1,308	2,055	0.46	0.40

Source: Government of Malaysia, Department of Statistics.

Determinants of Input Use on Small and Large Farms in Africa

Why is productivity lower on small farms in Africa? Analyses of the South Asian experience suggest that there are no significant economies of scale in the adoption of new technology, but rather that large farmers have better access to the inputs required by the newer technologies (Deolalikar 1981; Roy 1981). Lower utilization of new inputs by small farmers may also be due in part to problems in the distribution network and to the inability of small farmers to bear the greater risk introduced by the use of purchased inputs (Srinivasan 1972). Not surprisingly, the same phenomenon is observed in Africa. Lele (1989b) and Carr (1988), have documented, for example, that the better-off small farmers and estates in Malawi have had easier access to seasonal credit than their subsistence counterparts. It is therefore of interest to explore the determinants of the use of factors of production.

Subsistence needs. An extensive literature has documented that the subsistence needs of small farmers has been important in their production decisions.[11] The risk aversion accompanying poverty and subsistence agriculture stands as an obstacle to the adoption of improved technologies as well as to the production of cash crops, although the reverse has also been shown to be true—namely, that production of export crops alleviates food insecurity (Weber et al. 1988). Our studies bear out other findings that output of export crops on small farms is constrained by the need to grow food for subsistence. Thus, smallholder tobacco producers in Malawi must also grow subsistence crops such as maize, sorghum, and groundnuts, which make competing demands on their time. The extent to which specialization in crop production by estates releases labor time is not adequately known. Tobacco estates often buy food from ADMARC to meet workers' subsistence requirements[12] or provide workers with individual plots for growing their own maize, cotton, and groundnuts. Either because of higher productivity in maize production or the ability to purchase maize from ADMARC, estates producing flue-cured tobacco are able to devote two-thirds of their cultivated land to tobacco and only one-third to maize.[13] In the case of smallholders, by contrast, only half the land is devoted to tobacco, while the rest is devoted to maize and a small amount to groundnut cultivation. Whereas smallholders devote a quarter of their time to subsistence cultivation, less than 10 percent of labor time on estates is spent on cultivating maize. Furthermore, estates spend about three times more per hectare than smallholders on chemicals and fertilizer for maize.[14] The Tobacco Sector Study suggests that both greater application of fertilizer in maize production and the ability to purchase maize from ADMARC enable estates to meet the subsistence requirements of the workers using relatively less labor for food crop cultivation than smallholders, thus enabling them to use more labor, as well as more fertilizer and other chemicals per hectare of tobacco.

Why the adoption of improved or hybrid maize is so low in Malawi among small farmers even after 15 years of rural development efforts that involved donor commitments of $1,585.7 million (1983 US$) relative to the adoption rates in Kenya is an issue that is explored in greater detail in several other MADIA papers (Lele 1989b; Lele and Meyers 1987; Lele, Christiansen, and Kadiresan 1989). Less than 10 percent of small farmers in Malawi grow hybrid or improved maize compared to nearly 60 percent in Kenya. Most of those who adopt hybrid maize are the relatively better-off small farmers with more than 1 hectare of land who produce for the market. However, even among these commercially-oriented small farmers the use of fertilizer (by 25 percent of small farmers) is more extensive than that of improved seed. The explanations range from consumer dislike of dent (hybrid) maize due to its poor storability, processing quality, and taste to the lack of research on flint maizes that Malawian households prefer, the lack of access of small farmers to credit, seed, fertilizer, and extension,

and their poor ability to undertake risk due to the strictly enforced rules for nonpayment established under the system of group credit. Nevertheless, because there are not adequate field-level data to pinpoint the more precise constraints it is not possible to devise specific interventions to alleviate those constraints. The questions that were raised as early as 1974 about the likely possibility of slow adoption were largely brushed aside in the extension-focused rural development projects which assumed that appropriate technology for small farmers existed and simply needed to be extended.

Whether crop yields reported for a single crop for small farmers reflect total factor productivity is an important but largely ignored issue in technology development in Africa despite the preponderance of evidence of mixed cropping among small farmers. Some of it (for example in northern Nigeria, see Lele, Oyejide, et al. 1989) suggests that total per hectare yields of all crops combined may well tend to be higher than those of individual crops under traditional technology. In the case of Kenyan coffee de Graaff (1986) observes that a typical smallholder in the coffee growing areas operates a farm of 1.5 hectares of which only 0.2 hectare is devoted to coffee. Interestingly, in smallholder areas far away from estates, again according to de Graaff, a large proportion of the coffee plantations are shaded, accompanied by a relatively low level of fertilization and modest yields, suggesting the demonstration effect of estates on the cultivating practices of small farmers. The yields considered here are those for sole cropping of coffee.

