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Economic Liberalization and Smallholder Productivity in Tanzania. From Promised Success to Real Failure, 1985–1998

RUNE SKARSTEIN

In the mid-1980s, Tanzania adopted a programme for economic liberalization of the entire economy, including agriculture. After pressure from the IMF and the World Bank in particular, but also from most of the bilateral donors, agricultural producer and input prices were decontrolled, panterritorial prices were abolished, subsidies were removed and trade in agricultural products and inputs was to a large extent taken over by private traders. The international donor community promised that economic liberalization would provide a strong stimulus to Tanzanian agriculture, resulting in increasing yields, increased labour productivity, rising agricultural production and higher incomes. However, available data show that, as far as food crop production is concerned, this promise has not been fulfilled. Even compared to the 'crisis years' 1979–1984, labour productivity, yields and production per capita of food grains stagnated or declined up to the end of the 1990s. Some causes of this failure are discussed.

Keywords: economic liberalization, agricultural labour productivity, land productivity, agricultural output, Tanzania

1. BACKGROUND

Smallholders are the main producers of food crops in Tanzania.[1] In 1994/95, approximately 88 per cent of the total agricultural area in Tanzania was under

Rune Skarstein, Department of Economics, NTNU, N-7491 Trondheim, Norway. e-mail: rune.skarstein@svt.ntnu.no

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[1] In this article, the term 'smallholder' has the same meaning as in official Tanzanian statistics. According to the *National Sample Census of Agriculture of 1994/95* (United Republic of Tanzania 1996), there were 3,873,000 smallholders in Tanzania Mainland. In the *masika* season (the great rain season), average planted area per smallholder was 0.86 ha. 9.9 per cent of all smallholders had a planted area of more than 2 ha, while only 1.4 per cent had a planted area of more than 5 ha. 99.9 per cent had a hand hoe (*jembe*), while 9.3 per cent had an animal-operated plough. 17.6 per cent employed temporary worker(s), while only 1.1 per cent employed permanent wage labour. Thus, the Tanzanian smallholders operate their holdings mainly with family labour, the great majority using only hand tools. In my interpretation, the term 'smallholder' is therefore identical with the term 'peasant'.

smallholdings, which accounted for 97.8 per cent of total maize production, 97.3 per cent of total paddy production, and almost all production of sorghum/millet in the country (United Republic of Tanzania 1996, 38; 1997, vi–vii). For this reason, the focus of this paper is the impact of economic liberalization on smallholder productivity.

Let me start by recapitulating the stagnation in Tanzania's agricultural production in the late 1970s and early 1980s. The first serious setback was in 1973/74 and 1974/75, associated with the villagization campaign, but also attributed to bad weather. In 1976/77, agricultural production recovered again. But in subsequent years, there was a persistent stagnation until 1983. In the period 1976–77 to 1982–83, the average annual growth of maize and rice production was 1.0 per cent and 0.2 per cent, respectively, while agricultural GDP (crop and animal husbandry) increased by only 1.3 per cent per year. With a population growth rate of 3.2 per cent per annum in this period, per capita production of the two major food grains declined by 2.2 per cent and 3.0 per cent per year, respectively.[2] Thus, production of the most important staple food by far, maize, dropped from an average of 93.5 kg per capita in 1976–77, to 82.1 kg per capita in 1982–83. On the other hand, it is notable that in the years 1983–86 (which have often been considered as the worst crisis years) there was, according to official statistics, actually a strong upswing in agricultural production (Table 1). Maize production rose by more than 26 per cent from the crop year 1982/83 to 1984/85, reaching a historical high of 2,093,000 tonnes, corresponding to 96 kg per capita of the population, in the latter year. In the period 1984–86, both maize and paddy production increased every year; maize production rose by an average of 10.2 per cent per year, while paddy production increased by more than 16 per cent per year (also Table 1).

The stagnation of agricultural production in the late 1970s and early 1980s contributed to Tanzania's increasing dependency on large imports of the major food grains maize and rice. In the period 1972–86, Tanzania had net imports of maize in all years except in 1978 and 1979. Total net imports of maize over the whole period amounted to 1,587,000 tonnes, i.e. an average of 105,800 tonnes per year. In the same 15-year period, Tanzania was a net importer of rice every year, amounting to 770,000 tonnes over the whole period, corresponding to an average of more than 51,000 tonnes per year (Bryceson 1993, 239). There can be no doubt that these imports contributed to Tanzania's mounting balance of payments crisis in the 1980s.

However, the large imports of food grains up to 1985 were not caused by production shortfalls alone. That is indicated by the fact that net grain imports rose even in the period 1983–85, in spite of large production increases. In 1985,

[2] Maize and rice/paddy are the two most important staple foodstuffs both in terms of value and weight. In 1976/77, maize contributed 43.5 per cent to the total value and 40.2 per cent to the total weight of consumption of staple foodstuffs. The corresponding figures for rice/paddy on second place were 13.7 and 6.3 per cent, respectively (Bryceson 1993, 219).

Table 1. Production of maize and paddy, '000 tonnes, and growth rate of agricultural GDP, 1976–98

Period	*Maize*		*Paddy*		*Annual growth, agricultural GDP (%)*[a]
	Average annual production	*Average annual growth (%)*	*Average annual production*	*Average annual growth (%)*	
1976–79	1575	+5.9	327	–8.8	+1.1
1980–83	1718	–1.0	290	+7.5	+2.6
1984–86	2081	+10.2	443	+16.5	+4.7
1976–86	*1873*	*+3.46*[b]	*356*	*+3.65*[b]	*+2.71*[b]
1986–89	2466	–1.8	620	+22.4	+1.6
1990–92	2261	–4.1	511	–20.0	+0.2
1993–95	2443	+8.9	659	+16.6	+4.1
1996–98	2631	–2.3	799	+18.7	+4.1
1986–98	*2452*	*+1.12*[c]	*622*	*+4.95*[c]	*+2.47*[c]

[a] For the period 1976–86, crop and animal husbandry at constant 1976 prices. For the period 1986–98, crop and animal husbandry at constant 1992 prices.
[b] Trend growth rate (fitting a least-squares linear regression trend line to the logarithmic annual values of the variable), 1976–86.
[c] Trend growth rate, 1985–98.
The crop data up to 1983 stem from various publications from the Ministry of Agriculture. The data for the period 1983–85 are from the Crop Monitoring and Early Warning Unit (CMEW), while the data from 1986 onwards are from the Agricultural Statistics Unit (ASU) within the Ministry of Agriculture. The data for 1976 refer to the crop year 1975/76, and so on.
Sources of data for the period 1976–86: BOS (1992, 8, Table 3.1), for agricultural GDP. *Tanzanian Economic Trends*, vol. 7, nos. 1–2, 1994, Table 12, p. 99, for production of maize and rice.
Sources of data for the period 1986–98: World Bank (2000, 77, 92), data from ASU/MAC. An argument for using ASU data, especially from 1993 onwards, is presented in section 3 below.

the very same year as Tanzania had a bumper harvest of maize (2,093,000 tonnes), net imports of maize also reached a historical high of 278,000 tonnes. The explanation of this contradictory development is the growth of smuggling to neighbouring countries which accelerated after the war in Uganda in 1979. The increased smuggling was caused by factors on the demand side as well as the supply side. Due to disruptions caused by the war, there was grain shortage and correspondingly very high prices in Uganda. Also in Kenya, grain prices were high due to bad harvests. On the supply side, the Tanzanian government's commandeering of a large part of the transport fleet, spare parts and fuel for the war effort caused a severe disruption of the grain purchases of the National Milling Corporation (NMC). These factors combined prompted farmers to market their maize through

unofficial channels (Bryceson 1993, 95).[3] It should also be noted that the average annual level of maize production was 9 per cent higher in the 'crisis years' 1980–83 than in the preceding years 1976–79 (Table 1).

Against this background, to what extent the government could have prevented smuggling through a high-price policy may be questioned. After all, in the years when smuggling was at its highest, from 1980 to 1983, the nominal producer price of maize was increased by 120 per cent, while the real price (nominal price deflated by the NCPI) rose by 6.8 per cent. On the other hand, private traders smuggling maize from the granaries of the country – in particular from Njombe and Mbeya in the Southern Highlands and Arusha and Mbulu in the northern part of the country – offered the peasants better producer prices and more punctual collection of crops than the NMC. Most probably, this development was also to a considerable extent the result of the increasing inefficiency of the NMC, which charged high marketing margins while real producer prices were stagnant. However, the NMC's inefficiency was not only caused by its decaying internal organization. In the mid-1980s, approximately 75 per cent of Tanzania's lorry fleet was in private hands, and for lack of sufficient own transport capacity, the NMC had to hire private transporters at rapidly escalating costs (Bryceson 1993, 77, 98).

