

# **THE CHALLENGE OF INCREASING FOOD PRODUCTION IN ETHIOPIA**

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## **1. INTRODUCTION**

Agriculture dominates the Ethiopian economy. At least 85 percent of the country's population live in the rural areas. The contribution of agriculture to GDP varied between 46% and 58% between 1980/81 and 1997/98 (Annex I). About 85% of the foreign exchange is also derived from agriculture.

The performance of the agricultural sector in Ethiopia has remained weak and it is heavily influenced by weather conditions. Annual growth rates dropped by 13 and 21% during the drought years of 1983/84 and 1984/85, respectively. Favorable rains in 1982/83 1986/87 and 1995/96, on the other hand, resulted in growth rates exceeding 14% per annum. In general, agricultural growth rates averaged 2% between 1980/81 and 1990/91 (under the former military government) (Annex I). In the mean time, population grew by nearly 3%, leading to a sharp decline in per capita agricultural production and a rise in the incidence of poverty.

One of the consequences of the poor performance of Ethiopian agriculture is widespread food security problem. An estimated 50 to 60 percent of the country's population is food insecure, or live below the poverty line. The number of drought-affected population between 1981 and 1995 ranged from a minimum of 2.53 million in 1987 to 7.85 million in 1992. Food aid accounted for as much as 10.7% of the domestic production during the period 1985 to 1996. Owing to the good harvest, the share of food aid declined to 3.2% in 1996 (FDRE, 1996).

Domestic food supply has failed to meet the food requirement of the country. Based on the recommended food intake of 2100 kcal per person per day (equivalent to 225 kg/head per annum), the annual deficit increased from 0.75 million ton in 1979/80 to over 5 million ton in 1993/94, more than 6 fold increase in just 14 years. The situation appeared to have improved after 1994/95, but the food gap remained over 2.6 million even in the year with record harvest (1995/96).

The objective of this paper is to review the development strategies and policies pursued in agriculture and assess their impact on crop and livestock production. The paper concludes by examining the major challenges to developing the Ethiopian agriculture.



## **2. DEVELOPMENT STRATEGIES AND POLICIES**

### **2.1. Pre-1991**

The first major development effort to help smallholder agriculture came into being in the late 1960s. An integrated development project, named the Chilalo Agricultural Development Unit (CADU), was launched in 1967. The project which aimed at integration of agronomic research, dissemination of research results, provision of modern farm inputs, marketing and credit facilities as well as the promotion of cooperative societies was implemented in one of the high potential districts of the country. Two other comprehensive projects with similar objectives, the Wolamo Agricultural Development Unit (WADU) and the Ada District Development Project (ADDP), were also initiated in two districts in 1970 and 1972, respectively. In an attempt to expand coverage, the Imperial Government launched the Minimum Package Project, MPP, in 1971. The MPP was designed to achieve an increasing and eventually nation-wide diffusion of essential inputs (mainly fertilizer and improved seeds) tested and developed by the comprehensive projects such as CADU. Financial and technical support from the Swedish International Development Authority (SIDA), International Development Association (IDA) of the World Bank and the USAID played a major part in the establishment and operation of the projects.

The new initiative demonstrated the potential of increasing yield using new technologies. The number of adopting farmers and production increased rapidly in all the project areas. However, landowners, businessmen and government officials were also impressed by the yield gains and many took the initiative to set up commercial farms. Tax and credit incentives offered to buyers of tractors and other farm machinery favored mechanized farming and resulted in large-scale eviction of landless farmers. The number of commercial farms rose to 2,626 and the size of mechanically cultivated land increased to 481,659 hectares by the early 70s. It was observed that the expansion of commercial farming seriously constrained the impact of the projects on smallholder agriculture (Mulat, 1989; Dejene, 1990).

Following the overthrow of the Haile Sellassie Government in 1974, the official policy in agriculture became expansion of collective and state-owned farms. All rural lands were made public property and private ownership of land by individuals and organizations was prohibited as a result of the 1975 land reform proclamation. Large commercial farms were reorganized into state farms. Peasants were entitled to a usufructary right to cultivate a maximum of 10 hectares. Tenancy was abolished and the use of hired labor was banned. Every one above the age of 18 was given the right to claim land, resulting in frequent redistribution of land and diminishing farm size. The 1975 land reform also made provisions for the formation of peasant associations, with a power to redistribute and administer rural land. Subsequent proclamations gave the peasant associations the right to form service cooperatives and producers' cooperatives. A villagization program, which aimed to bring scattered



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households into small village clusters, was also launched in the mid-1980s. Villagization was viewed as the primary condition for successful collectivization.