Tobacco types. Evidence from the Tobacco Sector Study found that tobacco yields in Malawi are a function of both holding size and the type of tobacco produced. Thus, estate yields averaged 1,450 and 1,500 kilograms per hectare, respectively, for burley and flue-cured tobacco. At 600 and 800, respectively, smallholder yields for tobaccos are only about half those on estates. And smallholder yields for sun/air-cured, dark-fired, and oriental tobacco—the types to which smallholders are generally restricted by law—are even lower, at about 250 kilograms per hectare.

In part, the differential between smallholder and estate per-hectare yields can be partly explained by differences in the intensity of input use. Thus, smallholders cultivating flue-cured or burley tobacco only apply about half the fertilizer and chemicals per hectare as estates, while producers of dark-fired or sun/air-cured tobacco use hardly any. What is surprising in Malawi, a labor surplus country, is that, unlike in South Asia, small farms use only about three-quarters as much labor per hectare as estates in producing flue-cured and burley and even less (two-thirds of their total labor input) in cultivating sun/air-cured and dark-fired tobacco. This is because farms engaged in cultivating the latter tobaccos tend to be smaller than those producing flue-cured and burley and therefore must devote a larger share of inputs to maize cultivation to meet their subsistence needs. Also, lower producer prices dictate lower input intensity.

In Kenya, the higher productivity on estates also seems to stem from greater input use.[15] Even though Kenyan smallholders get almost the same price as estates for coffee and tea, they use only one-fourth to one-fifth as much fertilizer and pesticide. But what is perhaps unexpected is that Kenyan smallholders also use considerably less labor for weeding and pruning. In most regions, smallholders use about 200 person-days of labor per hectare of coffee, while estates use about 400 person-days.

Labor shortages. Ram (1979) attributes the lower yields of smallholders in areas west of the Rift Valley partly to critical shortages of labor on small farms. He notes that farmers under the KTDA showed a tendency to deliver more tea when schools were closed and children could help with the picking. Schluter (1984) quotes a 1976-77 field survey which estimated that 50 percent of potential tea output went unharvested because of labor shortages. A more recent survey found that 73 percent of farmers had problems hiring sufficient labor, and corroborated Schluter's finding that almost half of the potential crop was not harvested (Karuga 1987). On the other hand, World Bank appraisal reports tend to assume relatively abundant labor availability (Jones 1985).[16] Indeed, while due to concern about world market prospects they have aimed at economic benefits to be derived mainly from yield increases on existing planted areas, expansion has tended to be the main source of production increases, as we have documented in this paper.

Inability to hire sufficient labor is due mainly to a shortage of workers and lack of sufficient cash to hire labor. The former may reflect the broad-based smallholder strategy adopted by Kenya which has tightened labor supplies in rural areas, although urbanization has also been quite rapid at 3.39 percent per annum. Field interviews with coffee estate operators in Kenya indicate that the supply of labor decreases substantially in years of good maize harvest, requiring recruitment of seasonal labor from as far away as 200 kilometers. Similarly, farmers benefitting from remittances use more inputs than those who do not (Lele and Meyers 1986). The phenomenon of a high reservation price for labor is less likely to operate in Malawi, where policies toward land access and rights to grow crops and secure fair prices have not made self-employment by smallholders as profitable as in Kenya (Lele 1989b).

The relatively lower use of labor per hectare in cash crop production on small farms than on large farms may reflect the relationship between the operation of the credit market and the labor market. Formal credit programs offer in-kind credit in the form of seed and fertilizers, but there has been reluctance to provide farmers with cash for the purchase of labor (Lele 1988a).

Due to climatic factors, labor use in Africa tends to be more seasonal than in India (Delgado and Ranade 1987), so that less labor may be available for cash crop production at seasonal peaks of food crop production. The lack of substitutability of labor between different seasons may help to explain the labor constraint.