2. EXTERNAL VS INTERNAL CAUSES

The above considerations lead us to the heated debate on the 'external' vs 'internal' causes of Tanzania's crisis in the 1980s. In the early 1980s, Tanzanian researchers and politicians tended to emphasize external causes for the agricultural stagnation, in particular weak demand for agricultural export crops and correspondingly worsening terms of trade,[4] rising interest rates in international credit markets, increased protectionism in industrialized countries, the oil price shocks in 1973/74 and 1979, the breakdown of the East African Community in 1977, the cholera epidemic in 1978, and the war with Uganda in 1979.

Among 'external causes' were also periods of bad weather conditions. In 1979, poor weather was reported as the cause of a bad maize harvest, particularly in Arusha, which was then one of the NMC's major supply regions. A few years later, a drought which affected large areas in the crop year 1981/82 and floods in parts of the country in the following year, led to bad harvests with a production of only about 1650 thousand tonnes in each of those years.

Another 'external cause' of Tanzania's economic troubles in the early 1980s, which was far less highlighted, was the dramatic decline in foreign aid, including

[3] For the crop years 1983/84 and 1984/85, the Marketing Development Bureau estimated that as much as 75 per cent of marketed maize and 80 per cent of marketed rice went through parallel markets (Bryceson 1993, 96). In my assessment, these figures are exaggerated.

[4] Indeed, in the period 1977–85, Tanzania's commodity terms of trade declined by 50.8 per cent, while the income terms of trade declined by 64 per cent in the same period (Central Bank of Tanzania 2001, 155).

concessional loans, which was reduced by more than 30 per cent, from US$701.9 million in 1981 to US$486.9 million in 1985. This reduction of foreign aid by US$215 million corresponded to 62 per cent of Tanzania's merchandise exports and was 3.2 times larger than the country's merchandise trade deficit in 1986. The sharp reduction of foreign assistance compounded the crisis by leading to a drastic import compression, which had a profound negative effect on the supply of implements and inputs to the agricultural sector.

The drop in foreign aid was mainly accounted for by The Federal Republic of Germany, The United Kingdom, the Netherlands, Sweden and the World Bank (Havnevik et al. 1988, 124–7).[5] These cuts were related to the fact that Tanzania had refused to conclude an agreement with the IMF (International Monetary Fund) on structural adjustment, i.e. a programme of economic liberalization. In October 1985 Nyerere left the presidency, refusing to stand for a new term, and in August 1986 the Tanzanian government signed an agreement with the IMF for support to an Economic Recovery Programme (ERP). It is noteworthy that as soon as Tanzania had adopted the ERP, which was designed by the World Bank, the Bank increased its disbursements considerably. For 1986 as a whole, World Bank disbursements totalled more than US$60 million, or more than twice the amount in 1985 (Havnevik et al. 1988, 127). In the period 1985–90, foreign aid to Tanzania increased considerably every year, and in 1992 the aid inflow reached a historical peak of US$1345.5 million, which represented an increase of 176 per cent compared to 1985 (OECD 1990, 264; 1995, 183). The aid inflow in 1992 also represented a historical peak of 33 per cent of the country's GDP and covered as much as 83.6 per cent of the import bill. Against this background, it is clear that foreign aid was used both as a stick and a carrot to make the Tanzanian government embark upon the road of economic liberalization.

On the other hand, without directly denying these external factors, many foreign researchers, as well as the donor community and the international financial institutions (World Bank and IMF) increasingly tended to emphasize internal causes. They argued ever more strongly that the stagnation of Tanzania's agriculture was mainly caused by wrong policies and internal economic structures suffocating the development of agriculture. Among the internal factors which were most often emphasized was the already noted inefficiency of agricultural parastatals resulting in delayed or no payments to producers, high marketing margins and correspondingly lower share of producer prices in the final prices (Ellis 1983, 1988).[6] Other internal factors which were often referred to were

[5] Both in absolute and percentage terms, the World Bank made the greatest cut in disbursements, from US$97.9 million in 1982 to US$28.5 million in 1985, corresponding to minus 71 per cent (Havnevik et al. 1988, 126).

[6] A serious limitation of Ellis' studies in terms of explaining agricultural stagnation after 1970 is that, in addition to dealing mainly with export crops, he does not provide data from before 1970. On the other hand, with reference to data collected by Odegaard, Deborah Bryceson (1993, 239) has shown that, at least for food crops, the marketing margins, i.e. the difference between the consumer and producer price divided by the producer price, were considerably higher in the period 1964–72

nepotism and rent-seeking by corrupt bureaucrats in the state and the parastatal sector, 'financial repression' and controlled and panterritorial prices which led to 'price distortions' discouraging agricultural producers from an efficient allocation of resources, and the development of an industrial sector which stagnated due to its inefficiency and import dependency and became increasingly unable to provide agricultural producers with incentive goods (e.g. Bevan et al. 1989; Collier and Gunning 1999).

It is noteworthy that the counterproductive effects of villagization, which both the World Bank and most bilateral donors had applauded in the mid-1970s, were more rarely referred to. However, several studies indicate that villagization was possibly the most important sole cause of agricultural stagnation in the period from the mid-1970s to the mid-1980s. Large numbers of peasants were disrupted from their known productive environment and moved to areas where they did not know the quality and properties of the soil. In the old scattered settlements, shifting cultivation had ensured conservation of the soil. The new settlements necessarily implied a more intensive pressure on land resources and soil degradation.

After villagization, an increasingly intensive cultivation pattern developed around the villages, which could count several thousand inhabitants.[7] The average fallow period declined rapidly, while the smallholders did not have the necessary resources to conserve land by using chemical fertilizer, and walking distances to the fields increased as villagers tried to counterbalance the decline in soil fertility by cultivating areas more remote to the villages.[8] One study of five villages in Mufindi district carried out in the early 1980s shows 'a significant and continuing fall in output per hectare of maize during the three most recent post-villagization years. This fall in productivity does not seem to have been caused by climatic factors, because . . . the excess rainfall in 1983 did not seem to have had adverse effects on crop productivity' (Kikula 1997, 78). In the years 1981–83, the average maize yield in the five villages was 18 per cent lower, and in 1983 as much as 25 per cent lower than the normal yield before villagization (Kikula 1997, 77–80).

than in the stagnation/crisis period 1973–84. For maize flour (*sembe*), the marketing margin was 309 per cent in the former period and 85 per cent in the latter period. For rice, the corresponding figures were 244 and 178 per cent, respectively, and for wheat 212 and 199 per cent, respectively. Neither for *sembe* nor rice was there any tendency of increasing marketing margins during the period 1973–84. Both for this reason and because the marketing margins of private traders are largely unknown, the claim that 'in the Tanzanian grain market, trading costs doubled during the period of controls, and fell by over 60 per cent once they were removed' (Collier and Gunning 1999, 97) is, in my assessment, highly questionable.

[7] In 1979, there were on average about 1730 inhabitants in each of the more than 8000 villages (Ellis 1982, 68). In this average are included villages with much larger populations. For example, the seven villages in the northern flood plain of Rufiji District had an average population of about 4570 in 1978 (Havnevik 1993, 79), and several villages in the country have had populations of more than 10,000.

[8] As the area of cultivated land extended around the villages, so also the walking distance to firewood tended to increase. According to an International Labour Organization study, the rural household distance to firewood rose from between 0.7 and 4.2 km in 1977, to between 2.5 and 5 km in 1981 (ILO 1981, 230).

3. ECONOMIC LIBERALIZATION

Although internal and external causes were unequally emphasized by different studies, there was considerable agreement on the diagnosis of the crisis and the identification of its main causes. There was no such agreement on a prescription as to how to overcome the crisis. On this question there was a gulf of disagreement mainly between two groups. On the one hand there was a group, mainly researchers, who argued that the crisis problems should be solved by reforming the existing institutions and democratizing society through political mobilization from below. They would retain a high degree of economic planning and state intervention, but reform the whole public sector radically and also reduce its bureaucracy. In particular, they argued for control of foreign trade and exchange controls, for protection of infant domestic industries, for the restrengthening or revival of customary tenure rights in agriculture, for retaining panterritorial input and producer prices, and for a profound democratization of the cooperatives, as well as society as a whole (e.g. Boesen et al. 1986; Shivji 1986, 1998; Havnevik 1987, 1993; Gibbon et al. 1993).

On the other hand, the IMF and the World Bank in particular, with more or less active support from virtually all bilateral donors, claimed that the only solution to the crisis was less state and more market, which implied economic liberalization, dismantling of a large number of parastatals and generally a dramatic reduction of the role of the government in the economy. In the view of the IMF and the World Bank, the Tanzanian system with heavy state involvement in the economy had led to grave distortions in the pricing and incentive systems. Therefore, economic liberalization was considered necessary to liberate private economic initiative and to 'get the prices right', so that they would reflect relative scarcities and ensure an optimal allocation of resources. Or, as the IMF phrased it in 1986 referring to the ERP,

> partial attempts at correcting a fundamentally deteriorating economic and financial situation do not succeed . . . in the absence of appropriate price signals. . . . [T]he main emphasis of the programme is to provide to economic agents the appropriate pricing signals and to give them the necessary opportunities to act on the basis of those signals. This should provide incentives toward economic efficiency and improved allocation of scarce resources. (IMF 1986, 3, 6–7)

What the IMF states here is that 'appropriate pricing signals' ensure *static efficiency*, in the sense of allocating given 'scarce resources' so as to produce a maximum output in the short term. But the statement does not indicate whether 'appropriate pricing signals' could also ensure *dynamic efficiency*, through an 'optimal path' of technical progress and growth of land and labour productivity in the longer term, which is actually the crucial problem in Tanzanian agriculture. The World Bank's structural adjustment programmes, which aim at improving long-term dynamic efficiency, also stress the objective of 'getting the prices right',

apparently by assuming that static efficiency will lead to long-term dynamic efficiency.[9]

The process of economic liberalization, which was ultimately carried out from above by the power of the international finance institutions (IFIs), had started well before Tanzania was compelled to sign an agreement with the IMF in 1986. In 1981, the government launched a National Economic Survival Programme (NESP) in an attempt to mobilize foreign exchange. In 1982 this was followed by a Structural Adjustment Programme (SAP), which apparently intended to partially meet the demands of the IMF by dealing with the economy's structural problems. In the agricultural sector, SAP aimed at higher producer prices, improved input availability and more efficient marketing. And as a matter of fact, in the 1984/85 budget, the government more than doubled agricultural expenditure, removed the subsidy on the consumer price of maize, and announced a substantial devaluation of the Tanzanian Shilling (Gibbon et al. 1993, 52–71). In October 1982, the government launched a document on national agricultural policy (United Republic of Tanzania 1982), which contained rather detailed analyses of the development of agriculture and its subsectors, as well as agricultural extension, credit and marketing in the period 1961–82. The recommendations in the policy document could be read as a detailed follow-up of the section on agriculture in the SAP.

However, the IMF and the World Bank were still not content, and in August 1986 Tanzania had to sign the Economic Recovery Programme (ERP) with the IMF. The election of the (in the IMF's sense) more reform-friendly president Ali Hassan Mwinyi in 1985 helped to reach the agreement. The ERP and its follow-up, the ERPII: Economic and Social Action Programme (ERPII ESAP) in 1989, as well as the Tanzania Agricultural Adjustment Programme (TANAA) agreed with the World Bank in 1990, and the Enhanced Structural Adjustment Facility (ESAF) agreed with the IMF in 1991, meant decisive further steps in the direction of economic liberalization.

By 1987, all weight restrictions on interregional food grain trade had been abolished and legal private traders had started to compete with the NMC. Panterritorial pricing was abolished, and from the late 1980s onwards, primary societies and cooperative unions (created under the new Act of 1982) were allowed to sell directly to private traders. In 1990, individual farmers were also given this option, hence competition between the parastatal/cooperative system and the private sector had become fully legalized. To begin with, the role of the NMC was reduced to a buyer of last resort and manager of the Strategic Grain Reserve (SGR). However, in 1990, the NMC was in practice abandoned, as the Government, through the Food Security Department in the Ministry of Agriculture, took direct control of the management of the SGR. The NMC ceased to buy crops directly from the producers in 1991/92. The SGR is currently buying maize

[9] 'Getting the prices right' is essential in the theory of technical change through 'induced innovation' (e.g. Binswanger and Ruttan 1978). For critical discussion of this as well as static vs dynamic efficiency, see Bhaduri (1991) and Skarstein (2004).

both directly from producers and from private traders, who deliver the produce at its godowns (MAC/MDB 1995, 18–20). In 1986–87, 36 per cent of marketed maize was still handled through the official market. In 1988–97, this share had declined to between 10 and 20 per cent, while private traders handled between 80 and 90 per cent of all marketed maize (Temu and Ashimogo 1999, 142). In 1994/95, the procurement and distribution of agricultural inputs were liberalized. Agricultural subsidies are seen by the World Bank to cause economic inefficiencies, and the Bank demanded that they should be abolished altogether. For example, as will be described in section 5.2, the subsidy on fertilizer was completely removed in 1994/95 (World Bank 1994, 85–92; Ponte 1999, 11, 14).

The transition from a single-tier to a multi-tier agricultural marketing system had been completed by 1990, when indicative prices for food crops were introduced. By 1992, the private sector had taken control of nearly the entire grain market (MAC/MDB 1995, 21–5). In sections 5.2 and 5.3, we will see that the impact of these changes, including the withdrawal of input- and transport subsidies, was a sharp decline in the profitability of smallholder cultivation of maize, especially in the south-western part of the country. Maize production started to shift gradually back to the northern part of the country, where more fertile soils allow cultivation with less dependence on chemical inputs and access to the national markets is much easier. This, in turn, resulted in an agricultural depression in the south-eastern highlands of Rukwa and Ruvuma.

In the view of the IMF and the World Bank, the rent-seeking character of the state had become a major obstacle to economic development. The state therefore had to be forced to withdraw in order to open up space for an entrepreneurial private sector starved of opportunities because of the all-embracing character of the state. The government was further obliged to bring about balance in its budget which implied a dramatic reduction in its expenditures and less efforts to strengthen its revenue side. At the same time, the credit system, foreign trade and foreign exchange transactions were liberalized.

Finally, in 1995 Tanzania adopted a national land policy, which – despite the fact that all land should still be 'vested in the President as trustee on behalf of all citizens' – opened the door ajar for commodification of land, through the statement that 'Individuals should be allowed to obtain individual titles within an area not designed for communal uses, land conservation and other specified village or community projects' (MLH 1995, 9, 21).

In 1992 – a year when production of the main food crops dropped by 3.3 per cent and agricultural GDP rose by only 0.5 per cent (Delgado et al. 1999, 160) – the World Bank started to celebrate Tanzania's economic liberalization by asserting that 'the economy is no longer in crisis' (World Bank 1992, 1). And in 1995, the IMF stated that 'With the support of the international community . . . the authorities [of Tanzania] are transforming perhaps one of the most regulated economies in Africa into one of the most liberalized. More could be done, but a lot has been achieved' (IMF 1995, 1). We will consider to what extent these assertions can be defended by an actual upswing in Tanzanian agriculture in the wake of economic liberalization.

4. THE GROWTH PERFORMANCE OF TANZANIAN AGRICULTURE AFTER LIBERALIZATION

We have already referred to the optimistic predictions of the World Bank and the IMF: with economic liberalization, including 'free prices' and removal of input and output subsidies, agricultural producers would respond to 'price incentives', and start to specialize, accumulate and innovate. And indeed, good agricultural harvests – owing to good weather conditions – in 1987–89 allowed the IFIs, as well as bilateral donors and the Tanzanian government, to proclaim that their new agricultural policy was a success, although maize production fell also in that period compared to 1986. In the official rhetoric, the immediate positive response of the agricultural producers was linked to the new marketing arrangements, especially for food crops, and the restored availability of incentive goods. However, from 1989 to 1994, production of the main food crop maize, as well as the growth of agricultural GDP, suffered a serious setback (see Table 1).[10]

There are several, and partly conflicting, statistics on agricultural production in Tanzania, issued by different government agencies. This has led to a discussion on which data source is the most reliable (for example, cf. Bhaduri et al. 1993, 87–90; Ponte 1999, 15–21; Delgado et al. 1999, 99–106). It is beyond the scope of this paper to enter this discussion. Suffice it to say that the two most important data sources are the Crop Monitoring and Early Warning Unit (CMEWU) and the Agricultural Statistical Unit (ASU), both within the Ministry of Agriculture and Cooperatives. The CMEWU figures are derived from pre-harvest forecasts, while the ASU figures are post-harvest estimates. On a year-to-year basis, the difference between the series from these two sources has been considerable for some years, but over the longer run they are almost equal. It should also be noted that until 1994 the two series relied on the same agricultural reporting system.[11] However, I agree with Ponte, as well as Delgado et al., that – since the mid-1990s – the data issued by ASU are the most reliable, and 'should be considered the ''official'' government estimates' (Delgado et al. 1999, 106). The statistics from ASU are therefore the basis of the production figures as well as of the growth rates of agricultural GDP for the period 1986–98 presented in Table 1.

As Table 1 shows, neither the average annual production of maize nor rice was higher over the whole period 1986–98 than in the years 1986–89. Although paddy production showed a clearly positive trend in the 1990s, it should be

[10] As observed in footnote 1, maize is by far the most important staple food in Tanzania. In 1998, maize production was almost three times larger than the production of paddy measured in GDP-contribution. Maize accounted for 22.8 per cent of agricultural GDP, while paddy accounted for 8 per cent, millet/sorghum contributed 4.6 per cent and wheat only 0.5 per cent (Delgado et al. 1999, 145).