Other causes of labor market imperfection stem from cultural, sociopolitical, and natural factors. Division of labor along gender lines with women producing food crops and men cash crops, while highly variable among regions and breaking down rapidly with modernization, is still a problem in some locations (Jones 1985). Also, high rates of male migration to urban areas and across national borders, and ethnic barriers to regional migration, contribute to the labor constraint (Lele 1988a). Finally, the low status of tea and coffee picking in Kenya tends to encourage potential workers to choose other, even lower paying, tasks.[17] However, declining overall employment opportunities in the formal sector and growing population pressure may not only relax the labor constraint, but may also create an increased need for generating employment opportunities.

Efficiency of Production on Small and Large Farms

The higher productivity per hectare on estates compared to smallholdings seems to arise from greater use of all major inputs. This fact does not, however, tell us whether smallholder cultivation is relatively more or less efficient than estate cultivation in terms of output per unit of input use—in other words, whether the higher productivity is proportionately more than the greater input use.

In South Asia efficiency has been measured by estimating production functions or reduced-form profit functions based on farm-level data (Singh 1988). However, such farm-level data is lacking in the African context. In order to measure efficiency of resource use, therefore, we have to calculate domestic resource costs (DRCs), which measure the value of domestic resources needed to obtain one unit of foreign exchange through sales of export crops such as tobacco and coffee or import substitution crops such as maize.[18] DRCs were calculated using budgets presented in the Tobacco Sector Study for smallholder and estate tobacco producers in Malawi and in the de Graaff (1986) study for coffee producers in Kenya. To take account of distortions in the wage rate, DRCs for three different cases were calculated, but in each case family labor was valued at the same rate as hired labor: (a) the market wage rate is taken as the appropriate shadow wage rate, (b) the shadow wage rate is three-quarters of the market wage rate, and (c) the shadow wage rate is half of the market wage rate. While households tend to work on family farms at less than market wages to meet their subsistence needs, when they are producing for the market one should expect them to take account of market opportunities. The minimum wage in Malawi has not been revised for many years and for Kenya it has been revised only infrequently so that it is unlikely that minimum wages distort market wages. In the case of Kenya real agricultural wages tended to increase in the 1970s before showing some decline in the 1980s, whereas in the case of Malawi there seems to have been a slow but steady decline in the real agricultural wage over the last fifteen years. This difference in behavior of real wages in Malawi and Kenya may reflect the rate of growth of labor supply in the two countries. Despite more rapid population growth in Kenya, the labor supply may have increased less rapidly because of the smallholder development strategy which retained farmers on family farms and the broader spread of primary education of school-age children in Kenya which reduced the number of children in the labor force relative to Malawi where education is less extensive (Lele 1989a).

Table 8 shows the DRCs. DRCs for estate tea could not be calculated due to the lack of data. It is important to note, however, how low the DRCs for smallholder tea are in Kenya, which demonstrates a strong comparative advantage in smallholder production. Indeed, it is this strong competitiveness of smallholder production that perhaps explains the restrictions imposed by the colonial government in Kenya on the production of tea and coffee in the smallholder sector. This also ensured an elastic supply of labor to the estate sector. This same phenomenon explains the prohibition of maize production by smallholders in Zambia and of tobacco in Malawi in the recent period.

Overall, the DRCs show that the lower per hectare

Table 8
Domestic resource costs for coffee and tea production in Kenya

Year	Crop/type of producer	DRC	DRC (.75*WAGE)	DRC (.50*WAGE)
1982	**Coffee**			
	Smallholders			
	UM1	0.39	0.33	0.27
	UM2	0.33	0.29	0.26
	UM3	0.45	0.39	0.34
	Estates			
	Irrigated	0.57	0.53	0.48
	Non-irrigated	0.93	0.85	0.77
1987	**Tea**			
	Smallholder			
	Low Yield	0.39	0.32	0.25
	Medium Yield	0.34	0.28	0.22
	High Yield	0.30	0.25	0.20

Sources: Coffee DRCs calculated using budget data from de Graaff 1986. Tea DRCs calculated using budget data from C. Warnaars, Kenya Regional Office.

productivity on small tobacco farms in Malawi and coffee cultivation in Kenya reflects the less intensive use of all inputs, including labor, but there is little difference in *efficiency of production* between small farms and estates when total factor productivity is considered. In the case of coffee production in Kenya, DRCs for smallholders were consistently lower than for estates, and DRCs for nonirrigated estates were lower than those for irrigated estates (see Table 8).[19]

The results are more complex in the case of Malawi. There, DRC calculations show that the relative efficiencies of maize and tobacco have changed over time. In 1982, smallholder cultivation of maize was as efficient as smallholder cultivation of flue-cured or burley tobacco and more efficient than smallholder cultivation of sun/air-cured and dark-fired tobacco. By 1986, however, tobacco prices were higher and maize prices lower, so that DRCs for maize production were higher than for tobacco production.