[11] I disagree with Ponte (1999, 18–19) when he, using data for 1986/87–1990/91, implies that CMEWU has systematically overestimated production. As a matter of fact, the CMEWU data for the period 1986–98 yields a trend growth rate for maize production of only 0.2 per cent per year, compared to 1.12 per cent per year derived from the ASU data (data in Delgado et al. 1999, 148 and Table 1 above).

noted that it was first of all marked by strong fluctuations mainly due to changes in rainfall and floods. For example, in 1985 it was only 276,000 tonnes, and then soared by more the 50 per cent to 418,000 tonnes in the following year. In 1996, it reached 807,000 tonnes and then dropped by 32 per cent to 550,000 tonnes the year afterwards (Delgado et al. 1999, 148). On the other hand, the growth of production of the main food grain maize of only 1.12 per cent per year over the period 1985–98 was alarmingly low in view of a population growth of 3 per cent per year in the same period according to FAO statistics (FAO 2000). In the years 1993–95, the average annual maize production of 2,443,000 tonnes was only 19.5 per cent higher than the estimated average production in the 'crisis years' 1983–86, of 1,945,000 tonnes, while population had grown by almost 30 per cent between the two periods (Table 1 and Havnevik et al. 1988, 67).

In their report commissioned by the World Bank, Delgado et al. conclude: 'Overall agricultural performance in the post-reform period has been respectable but not outstanding. We estimate that agricultural GDP grew 3.5 percent per year over 1985–90 and 3.3 per cent over 1990–98, for an average rate of 3.3 per cent over the entire period' (Delgado et al. 1999, 134).[12] In my assessment, this characterization is highly disputable. In their calculation of the growth rate of agricultural GDP between 1985 and 1998, Delgado et al. use only two observations. In their 'base' year 1985, agricultural GDP was exceptionally low (therefore the increase from 1985 to 1986 was as much as 14.5 per cent), and in the end year 1998 it was exceptionally high (with an increase from 1997 to 1998 of 15.3 per cent) (Delgado et al. 1999, 160). This choice of endpoints gives an upward bias also to the estimates for the sub-periods 1985–90 and 1990–98.

If, on the other hand, 1986 is chosen as 'base year', the average annual growth rate of agricultural GDP over the period 1986–98 turns out to be less than 2.5 per cent per year. This demonstrates the arbitrariness of using only endpoints when calculating growth rates. For this reason I have used all 14 observations and estimated the annual trend growth rates of maize and paddy production and agricultural GDP from 1985 to 1998. As Table 1 shows, the trend growth rate of maize was only 1.1 per cent per year, while that of agricultural GDP was a modest 2.5 per cent per year, which means that in per capita terms, especially maize production, but also agricultural GDP declined considerably over the period, by 22.5 per cent and 5.5 per cent, respectively.[13]

It turns out that neither the growth rate of maize production nor the growth rate of the agricultural GDP was higher in the post-liberalization years than in the 'crisis years' 1976–86 (Table 1). In other words, if 'agricultural performance in the post-reform period has been respectable but not outstanding', that characterization applies even better to the 'crisis years' 1976–86. This becomes even clearer when we consider the development of agricultural productivity. Table 2 below shows that labour productivity of maize production (measured in kg per economically active person in agriculture), as well as production per capita of

[12] In June 2000, this report was published as a World Bank country study (World Bank 2000).
[13] The population growth rate over the period in question was 3.0 per cent per year (FAO 2000).

Table 2. Labour productivity and production per capita of maize and the five major food crops, 1976–98

Period	*Maize*		*Five major food grains*[a]	
	Labour productivity[b]	*Kg per capita of total population*	*Labour productivity*[b]	*Kg per capita of total population*
1976–79	203.9	91.6	343.2	154.2
1980–83	201.0	88.1	346.3	151.8
1984–86	218.9	95.6	372.2	162.5
Growth 1976–86, % per year[c]	*+0.66*	*+0.25*	*+1.08*	*+0.66*
1987–89	230.6	100.3	363.6	158.2
1990–92	198.7	85.8	313.6	135.4
1993–95	197.7	84.1	330.2	140.4
1996–98	200.3	83.8	320.7	134.1
Growth 1985–98, % per year[d]	*–1.94*	*–2.35*	*–1.39*	*–1.80*

[a] Maize, paddy, wheat, sorghum and millet, accounting for 71% of the value of total staple food consumption in 1976/77 and 55% of total food crops contribution to GDP in 1992 (Bryceson 1993, 219; Delgado et al. 1999, 145).
[b] Production in kg per economically active person in agriculture.
[c] Trend growth rate 1976–86 (fitting a least-squares linear regression trend line to the logarithmic annual values of the variable), 11 observations.
[d] Trend growth rate 1985–98, 14 observations.
Sources of production figures: see Table 1.
Source of population figures: FAO (2000).

the total population, was lower in all sub-periods of 1990–98 than in any of the sub-periods of 1976–86. Moreover, while the trend growth rates of these two indicators were positive in the period 1976–86, 0.66 per cent and 0.25 per cent per year, respectively, they were negative in the period 1986–98, by as much as –1.94 per cent and –2.35 per cent per year, respectively.

It may be argued that the productivity figures for maize could be misleading because the crop composition of agricultural output may have changed after economic liberalization. In Table 2, I have therefore also included figures for the five major food grains which accounted for between 60 and 65 per cent of total food crop production in Tanzania in the last decades. But the picture remains the same. In all sub-periods of 1990–98, labour productivity as well as production per capita of the entire population was lower than in any of the sub-periods of 1976–86. Moreover, for the five major food grains, the trend growth rate of labour productivity was 1.08 per cent per year in the period 1976–86, but negative, –1.39 per cent per year, in 1986–98. The trend growth rate of production per capita of the total population was also negative in the latter period, –1.80 per cent per year, as against +0.66 per cent per year in the period 1976–86 (Table 2).

Moreover, the decline in labour productivity for the five major food grains, as I have measured it in Table 2, cannot be entirely explained by a change in the composition of total food output. In 1985/86–87/88, the major five food grains accounted for an average of 61.4 per cent of the total tonnage of crops, while other food crops (cassava, sweet potatoes and pulses) accounted for 33.9 per cent, and export crops (tobacco, cotton, cashew and pyrethrum) 4.7 per cent. In 1995/96–97/98, the major five food grains accounted for 59.7 per cent, other food crops 35.2 per cent and export crops 5.1 per cent.[14] Almost the whole change in the composition of food crops was due to a strong rise of 83 per cent in the production of sweet potatoes, from an annual average of 279,000 tonnes in 1985/86–87/88 to 511.000 in 1996/97–97/98 (while the rest of the difference was made up by cassava). But this change may well be due to underreporting of sweet potatoes as well as cassava in the former period. The conclusion is that in terms of food grain production and productivity, the performance of Tanzanian agriculture has declined considerably after economic liberalization, and in all years 1990–98 it was poorer than even in the 'crisis years' 1980–83.

An important aspect of technical progress in agriculture is improved or more intensive use of land which leads to increased yields, i.e. increased production per hectare of cropped area. However, an increase in land productivity will have a positive impact on labour productivity only to the extent that it is not neutralized or even outweighed by a declining land/labour ratio. A rise in land productivity may be caused by increasing land shortage and a corresponding decline of the land/labour ratio, which compels the producers on small holdings to intensify cultivation, while their labour productivity falls. This is the central theme of the debate on the 'inverse relationship' between size of holdings and land productivity (Boserup 1965; Bharadwaj 1974; Dyer 1991, 1998).

From Table 3, which shows estimated maize and wheat yields for the period 1986–98, it appears that the trend of land productivity (yields) for maize is much the same as the trend of labour productivity shown in Table 2. Table 3 also shows that the average maize yield (ASU figures) was lower than in 1986–87 in all subsequent periods except 1996–97. A comparison of the figures in Tables 2 and 3 leads us to the conclusion that the declining labour productivity – at least for the major food crop maize – in Tanzanian agriculture is the combined result of a declining land/labour ratio and declining land productivity.[15] One probable reason for this development may be that owing to high population growth in rural areas, smallholders have been forced to cultivate increasingly less fertile land, while lacking the means to improve yields on those lands. However, the decline of wheat yields (on parastatal NAFCO farms), which is also shown in Table 3, cannot be given such an explanation.

[14] Calculated from data in United Republic of Tanzania/MAC, *Basic Data – Agriculture and Livestock Sector*, editions from 1990 and 2000. For lack of data, I have not included (cooking) bananas in other food crops, while tea has been excluded from export crops because it is a typical estate crop.

[15] Average labour productivity in agriculture can be expressed by the identity $(Y/L) \equiv (Y/A) \cdot (A/L)$, where Y is agricultural production, L is labour and A is cultivated area. Thus, a falling land/labour ratio, A/L, will reinforce the fall in labour productivity, Y/L, caused by declining land productivity (yields), Y/A.

Table 3. Maize and wheat yields, 1986–98

Year(s)	*Crop area '000 hectares*		*Yields, kg per hectare*		
			Maize		*Wheat*
	Maize	*Wheat (NAFCO)*	*ASU data*	*CMEWU data*	*NAFCO data*
1986–87	1530.2	24.2	1603.2	1496.1	1505.0
1988–89	1671.9	25.3	1480.8	1634.9	1830.0
1990–91	1739.9	26.4	1313.2	1380.3	1540.0
1992–93	1728.5	26.0	1312.5	1317.3	1500.0
1994–95	1687.8	26.3	1493.8	1396.7	983.2
1996–97	1650.7	26.4	1624.8	1400.1	1268.1
1998	2088.0	na	1285.9	1285.9	na
Growth, 1986–98, % per year[a]	*+1.01*	*+0.79*	*−0.31*	*−1.24*	*−4.14*

[a] Trend growth rate (fitting a least-squares linear regression trend line to the logarithmic annual values of the variable). For maize, 13 observations (1985/86–1997/98). For wheat, 12 observations (1985/86–1996/97). In the table, 1986–1987 refers to the crop years 1985/86 and 1986/87, and so on.
Estimates of cropped area for maize, which have been made by the Crop Monitoring and Early Warning Unit within the Ministry of Agriculture, are probably rather inaccurate for single years, but more reliable in showing trend over time. Source of crop area figures for maize: United Republic of Tanzania/MAC (1992, 33; 1998, 16; 2000, 14).
Source of production figures for maize, see Table 1.
Source of cultivated area and yields for wheat (both for NAFCO farms): Kapunda (1998, Appendix B).

5. POSSIBLE CAUSES

5.1. Did Changing Rainfall Play a Role?

In Tanzania, only 6 per cent of the crop-growing holdings use irrigation, and only 2 per cent of total planted area is under irrigation. Rivers are the most common source of irrigation, leading the water to the fields through furrows, practised mainly in Kilimanjaro, Arusha, Mbeya and Tanga. Much of the irrigated land area belongs to large-scale farms (United Republic of Tanzania/MAC 1999, 18; United Republic of Tanzania/MAC 2000, 44; United Republic of Tanzania 2001, 4). In other words, almost all smallholder agriculture is rain-fed. Therefore, it is no surprise that several studies suggest that changing weather conditions are the major cause of *short-term* fluctuations in agricultural output.[16]

We have already noted that a bad maize harvest in parts of Tanzania in 1979 was caused by poor weather, while drought in large areas in the crop year 1981/82

[16] For a survey of the literature on this issue, see for example, Hella and Kamuzora (1999).

Table 4. Rainfall: Annual averages in millimetres and coefficients of variation (CV)

Name of station (region)	*1976–1986*		*1987–1998*		*1964–2000*	
	Mean	*CV*[a]	*Mean*	*CV*[a]	*Mean*	*CV*[a]
Amani (Tanga)	1914.0	0.185	1789.6	0.229	1839.5	0.216
Arusha	928.8	0.361	809.7	0.280	839.5	0.343
Bukoba (Kagera)	2096.5	0.082	1972.5	0.112	2054.3	0.119
Dodoma	547.9	0.171	603.2	0.218	568.3	0.216
Kigoma	1039.6	0.138	919.6	0.138	975.3	0.184
Mbeya	926.5	0.184	945.3	0.239	964.3	0.237
Moshi (Kilimanjaro)	985.0	0.223	866.9	0.299	877.3	0.290
Mtwara	1105.2	0.129	1034.0	0.274	1083.7	0.210
Mwanza	1000.5	0.170	1151.3	0.198	1082.8	0.200
Songea (Ruvuma)	1156.2	0.181	988.7	0.236	1113.2	0.210
Tabora	958.2	0.202	851.5	0.323	917.1	0.243
Total averages[b]	*1150.8*	*0.393*	*1084.8*	*0.386*	*1119.6*	*0.391*

[a] Standard deviation divided by annual mean in the period.
[b] Average of regional means and CV of regional means in each period.
Source of data: Directorate of Meteorology, Ministry of Communications and Transport, Dar es Salaam. I am indebted to Dennis Rweyemamu at The Economic and Social Research Foundation (ESRF), Dar es Salaam, for providing the data, as well as to Professor Ashok Parikh at the University of East Anglia for having carried out the statistical computations underlying this table.

followed by floods in parts of the country in the following year were reported to have resulted in bad harvests. Also after economic liberalization, low agricultural production in some years has been caused by bad weather. In the years 1992–93, drought and uneven rains in large parts of the country were probably an important cause of exceptionally low maize yields, down to an average of 1177 kg per ha in 1992. However, such short-term variations do not indicate *longer-term* trends over time. The question therefore remains, whether *a declining trend of rainfall over time* may have led to the fall in the growth rate of maize production from the period 1976–86 to 1986–98 (Table 1). In other words, may a long-term trend in rainfall explain why labour productivity in the production of maize as well as the five major food grains rose modestly in the former period but declined considerably in the latter period (Table 2), and that maize yields declined over the entire period 1986–98 (Table 3).

Table 4 shows rainfall data from stations in eleven regions, covering the periods 1976–86 (before liberalization), 1987–98 (liberalization period), as well as the whole period from 1964 (when the Tanzanian Union was established) until 2000. It appears from the table that average rainfall declined at eight of the eleven stations from 1976–86 to 1987–98. But only in Moshi was the change in rainfall between the two periods statistically significant at a 5 per cent level. Also the

Table 5. Rainfall trends over time[a]

Name of station (region)	*1976–1986*	*1987–1998*	*1964–2000*
Amani (Tanga)	–	+	–
Arusha	–	+	–
Bukoba (Kagera)	+	+	– (8.85)
Dodoma	+	–	+
Kigoma	+	+ (15.04)	–
Mbeya	+	+	–
Moshi (Kilimanjaro)	+	+	+
Mtwara	+ (4.26)	–	–
Mwanza	– (24.93)	–	–
Songea (Ruvuma)	+	+	–
Tabora	+	–	– (6.98)

[a] Rainfall trends over time were estimated using ordinary least square (OLS) on the time variable (year). Plus sign (+) means positive trend, minus sign (–) means negative trend over the period in question. For trends that are statistically significant at a 5% level, the time coefficients (mm per year) are reported in parentheses. All the other trends are statistically insignificant.
I am indebted to Professor Ashok Parikh for having carried out the computations for this table.

annual average of all the eleven stations declined slightly, by 66 mm or 5.7 per cent, from 1976–86 to 1987–98. Table 4 shows that the annual average for the sub-period 1976–86 is above the average for the long period 1964–2000, while the average for 1987–1998 is slightly (3 per cent) below the long-period average. With regard to variability over time, Table 4 shows that for ten of the eleven stations, the coefficient of variation (CV) in the period 1987–98 is higher than or equal to that of the preceding period. The exception is Arusha, where the CV declined significantly from 1976–86 to 1987–98. Finally, Table 4 shows that the CV between the stations was slightly higher in the former than in the latter period, which indicates that rainfall in Tanzania did not become more regionally uneven from 1976–86 to 1987–98.

With regard to trend over time, a study covering the period 1960–96, based on data from two meteorological stations in Morogoro and sixteen other stations randomly selected from all over the country (fifteen regions), found no significant change in rainfall either over time or between the regions. Also the number of raindays in each year showed no trend over time (Hella and Kamuzora 1999). This finding is broadly confirmed by our own analysis (Table 5). For the period 1976–86, a trend was statistically significant only for two regions, with positive trend for Mtwara and negative trend for Mwanza. For the period 1987–98, there was only one significant (positive) trend, for Kigoma.

The significant trends turn out to be rather unimportant, with low coefficients, except for the negative trend at the Mwanza station in 1976–86 (–24.93 mm per

year), and the positive trend for the Kigoma station in 1987–98 (+15.04 mm per year). Only at the Mwanza station does there seem to have been a rather persistent decline in rainfall, since the trend is negative in both sub-periods 1976–86 (significant) and 1987–98, as well as over the entire period 1964–2000. Finally, it may be observed that more than half of the stations have positive trends in both sub-periods, viz. eight in 1976–86 and seven in 1987–98.

The general conclusion from Tables 4 and 5 is that – with the possible exception of the Mwanza station – there have been no noteworthy changes of rainfall either over time or with respect to regional pattern. Therefore, we cannot expect rainfall to have caused the change in agricultural productivity from 1976–86 to 1987–98. However, it is a bit surprising that regional data on maize yields for the years 1985–89 (for which such data are available) showed no significant relation to rainfall in the corresponding regions and years.[17]

There are several possible reasons for these results. First, the rainfall data from the regional stations may not be representative for the regions as a whole. Second, the regional yield data may be erroneous.[18] However, notwithstanding these possible errors, the above results do not exclude the possibility that poor rainfall *in combination with other inputs*, in particular fertilizer use, may have had a negative impact on yields in the period 1985–98. Unfortunately, data on fertilizer use to control for this possibility are not available, but an experiment carried out in Ikuwala and Llambiole districts in Iringa Region, 1995–98, may illustrate the point.