It is important to note the relative sensitivity of the results to changes in price. Using 1982 local prices, cultivation of sun/air-cured and dark-fired tobacco was inefficient as compared to burley and flue-cured, regardless of whether the latter was produced by smallholders or estates (Table 9). Smallholder cultivation of flue-cured and burley tobacco and maize was about as efficient as estate cultivation of tobacco.

When international prices are used the two major adjustments that are made are to raise the price of fertilizer as the subsidy is eliminated which raises costs on estates and increases the price that smallholders receive, so that the DRCs for smallholders are lowered relative to those of estates. For instance, whereas in Table 9 the DRC for flue-cured tobacco whether on estates or for smallholders is about the same, using international prices leads to DRCs for smallholders being about half of those on estates. DRCs for sun/air-cured and dark-fired tobacco also become significantly lower so that smallholders can now be seen to

be economically efficient in the production of these varieties of tobaccos. Similarly, the results are quite different when DRCs are calculated using 1986 prices (Tables 10 and 11). Because the prices of imported fertilizers rose faster than the price of labor (as a result of increased transport costs, devaluation, and removal of the fertilizer subsidy), smallholder cultivation of flue-cured and burley tobacco increased its advantage over estate production. This is because estates, which use more of all factors per hectare than smallholders, use relatively more fertilizer than other inputs. In particular, the DRCs for sun/air-cured and dark-fired tobacco are less than one when calculated at 1986 prices and greater than one when calculated at 1982 prices.

The 1986 DRCs were calculated for two sets of prices—first the average producer price paid by ADMARC for tobacco and, second, the price determined on ADMARC's auction floor. The price used makes a significant difference

Tables 9-11
Domestic resource cost for tobacco, maize, and groundnut production by smallholders, tenants, and estates producing different varieties of tobacco in Malawi

	1982			1986 (Smallholder producer prices to calculate value of production)			1986 ADMARC auction prices to calculate the value of production)		
Crop/type of producer	DRC	DRC (.75*WAGE)	DRC (.50*WAGE)	DRC	DRC (.75*WAGE)	DRC (.50*WAGE)	DRC	DRC (.75*WAGE)	DRC (.50*WAGE)
DRCs for Tobacco									
Smallholder									
Flue-cured	0.45[a]	0.37	0.30	0.49[a]	0.42	0.35	0.49[a]	0.42	0.35
				(.84)[b]	(.77)	(.69)	(.84)[b]	(.77)	(.69)
Burley	0.68	0.56	0.45	0.55	0.47	0.39	0.55	0.47	0.39
				(.71)	(.62)	(.54)	(.71)	(.62)	(.54)
Sun/Air	1.35[b]	1.05	0.76	0.63	0.50	0.37	0.53	0.42	0.31
				(1.07)	(.92)	(.77)	(.94)	(.81)	(.67)
Dark-Fired (northern)	1.62	1.26	0.90	0.82	0.65	0.48	0.50	0.39	0.29
				(1.21)	(1.03)	(.85)	(.85)	(.72)	(.60)
Dark-Fired (southern)	-	-	-	0.98	0.77	0.57	0.67	0.53	0.39
				(1.35)	(1.15)	(.95)	(1.05)	(.90)	(.74)
Tenant									
Burley	1.09	0.88	0.67	0.48	0.39	0.31	0.48	0.39	0.31
Estate									
Flue-cured	0.41	0.35	0.29	0.53	0.47	0.41	0.53	0.47	0.41
	(.90)[c]	(.83)	(.76)	(1.12)	(1.04)	(.96)	(1.12)	(1.04)	(.96)
Burley									
Direct Labor	0.52	0.46	0.39	0.61	0.56	0.50	0.61	0.56	0.50
	(1.09)	(1.01)	(.93)	(1.22)	(1.14)	(1.05)	(1.22)	(1.14)	(1.05)
Tenant	0.47	0.41	0.34	0.49	0.43	0.38	0.49	0.43	0.38
	(.82)	(.74)	(.67)	(.78)	(.71)	(.65)	(.78)	(.71)	(.65)
DRCs for maize by type of farm and type of tobacco grown									
Smallholder									
Flue-cured	0.42	0.35	0.28	0.83	0.71	0.60	0.83	0.71	0.60
Burley	0.53	0.44	0.35	1.12	0.97	0.81	1.12	0.97	0.81
Sun/Air	0.60	0.47	0.34	1.10	0.88	0.66	1.10	0.88	0.66
Dark-Fired	0.60	0.47	0.34	1.10	0.88	0.66	1.10	0.88	0.66
Tenant									
Burley	0.40	0.32	0.25	0.62	0.52	0.42	0.62	0.52	0.42
Estate									
Flue-cured	0.56	0.51	0.45	-	-	-	-	-	-
Burley	-	-	-	-	-	-	-	-	-
Direct Labor	0.57	0.52	0.46	-	-	-	-	-	-
DRCs for groundnut by type of farm and type of tobacco grown									
Smallholder									
Flue-cured	0.95	0.77	0.59	0.90	0.75	0.60	0.90	0.75	0.60
Burley	0.95	0.77	0.59	0.90	0.75	0.60	0.90	0.75	0.60
Sun/Air	1.21	0.98	0.76	0.97	0.81	0.65	0.97	0.81	0.65
Dark-Fired	1.21	0.98	0.76	0.97	0.81	0.65	0.97	0.81	0.65
Estate									
Flue-cured	1.28	1.11	0.93	2.31	2.06	1.81	2.31	2.06	1.81