That experiment showed that change of rainfall from about 500 to about 1000 mm per year had no noteworthy effect on maize yields at a low use of fertilizer. For example, at Ikuwala, a use of nitrogen fertilizer of 40 kg per hectare resulted in about 2500 kg maize per ha at any rainfall between 600 and 1000 mm per year. With soil and water conservation practices but no use of fertilizer, the maize yield was 1800–2000 kg per ha at amounts of rainfall varying from 600 to about 1000 mm per year (MacDonagh et al. 1999, esp. Figure 4a). In other words, at a low use of fertilizer there seems to be hardly any substitutability, but only complementarity between fertilizer use and rainfall.

On the other hand, the Ikuwala experiment showed that the effect of an increase in fertilizer use was quite significant at rainfalls between about 600 and 1000 mm per year. An increase in nitrogen fertilizer use from 40 to 140 kg per ha raised the maize yield from about 2500 to almost 4000 kg per ha (approximately 50 per cent increase) at a rainfall of about 600 mm per year, and from about 2500 to more than 5000 kg per ha (approximately 100 per cent increase) at a rainfall of

[17] I am indebted to Professor Ashok Parikh for having carried out the statistical computations. Another study (Bilame 1996) gave a similar result, finding that good weather had a negative but entirely unimportant effect on total maize production in the period 1970/71–1983/84, but a small positive effect in the years 1984/85–1994/95 (Bilame 1996, 47ff.).

[18] The regional yield data have been collected by CMEWU within the Ministry of Agriculture and Cooperatives on the basis of pre-harvest forecasts. As argued in section 4, these figures are assumed to be rather inaccurate, especially in the short run. (Source of data: United Republic of Tanzania/MAC, *Basic Data – Agriculture and Livestock Sector*, several editions.)

about 1000 mm per year (MacDonagh et al. 1999, Fig. 4a). Below an annual rainfall of 500 mm, the yield effect of increased fertilizer use became rapidly smaller with less rainfall. This means that smallholders in marginal (semi-arid) areas are exposed to the risk that there may be little or no yield effect of fertilizer use due to failing rains. Conversely, at rainfalls well above 500 mm per year, the effect of a change in rainfall appears to be considerable only at fertilizer use that is far above the levels in Tanzania after 1990.

5.2. Did Removal of Fertilizer Subsidy Play a Role?

In Tanzania, chemical fertilizer is used mostly in the growing of maize, tobacco, coffee and cotton, with more than 70 per cent of total fertilizer consumption used on maize in 1994/95 (Hawassi et al. 1999, 76). The proportion of agricultural holdings using fertilizer reached a historical peak of 27 per cent in 1991/92, declining to approximately 15 per cent in 1994/95, and only about 10.5 per cent in 1997/98. In the early 1990s, the average use was estimated at somewhat more than 20 kg per ha of planted area (World Bank 1994, 77–8; 2000, 39; MAC/NBS 2000, 21, 73). Only four regions – Ruvuma, Iringa, Mbeya and Tabora – accounted for more than half of total fertilizer use in Tanzania in 1997/98 (MAC/NBS 2000, 21, 74).

Fertilizer consumption has experienced two growth periods since the early 1980s. From a low of about 80,000 tonnes in 1981/82, it increased every year to 140,000 tonnes in 1986/87. In 1987/88 it dropped to less than 120,000 tonnes due to insufficient supply, and then rose in the subsequent years to about 150,000 tonnes in 1986/87 and further to almost 200,000 tonnes in 1994/95. There can be little doubt that an important reason for this development was the heavy subsidy. In the period from 1976 to 1984, the subsidy reduced the final price by about 50 per cent. After 1984, the World Bank has estimated that there was an implicit subsidy reaching almost 80 per cent of the final price in 1988/89 (World Bank 1994, 79–80; Hawassi et al. 1999, 73).

As part of the structural adjustment programme, the government started to phase out the subsidy in 1990/91 (70 per cent), reducing it to 55 per cent in 1991/92, 40 per cent in 1992/93, 25 per cent in 1993/94, and zero in 1994/95 and onwards (World Bank 1994, 79–80). Panterritorial input and output prices as well as the fertilizer subsidy were removed on advice from the World Bank and the IMF. The Bank's main argument for abolishing the subsidy was: 'Government interference in the fertilizer market *constrains supply* by both parastatal and private sector suppliers' (World Bank 1994, 91, my italics). In view of this argument it is ironical that fertilizer use fell steeply after removal of the subsidy, to only 63,000 tonnes in 1998/99, which was lower than in any year since 1973, 'mostly because of decreased use on maize' (World Bank 2000, 42; also MAC 2000, 153).

That a high price is an important cause for decreasing fertilizer use was clearly indicated by the *Integrated Agricultural Survey 1997/98* (MAC/NBS 2000, 73) which reported that 89.5 per cent of all agricultural holdings in Mainland Tanzania

Table 6. Percentage share of holdings reporting reasons for not using fertilizer, 1997/98

	Too expensive	*Not available*	*Other reasons, incl. lack of credit*
Mbeya Region	52.2	12.0	35.8
Iringa Region	66.6	7.7	25.7
Rukwa Region	48.2	28.2	23.6
Ruvuma Region	67.4	15.1	17.5
Tabora Region	41.1	36.6	22.3
National average	39.1	35.9	25.0

Source: Estimated from data in MAC/NBS (2000, 73).

did not use fertilizer. Among these holdings, 75 per cent responded that the reason was either 'too expensive' fertilizer (39.1 per cent), or that fertilizer was 'not available' (35.9 per cent) (Table 6). The survey showed interesting differences between regions which deserve some further discussion.

The Southern Highlands (Iringa, Mbeya, Rukwa and Ruvuma regions) account for the major share of fertilizer use in Tanzania. This pattern of regional distribution of fertilizer use began to develop in the late 1970s. The combination of stable rainfall and altitudes above 1500 metres made the Southern Highlands suitable for hybrid maize, and within a decade a green revolution took place in these regions (Rasmussen 1986). The result was a steep increase of maize production in the Southern Highlands, while production stagnated or declined in the rest of the country. That the Southern Highlands became the 'granary of Tanzania' is indicated by the fact that the NMC's purchases of maize from these regions as a share of its total purchases rose from an average of 33 per cent in 1974/75–75/76, to 86 per cent in 1982/83–83/84 (Rasmussen 1986, 202; Bryceson 1993, 233–4).

When panterritorial pricing was the practice and subsidies were applied, The Southern Highlands consumed more than 50 per cent of all fertilizer in Tanzania. With the abandoning of these practices, the pattern of fertilizer consumption changed dramatically. The cooperatives had no longer any responsibility to supply remote areas with fertilizer and give credit for such deliveries, while private traders found it too costly to transport fertilizer to those areas. Moreover, the price of fertilizer in the more remote areas became so high that it was no longer profitable to use it in maize production. For example, in 1998/99, the price of ammonia sulphate in Kilimanjaro was up to 12 per cent higher, while the price of triple superphosphate was 65 per cent higher than in Tanga Region, although Kilimanjaro cannot be considered a remote area. This is probably the reason why, especially in the remote typical maize-producing areas, a higher proportion of holdings than the national average report 'too expensive' as reason for not using fertilizer (see Table 6).

Table 6 shows that the highest shares of holdings reporting 'too expensive' are in regions where maize is the dominant crop, viz. Mbeya, Iringa and Ruvuma. It

is noteworthy that Ruvuma, which has been most specialized in maize production, had the highest share of 67.4 per cent. On the other hand, Rukwa, where both maize and tobacco are important, had a lower share of holdings reporting 'too expensive', while Tabora, where tobacco growing is dominant, had the lowest share of the regions in the table, at about the national average. That high price was the main reason for reduced or no use of fertilizer was confirmed by a comprehensive field study in Mbinga district in south-western Ruvuma, comprising 150 smallholders randomly selected in fifteen villages. According to that study, 87 per cent of the sampled farmers indicated high prices after subsidy removal as the main reason for applying fertilizer below the recommended rates. In the study area, the average intensity of fertilizer application in the growing of maize was reduced from 74.96 kg nitrogen per ha in 1992 to 59.94 kg per ha in 1996 (Hawassi et al. 1999, 77–9). In a field study in Songea, Stefano Ponte observed a similar trend: average fertilizer use per acre in maize production declined from 61 kg in 1986/87 to 44 kg in 1994/95 (Ponte 2002, 89).

Regional data on fertilizer consumption indicate that the intensity of use has continued to fall after 1996. Iringa and Ruvuma regions, which consumed almost 65,000 tonnes of fertilizer in 1990/91, used a mere 20,000 tonnes in 1998/99. By contrast, Tabora's fertilizer consumption rose from less than 18,000 tonnes in 1990/91 to 31,000 tonnes in 1998/99 (MAC 2000, 153). In other words, while total fertilizer consumption in Tanzania has declined dramatically since the mid-1990s, there has also been a sharp change away from typical maize-growing regions to typical tobacco-growing areas, which implies a change in fertilizer use away from maize, especially in the Southern Highlands, and towards use in tobacco growing.

The World Bank claims, without referring to any evidence, that the fall in fertilizer consumption has not affected maize production negatively: 'the impact on production of fertilizer-using crops has been negligible, suggesting either inadequate application or wastage in use' (World Bank 2001, 53). This claim is not supported by available evidence. In particular, Bilame's study showed a significant and considerable negative correlation between the price of fertilizer and maize output in the period 1984/85–1994/95 (Bilame 1996).

Accordingly, there is reason to expect that the sharply reduced use of fertilizer in the growing of maize has already had a negative impact on overall maize yields in Tanzania (Table 3), which signals the decline of the Southern Highlands as the 'granary of Tanzania'.[19] This process is reinforced by the fact that private traders, due to high transport costs, do not find it profitable to collect maize in remote areas, especially in Mbeya, Rukwa and Ruvuma. Therefore, the World Bank's finding is not surprising: 'The regional composition of maize production shows that between 1987–89 and 1996–98 maize output has declined by 13–19

[19] Against this background, it is not surprising that the Tanzanian government, against the advice of the IMF and the World Bank, reintroduced transport subsidy on fertilizer (of TShs 2 billion) to Ruvuma, Mbeya, Iringa and Rukwa regions in its budget for 2003/04 (paragraphs 70–72 in the Budget Speech by the Minister of Agriculture for the Fiscal Year 2004/2005, in Swahili).

Table 7. Ratios of average crop producer prices to farmgate fertilizer prices 1985–98

	1985–89	*1990–94*	*1995–98*	*1998*	*% change from 1985–89 to 1998*
Maize	1.40	0.83	0.37	0.36	–74.3
Paddy	2.23	1.39	0.56	0.60	–73.1
Wheat	1.58	1.87	0.92	0.84	–46.8
Millet/sorghum	1.05	1.15	0.85	0.54	–48.6

Source: World Bank (2000, 46).

per cent in the three more remote regions of the southern highlands (Mbeya, Ruvuma, and Rukwa), while expanding in Iringa, Dodoma and other regions closer to Dar' (World Bank 2000, 53).

The Bank's finding is consistent with the field study from Mbinga district, which provides ample evidence that complete removal of the fertilizer subsidy had significantly reduced maize yields and output in the study area (Hawassi et al. 1999, 72, 80–1). Also the general trend in maize yields and production in Tanzania suggests that the rise of fertilizer prices and the dramatic fall in fertilizer use has had a negative impact which may be reinforced in the coming years as soil nutrients are being gradually depleted.

On the other hand, we may assume that marketed output of a crop depends not only on the fertilizer price, but rather on the ratio between the producer price of the relevant crop and the fertilizer price. In Table 7, the development of this ratio from 1985 to 1998 is shown for the four most important food crops in Tanzania.

Table 7 shows that the ratio of crop producer price to farmgate fertilizer price has declined by between 74 per cent for maize and 47 per cent for wheat from 1985–89 to 1998. According to estimates made for the World Bank, the decline in the ratio of producer maize prices to inputs prices (seed, fertilizer, pesticides) led to a reduction of the real return per 'man-day' of maize production from 2496 TShs at 1998/99 prices in 1992 to 501 TShs in 1998, in other words an 80 per cent reduction (Delgado et al. 1999, 95).[20] The field study in Mbinga district in Ruvuma in 1996 found that it was not profitable to use any fertilizer at the current fertilizer and maize prices, given the responsiveness of maize yield to fertilizer input (Hawassi et al. 1999, 82). However, the declining ratio of producer price to fertilizer price was not only due to rising fertilizer price, but also a relative stagnation in the producer prices for maize (as well as for other food crops).

[20] In a note to the table from which these figures are drawn, is the following clarification: 'Assumptions are: hand-hoe technology, involving 123 man-days of family labour, with a yield of 1500 kg/ha . . .'. It is well known that almost all hand-hoe work in Tanzanian agriculture is done by women. Therefore, 'person-days', or even 'woman-days', would be more appropriate terms than 'man-days'.

Table 8. Real producer prices for main food crops, 1981–99. TShs per kg at 1998/99 prices[a]

Year	*Maize*	*Paddy*	*Wheat*	*Millet*	*Beans*
1981–85[b]	140	232	195	117	334
1986–90[b]	149	250	170	109	369
1990/91	106	212	473	279	471
1991/92	279	370	495	289	508
1992/93	298	491	525	365	533
1993/94	256	424	497	376	712
1994/95	181	254	452	484	797
1995/96	165	216	423	538	571
1996/97	138	245	362	245	475
1997/98	117	195	272	175	431
1998/99	118	151	228	175	317

[a] Nominal prices deflated to constant 1998/99 prices using the National Consumer Price Index.
[b] Official procurement prices (before deregulation of prices in July 1990).
Reference is to fiscal years (1 July to 30 June) which largely coincide with crop years.
Source: World Bank (2000, 26).

5.3. The Role of Deregulated Producer Prices

A main argument for economic liberalization was that deregulation of prices and free competition in the marketing of inputs as well as crops would result in 'correct' input prices, but also higher and 'correct' producer prices, which would in turn spur producers to increase efficiency, produce more and make investments to raise land and labour productivity. Table 8 shows the development of real producer prices from 1981 to 1999.

For all crops reported in Table 8, there was a rise of the producer price in the early 1990s, which peaked around 1993–94. But since the mid-1990s, the real producer prices of all crops have declined. It is noteworthy that the by far most important staple crops maize and rice have experienced the largest decline in producer prices compared to the 1980s.

With regard to depressing marketed production, the short- to medium-term fluctuations of producer prices in a deregulated market are most probably at least as important as the long-term trend. In Tanzania, as in other sub-Saharan countries, the market demand for staple grains, in this case maize, is highly inelastic, with an (absolute) value of price elasticity considerably lower than unity. As a consequence, without intervention in the market, rather modest changes in supply lead to quite large price changes.[21] Before the deregulation of prices in 1990,

[21] The first to spell this out clearly was, as far as I know, Michal Kalecki in his article on 'Costs and prices' (1943), where he distinguished between cost-determined prices in industry and demand/supply-determined prices in primary production (Kalecki 1971, 43–61).

Table 9. Highest and lowest monthly producer and consumer prices of maize

Year	*Producer prices (TShs per kg)*			*Consumer prices (TShs per tin)*[a]		
	Highest price (H)	*Lowest price (L)*	*H:L*	*Highest price (H)*	*Lowest price (L)*	*H:L*
1992	58.30	44.91	1.30	1195.1	945.2	1.26
1993	66.01	39.98	1.65	1354.1	794.3	1.70
1994	128.95	49.90	2.58	1458.2	1104.5	1.32
1995	71.50	49.12	1.46	1695.2	1144.5	1.48
1996	101.76	54.11	1.88	2159.0	1259.5	1.71
1997	120.77	84.96	1.42	2531.3	1795.1	1.41
1998	116.70	61.04	1.91	2924.4	1471.4	1.99
Average 1994–98	107.94	59.83	1.80	2153.6	1355.0	1.59

[a] One tin is approximately 20 kg.
Source of producer prices: United Republic of Tanzania/MAC (2000, 39).
I am indebted to Dennis Rweyemamu at The Economic and Social Research Foundation (ESRF) for having compiled for me the data on consumer prices from the files at the Marketing Development Bureau (MDB).

such variations were modified through the government's price setting. The agricultural producers were informed at planting time on the procurement prices for the next harvest. There could be considerable price changes from one year to the next, but there was no uncertainty among smallholders about the producer prices of the next harvest.

This may explain Bilame's finding that before liberalization there was a positive correlation between the real producer price and maize production, while this correlation was found to be negative in the liberalization period (Bilame 1996). After liberalization, high price reflects a situation of deficient supply, while the low price reflects a bumper harvest. Such price variations will, in turn, affect the production plans of surplus-producing smallholders. When prices are low in one harvesting season, smallholders tend to make plans for lower marketed output of the crop in question in the next season, and vice versa. This is supported by Bilame's finding of a negative correlation between maize production in one year and production in the preceding year. Thus, in a deregulated agrarian economy, also the behaviour of producers will tend to reinforce the volatility of prices. In the absence of price stabilization measures, strong price volatility and stagnation of marketed output will therefore be a basic feature of the Tanzanian maize market, as well as of other deregulated sub-Saharan markets for food grains.