Notes: DRCs for maize and groundnut are differentiated by whether they are grown by smallholders, by tenants (on estates), or by estates, and by the type of tobacco grown by each of these producer types along with the maize and groundnuts.

[a] Smallholder flue-cured and burley DRCs are for the production of each individual crop. They include marketing costs (transport, packing, auction floor charges, and levies) but exclude overhead costs (repairs and maintenance, rent, interest on working capital, and management salaries for estates).

[b] Smallholder sun/air and dark-fired DRCs exclude both marketing and overhead costs.

[c] Values in parentheses are DRCs for the entire estate production, which include all marketing and overhead costs.

Source: Minster Agriculture Ltd. (1982). Government of Malawi, Economic Reports, various years. Government of Malawi (1987).

to DRCs for sun/air-cured and dark-fired tobacco, which must be sold to ADMARC, with the DRCs being greater when fixed producer prices were used to determine the value of production than when auction prices were used. This difference underlines the importance of marketing margins for smallholders. Unit marketing costs for smallholders tend to be larger than those incurred by estates due to scale economies in marketing, thus affecting the efficiency of smallholder cultivation. The most significant reason for the differential price paid to estates and smallholders, however, has been the Malawian government's policy of taxing smallholders by paying low producer prices, while leaving the estate sector virtually untaxed. In Kenya, on the other hand, much of the difference between estate and smallholder producer prices for tea and coffee is explained mainly by higher unit marketing costs in handling smallholder production, since both receive the same auction prices. These differences in marketing margins do affect smallholders' decisions to prefer one crop over another, even though there is no difference that is unfavorable to smallholders in terms of the economic efficiency of production between the two types of production.

Policy Implications

Past policies toward the smallholder sector in Kenya and Malawi have been the outcome of the different, and often conflicting, objectives of donors and governments. Donors, particularly in the 1970s, focused on the need to alleviate poverty and were motivated by the view that small-farm production is fully as efficient as large-scale production. Their assistance thus began to concentrate explicitly on smallholders. But this "small is beautiful" perspective did not pay significant attention to the specific constraints faced by smallholders in intensifying production, and the need to design agricultural policies and services to alleviate those constraints and ensure that benefits from smallholder intensification could actually be realized in the long run (Howell Forthcoming).

African governments, on the other hand, were driven by the need to secure political support from key groups and by the need to achieve rapid "success" in agriculture. In the 1960s, for instance, Malawi wished to free itself from dependence on British aid to cover the budgetary deficit. It seemed logical to tax small farmers to achieve public sector resource mobilization. It also seemed appropriate to favor production of export crops by estates, which required only limited government intervention in establishing credit organizations, diffusing technology, and developing input supply and marketing channels in order to raise production levels. Rhodesia's unilateral declaration of independence, which quickly improved markets for Malawian tobacco, and the perception that scale economies would accrue to tobacco grown on large farms reinforced the argument in favor of estates (Christiansen and Kydd 1987). Doubts about the reliability and the productive potential of smallholder agriculture also played a part in the policy bias against smallholders.

Governments have favored the large-farm sector through various measures. In both Malawi and Kenya, substantial institutional credit was channeled to the large-farm sector.[20] In Nigeria, the government has subsidized settlement, irrigation, and mechanization costs to encourage large-scale production of food crops. In 1982, almost 3 percent of the total subsidy budget is estimated to have been devoted to the tractor-hire service—a subject of contention between the government of Nigeria and the World Bank for nearly a decade (Lele, Oyejide, et al. 1989).

A policy favoring smallholders requires a political system that is able to articulate the demands of farmers. There is disagreement over which elements of a political system are conducive to smallholder development. Bates (1987), for example, argues that Kenya's relatively good record in small-farm development is explained by its one party system, which forced members of parliament to compete in providing services to constituents. Bates' reasoning, however, is contradicted by the experience of many other one party African states. Also, his argument does not take into account the fact that KTDA policies to encourage smallholder tea production were developed well before the one party system was adopted in 1969.[21] Indeed, it was the pressure on the colonial government to allow Africans the right to own land and to grow export crops that fueled Kenya's independence movement. The more broad-based representation of producer interests in Kenya's politics and bureaucracy relative to other countries may explain Kenya's greater smallholder orientation (Lele and Hanak Forthcoming), although the political economy of why different strategies are adopted clearly requires further research.

If the aim of governments and/or donors is to foster growth in smallholder production, a number of policy actions need to be taken. First and foremost, it is necessary to impose equal access to land, rights to grow crops, and opportunities to sell them in private markets, regardless of farm scale. This paper has demonstrated that Malawi's policy of requiring smallholders to grow only lower-quality tobacco and to sell their production only at government-established prices has put them at a disadvantage in many ways. Since there are usually no economies of scale in the production of tobacco, there is no excuse for the continuation of this policy.

There are other land policy considerations in situations where farms of different sizes coexist. For instance, African governments have tended to argue that adoption of modern technologies on large farms has an important demonstration effect on small farmers. Indeed, Cameroonians point to this demonstration effect as one of the key factors explaining rapid growth of coffee and hybrid maize cultivation by smallholders in Kenya. Where smallholders and large farms operate in quite different policy environments, as in Malawi, however, a demonstration effect is unlikely to apply. The lack of such a demonstration effect may help to explain the slow adoption of hybrid maize in Malawi, despite the substantially higher returns to growing hybrids, even on very small farms.[22]

Second, rural development programs need to address the specific constraints facing smallholders, including the high risk aversion accompanying poverty and the lack of cash resources to purchase inputs, that limit their ability to adopt new technologies and practices. Exclusive reliance on the private sector to establish competitive markets for

credit, fertilizer, and other inputs may not be possible at an early stage of such programs.[23] It is equally clear that the private sector must not be prevented from playing a role that it finds profitable, a tendency that donors encouraged in the 1970s, albeit inadvertently. Kenya's dynamic growth in horticultural crops produced by smallholders, for example, is in large part due to the role that the private sector has been allowed to play in the provision of services and experts—an area in which external assistance played a minor role. Poor design of public sector interventions combined with the excessive growth of public enterprises has caused a sharp swing of the pendulum between those two alternatives rather than a balance.

The contrast between Kenya and Malawi illustrates the importance of relieving smallholders' food constraints in order to free resources for export crop production. Squeezing an ever larger population onto smaller farms is bringing a larger proportion of the population close to subsistence and reducing the ability of these households to bear risks in adopting improved technology. The slower adoption of hybrid maize in Malawi is, at least in part, a result of the declining ability of smallholders to accept risks. Thus, whereas the government's need for food self-sufficiency increases as population pressure increases, the ability of smallholder households to respond to those needs appears to decline.