Before deregulation there was no change of producer prices during a particular crop year, implying that the smallholders would not make losses by selling their crops immediately after harvest. By contrast, after deregulation, producer prices have shown a considerable seasonal variability, being lowest just after the main harvest (*masika* season) and highest before the next main harvest. As can be seen in Table 9, in the years 1994–98, the highest monthly producer price of

maize was on average 1.8 times higher than the lowest producer price in the same year. The seasonal pattern of consumer prices is much the same, with the notable exception of the year 1994.[22] This is well in accordance with experience from other sub-Saharan countries, where producer prices have been deregulated. For example, in Zambia and Malawi the producer prices before a new harvest are generally about twice as high or more than towards the end of the preceding harvest (Øygard et al. 2003).[23]

The low price elasticity of maize is the major cause of seasonal price variability. However, in a deregulated market, the price variability is reinforced by speculative behaviour among traders, as well as consumers. A rising price, which may be triggered by a bad harvest, will result in increased revenue both to each individual trader and the traders as a whole. Traders will therefore tend to withhold grain from the market, i.e. postpone sales, when the price is rising. On the other hand, relatively wealthy consumers will tend to hoard staple grain in such a situation, if they have the facilities to do so. The combined effect of these two behaviours is a continued and reinforced price rise. Conversely, a declining price, which may be caused by a bumper harvest, will make traders reluctant to buy crops from the smallholders in expectation of even lower producer price, while selling out their stocks in order to avoid losses. In such a situation, consumers will postpone purchases as much as possible. Both behaviours will result in a continued and reinforced fall of the price.

The seasonal price variability is reinforced by 'forced commerce' (e.g. Bhaduri 1986). For lack of money as well as storing facilities – in other words because of their poverty – many smallholders, among them a large number of deficit producers, sell so much of their crop (at low prices) at harvesting time that they do not have enough food grain until the next harvest. Later on they therefore have to buy food grain (at high prices) – often with expensive credit – in order to survive.[24] Forced commerce implies a serious income loss to the smallholders and a corresponding income gain to private traders. Government control of producer prices

[22] A main reason for the discrepancy in 1994 may be that domestic production covered only 71 per cent of domestic demand in 1993/94, implying a gap of about 750,000 tonnes, or 39 per cent of domestic demand. Also in 1996/97, domestic demand exceeded production by 350,000 tonnes (Kapunda 1998, 52). It is unclear to me how and to what extent especially the gap in 1993/94 was covered. According to the MDB, only 61,150 tonnes of maize were imported in 1994 (MAC/MDB 1995, 30). On the other hand, The Strategic Grain Reserve reduced its stocks (which mainly include maize) by only 57,000 tonnes from 1993/94 to 1994/95 (MAC 2000, 128). Probably, a considerable share of maize imports in 1994 was in the form of flour and therefore categorized as food in the data on imports. From 1992 to 1994, food imports rose by 61.9 per cent at constant 1994 prices (deflated by the food component of the NCPI). As a consequence, food imports as a share of total imports rose from 3.3 per cent in 1992, to 6.2 per cent in 1993, and 8.5 per cent in 1994. From 1994 to 1995, food imports at constant prices declined by 69 per cent, reducing the share of food in total imports to 2.9 per cent (Central Bank of Tanzania 1998, 64, 76). In any event, large imports of maize or maize flour will affect domestic consumer prices strongly.

[23] On the other hand, I miss evidence for Colliers and Gunning's claim that 'The coefficient of variation of Tanzanian maize prices in regional centers doubled between 1964 and 1980, and sharply declined again once the market was liberalized' (1999, 97).

[24] This is not at all a question of market efficiency, but a question of how a market *necessarily* works within a particular structure of production.

and public buffer stocks (buying above market prices at harvest time, selling below market prices in the months before next harvest) have so far proved to be the most effective means to alleviate this problem (e.g. Gabre-Madhin et al. 2003).

However, so far there is no public storage system in Tanzania that can work as an effective buffer stock, and seasonal storage is largely left to the smallholders themselves. In 1997/98, about 60 per cent of all agricultural holdings reported storage of maize. Among those holdings which did store maize, 68 per cent reported that the duration of storage was less than six months and 44 per cent reported that the storage was in sacks at home (MAC/NBS 2000, 51, 75–6). Their lack of adequate storage facilities forces the smallholders to sell the surplus of their crop at harvest time, when prices are at their lowest. Moreover, the private storages that do exist imply considerable losses, because much of the crops which are stored on the holdings is eaten by rats or destroyed in other ways.

6. CONCLUDING REMARKS

The advocates of economic liberalization – in particular, the IMF and the World Bank, but also bilateral donors – promised that economic liberalization would provide a strong stimulus to Tanzanian agriculture, resulting in increasing yields, increased labour productivity, rising agricultural production and higher incomes. Available data show that, as far as food crop production is concerned, this promise has not been fulfilled. Even compared to the 'crisis years' 1979–84, labour productivity, yields and production per capita of food grains have stagnated or declined.[25]

The experience of liberalizing Tanzanian agriculture should indicate that introducing 'free markets' and 'getting the prices right' is not at all the right means for triggering transformation and growth in a predominantly pre-capitalist agriculture which is not even surrounded by a developed capitalist environment. Economic liberalization has not spurred Tanzanian smallholders to specialize, improve technology and increase land and labour productivity. By contrast, several studies have shown that, instead of fostering specialization, economic liberalization has increasingly forced the smallholders to seek income diversification outside their holdings in order to reduce risk and secure their livelihood, while at the same time leading to 'subsistence fallback' (e.g. Seppälä 1998; Havnevik and Hårsmar 1999; Bryceson 1999; Ponte 2002, 133–58).

The phenomena of 'subsistence fallback' and 'income diversification' are two sides of the same coin. On the one hand, the vagaries of the market, the declining ratio of crop prices to input costs, in many cases even lack of any marketing possibility, have increasingly led smallholders to produce agricultural crops only

[25] In the longer run, this, of course, leads to mounting food shortages. In late 2003, the Science and Development Network reported that 'Tanzania is facing a shortage of 350,000 tonnes of food this fiscal year and has waived all import duties on food' (Deodatus Balile, 'Tanzanian parliament blocks government on GM seeds', 28 November 2003, http://www.scidev.net/). For comparison, Tanzania's annual net imports of food grains averaged 321,000 tonnes in the 'crisis' years 1980–82 (Bryceson 1993, 239).

for own consumption, i.e. subsistence fallback. On the other hand, agricultural households seek cash incomes outside their holdings, in petty trade, petty transport, beer brewing, etc. Some neoclassical economists note that income diversification is not consistent with specialization: 'In diversifying to cope with shocks, the household sacrifices the gains of specialization in favour of spreading risk over multiple income generating activities' (Collier and Gunning 1999, 77). But they do not acknowledge that the rising income diversification, as well as subsistence fallback, is the outcome of the economic liberalization they are advocating. In other words, instead of fostering specialization in agriculture, as its proponents promised, economic liberalization in Tanzania has resulted in exactly the opposite.

As opposed to liberalization, prices of agricultural output and inputs should be considered and used as policy instruments and not left to be determined solely by market forces. The recent Asian experience points to the extensive role of government in both stabilizing and supporting prices as a means of encouraging and sustaining technology adoption among smallholders (Gabre-Madhin et al. 2003). As Gabre-Madhin et al. have emphasized: 'The alternative to the free market-based transformation strategy is that of a market-based stabilization policy to support agricultural transformation. By placing the burden of ensuring stability on governments and not markets, it transfers risk away from producers, who are at least able to bear it' (2003, 35).

In order to transform Tanzania's smallholder agriculture, there is a strong need for government involvement, among other things in the construction of rural roads, irrigation systems and storage facilities, in the establishment of institutions providing cheap agricultural credits, as well as an agricultural insurance system which can protect the smallholders in years of crop failure. Farmers cooperatives are needed first of all to give the smallholders bargaining power in the input, output and credit markets. Government support appears to be necessary for facilitating the establishment of such cooperatives, and it is indispensable for agricultural extension services, experiment stations and agricultural colleges, and not least for improved primary education. In other words, as the Asian experience shows, what is needed is not state withdrawal from the market, but an accountable and determined developmental state. In my assessment, these issues are not adequately addressed in the most recent government agricultural policy document, which seems to believe that agricultural transformation can be promoted by giving more room for private agribusiness, while the government emphasizes poverty reduction in smallholder agriculture.[26]

[26] The *Agricultural Sector Development Strategy* 'proposes further modifications to permit private agribusiness to expand investments in primary production directly or through partnerships with smallholders, input distribution, produce marketing, and agro-processing. . . . The overarching Government objective is poverty reduction and this calls for strategies that are capable of raising the incomes and living standards of a large portion of the rural population in the relatively near future. . . . At the same time, the macroeconomic reforms rule out the possibility of profligate government expenditure or subsidies and limit the role of the Government to policy formulation, the establishment of a regulatory framework, and the provision of public goods and safety nets for the most vulnerable in society' (United Republic of Tanzania 2001, vii).

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