The food constraint can be relaxed either by improving productivity of food crop production or by providing reliable supplies of food through the markets, as tobacco estates often do in Malawi. Indeed, the less reliable food markets become, the greater the tendency for small farmers to retreat into subsistence. The fact that, in the Central and Eastern provinces of Kenya, a large majority of smallholders producing tea and coffee buy up to 50 percent of their food needs from the market is a reflection not only of their purchasing power from export crop production but also of their confidence in the maize market. The government's presence in the market has partly ensured this confidence, albeit at a high cost. In Tanzania, on the other hand, the shift out of cotton and coffee into maize in the 1970s and early 1980s was, at least in part, a result of food insecurity (Lele, van de Walle, and Gbetibouo 1988).

The higher marketing costs in handling smallholder relative to estate production, both in terms of supplying food and inputs to small farmers and collecting their production, also points to the importance of reducing marketing costs and relieving the uncertainty of inadequate throughput for processing plants. One way to do this is to use nucleus estates, where small farmers' output is processed at a nearby estate to take advantage of economies of scale in processing, while at the same time obviating the need to transport output over a large area in order to operate a processing plant for smallholders only. As smallholder production increases, construction of processing plants catering only to smallholders may become efficient.

All of these actions—improving marketing of inputs, food, outputs, and credit; assuring supply of fertilizers; building feeder roads; generating and diffusing improved technologies; and creating an effective land policy—involve an active role for the government in formulating thoughtful and efficient policies. Such presence also requires increased public expenditures in the short run, since the benefits would be realized only after a substantial time lag. Lack of budgetary resources tends to lead governments to ignore opportunities for increasing smallholder production, even though this strategy may be efficient. While budgetary fears were partly responsible for the Malawi government's decision in the mid-1960s to follow an estate strategy, the donors' reluctance to finance recurrent costs, while rapidly expanding donor-funded investments in agriculture and rural development has also posed a constraint.

In conclusion this paper stresses the intertemporal trade-offs. It shows that even though a smallholder strategy is both privately profitable and socially efficient—the latter in the long run, there may be substantial trade-offs between growth and equity in the short and medium run due to the time lags before the benefits of such a strategy are realized. Government policies can make a significant difference to the extent of these lags by removing barriers to factor mobility and economic opportunities and by reflecting an understanding of the precise constraints facing smallholder development in the interventions directed at these households. Nevertheless, even with the best designed programs government expenditures will be needed,[24] causing a strain on the budget, especially when taxation and government expenditures are regressive. Also since exports can increase only after output increases while food imports may have to increase to meet the internal demand, balance of payments will be strained. Concessional aid and recurrent budgetary support may, therefore, be essential to manage the balance of payments and the government budget in the short and the medium run, provided the design of interventions financed by these expenditures address the precise situation-specific policies and services that directly meet smallfarmer needs. As the experience of the last fifteen years reviewed in the MADIA study shows, failure to address these constraints can lead to continued pressure on the balance of payments and the budget and not much sustained growth.

Notes

1. For a review of the congressional mandate in the United States and various other policy papers on the need for a poverty focus in donor agencies see Johnston et al. and Howell in Lele (Forthcoming). And for analysis of changing development strategies and the role of aid, see Lele (1988a).

2. For analysis of empirical evidence from the MADIA study see Lele (1989a and 1989 b).

3. Personal communication.

4. Yield figures for maize in Kenya are somewhat puzzling. Over the period 1962-86 they show little increase in productivity despite the rapid expansion of high-yielding varieties and the opinion of most observers that productivity has grown rapidly. The answer seems to be that maize production has spread to less fertile areas, and the introduction of the high-yielding varieties has prevented a decline in productivity. See Lele and Meyers (1987).

5. For an analysis of the effects of rapid population growth, see Boserup (1965). Also see Lele and Stone (1989).

6. This literature is surveyed in Singh (1988).

7. Bhalla and Roy (1988) argue that differences in land quality account for the productivity differences. But in our opinion they do not fully discount the impact of the green revolution.

8. Chattopadhyay and Rudra (1977) and Bhardwaj (1974), however, pointed out that the existence of the inverse relationship reflects not so much small farmers' greater efficiency but their greater distress, which forced them to work so much on their small plots.

9. Area under estate tobacco production has increased from 9,600 hectares in 1970 to 47,699 hectares in 1985, while production has increased from 10,350 tons to 52,650 tons, so that average yields increased from 1,078 kilograms per hectare to 1,104 kilograms per hectare (although considerably higher yields were achieved between 1979 and 1984), giving an average annual growth rate in yields of 1.3 percent.

10. We are thankful to Dipak Mazumdar for providing us with the data relating to smallholder production in Malaysia.

11. See de Wilde (1967), Lele (1975), Eicher (1982), and Ruthenburg (1971). For a discussion of the situation in Malawi see Lele (1989b).

12. For a description of production conditions for tobacco cultivation in Malawi see Tobacco Sector Study, Minster Agriculture Limited (1982).

13. Tobacco estates in Malawi leave an average of 92 percent of their land uncultivated at any given time (Deloitte, Haskins, and Sells 1986). This estimate, to some extent, overstates the problem, because tobacco requires a four-year rotation cycle which reduces the quantity of land an estate is able to cultivate in a given year.

14. The values of fertilizer and chemicals used by smallholders and estates per hectare of maize cultivated are MK 59.60 for smallholder flue-cured and burley producers, MK 35.33 for smallholder dark-fired and sun/air-cured producers, and MK 194.9 for flue-cured and MK 552 for burley estates.

15. De Graaff (1986) reports that Kenyan smallholder coffee yields in terms of green coffee equivalents were usually about 400-500 kilograms per hectare except in one region where yields were as high as 700 kilograms per hectare. But yields on estates were 950 kilograms per hectare for nonirrigated land and 1,250 kilograms per hectare for irrigated production.

16. For an analysis of employment implications of new technologies, see Mellor and Lele (1972).

17. Harris Mule, letter of March 16, 1987.

18. A number of studies have looked at the import requirements of producing different crops, particularly in Kenya and Tanzania. See, for example, World Bank (1983) and Sharply (1984).

19. In the case of tea cultivation, we could not find enough information for production on estates to calculate the DRCs.

20. For information on Malawi see Kydd and Christiansen (1982) and on Kenya see Lele and Meyers (1987).

21. Further, Bates (1987) is skeptical that Kenya has adopted a smallholder strategy in a significant way. He contrasts government support for wheat production, which is dominated by large-scale farmers, with that of maize and contrasts policies regarding coffee, in which production is concentrated, with those regarding cotton, which is grown largely by smallholders. The data suggest, however, that coffee production on smallholdings has grown rapidly and their share in exports has increased substantially, as we have pointed out earlier.

22. See Lele (1989a) for further information in the case of Malawi.

23. The issues of agricultural marketing and cooperatives are discussed in Lele and Christiansen (1988).

24. For the importance of the role of the government, see Lele (1988a).

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THE MADIA STUDY

Although many generalizations have been made about the agricultural crisis in Africa, relatively few detailed country and cross-country studies of African agriculture based on systematic data analysis have been conducted. Similarly, although foreign aid has constituted a large part of total government expenditures in Africa for close to fifteen years, there has been little analysis of the role of external assistance in African countries that goes beyond political criticism of official assistance or the alleged self-serving objectives of donors. The impetus for the study "Managing Agricultural Development in Africa" (MADIA) was to begin the process of filling this gap and to explain the nature and sources of the agricultural crisis, particularly the extent to which it originated in resource endowments, historical and contemporary events, external and internal policies, and the economic and political environment.

The MADIA study involved detailed analysis of six African countries—Kenya, Malawi, Tanzania, Cameroon, Nigeria, and Senegal. In addition to the World Bank, seven donors, USAID, UKODA, DANIDA, SIDA, the French and German governments, and the EEC participated in the study. The analysis of country policies and performance during the last 20-25 years was carried out with the benefit of substantial input from the governments and nationals of each of the countries represented. The study had three main areas of focus: (1) the relationship between domestic macroeconomic and agricultural policy and agricultural performance, (2) donors' role in the development of agriculture, and (3) the politics of agricultural policy.

The MADIA study was the result of encouragement and support from many people. Anne Krueger, former Vice President for Economic Research Staff in the World Bank, encouraged the establishment of these studies on aid and development in 1984. Gregory Ingram, former Director of the Development Research Department, provided unstinting support for the study. During the reorganization of the World Bank in 1986, the strong support from Benjamin King, then acting Vice President for Economic Research Staff, proved invaluable. Barber Conable, President of the World Bank, and Mr. Edward V. K. Jaycox, Vice President for the Africa Region, have played a key role by ensuring support for the study's completion, as did Stanley Fischer, the Vice President for Development Economics. Yves Rovani, Director General of the Operations Evaluation Department, was particularly helpful as the MADIA study drew heavily on the works of OED.

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