A transition from smallholder to large-scale collective production was thought to resolve the problem of diminishing farm size, fragmentation and tenure insecurity. The government offered special incentives, including lower cost of fertilizer, higher grain prices, lower land tax and interest free loans (from service cooperatives) to producers' cooperatives. Local authorities frequently alienated good farmland belonging to individual peasants and allocated it to producers' cooperatives.

The impact of the new measures on production was dramatic with serious shortages and high prices of foodgrains in the urban areas. The government responded by establishing a parastatal marketing firm known as the Agricultural Marketing Corporation (AMC) to stabilize prices, AMC procured grain from farmers at low prices and sold it to major urban areas at prices much lower than the free market prices. Its operation was assisted by compulsory delivery quota imposed on farmers. Private grain dealers were also required to deliver at least 50% of their purchase to the AMC. Inter-regional grain movement by traders was also forbidden (Mulat, 1989). But the restrictions and the quota system further reduced the incentive to produce more and invest in agriculture.

The model farmer approach employed by the agricultural development projects was rejected on the ground that it led to a situation where a few farmers became rich and the vast majority were left behind. Equity implications were considered as the main drawback of the projects. The Military government attempted to reorganize the projects in line with its socialist policy of discouraging income disparity. However, most donors found the drive for collectivization and price controls incompatible with the original idea of developing smallholder agriculture and refused to extend their support further.

A new project under the name of Peasant Agricultural Development Program (PADEP) was launched in the early 1980s with the aim of increasing food production and promoting service and producers cooperatives. A total of eight PADEP zones were established with semi-autonomous status under the Ministry of Agriculture. The World Bank, the International Fund for Agricultural Development (IFAD), SIDA and the Italian government were expected to provide the financial and technical support for operation. However, the full operation of PADEP was delayed by disagreement between the donors and the government over the role of small farmers and state intervention in grain markets.

In general, the attempt to run a centrally planned economy through highly centralized and undemocratic administrative structure stifled private initiative and discouraged popular participation in planning and execution of development activities. Although the collectivization policy never resulted in the formation of a large number of collective farms (only 3.3% of the total cultivated land was operated by producers



cooperatives in 1984/85), the general uncertainty and negative attitude towards private farming discouraged agricultural production. Public investment and institutional credit in agriculture was directed towards the expansion of collective and state farms, whose combined contribution to agricultural output seldom exceeded 6%. Over 50% of the government budget was also used to finance the civil war.

## **2.2. After-1991**

Dissatisfaction with the restrictive policies and command system gave rise to popular discontent and reinforced the armed rebellion. The movement culminated in the overthrow of the military government in May 1991 by the forces of the Ethiopian People's Revolutionary Democratic Front (EPRDF) which formed the Transitional Government of Ethiopia (TGE). The TGE adopted a policy which emphasized the right of nations and nationalities to administer their own affairs. The decentralization process has created a federal system of government with nine regional governments (based on ethnic groups) and two city administrations.<sup>1</sup>

The 1991 economic policy document of the TGE declared collectivization and villagization as undesirable and liberalized both agricultural markets. The overriding objective of the government was given as attaining fast, broad-based economic development. An economic reform program was initiated, which took the form of Structural Adjustment Program (SAP) under the auspices of the World Bank and IMF. The reform included the removal of substantial taxation of agriculture, market liberalization and devaluation. The fertilizer markets was liberalized, creating a multi-channel distribution system.

A development strategy known as the Agricultural Development-Led Industrialization (ADLI) was formulated to focus on agriculture. The strategy views agriculture as the engine of growth, on account of its potentially superior growth linkages, surplus generation, market creation, and provision of raw materials and foreign exchange. According to the 1994 Constitution of the Federal Democratic Republic of Ethiopia, the right to ownership of rural and urban land, as well as of all natural resources is exclusively vested in the state and in the peoples of Ethiopia. The Constitution clearly stated that 'Land is a common property of the nations, nationalities and Peoples of Ethiopia and shall not be subject to sale or to other means of transfer'.

Within the framework of ADLI, a new system of agricultural extension, known as the Participatory Demonstration and Training Extension System (PADETES), was launched in 1994/95. The system tries to merge the extension management principles of the T & V system with the technology diffusion experience of the SG 2000 program. The major elements of the extension package are fertilizer, improved seeds, pesticides and better cultural practices mainly for cereal crops (teff, wheat,

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<sup>1</sup> The nine regional governments are Tigray, Afar, Amhara, Oromiya, Southern Nations and Nationalities Peoples (SNNP), Benshangul and Gumuz, Gambela, Somalia and Harari, while the two city administrations refer to Addis Ababa and Dire Dawa.



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maize, barley, sorghum and millet). Under the new extension system, the woreda bureaus of agriculture provide participating farmers with the package of inputs. Participants agree to allocate 1/4 to 1/2 ha of land for the demonstration plot and pay a 25-50% down payment on the input package at the time of planting with the balance due after harvest. The plots are managed by the farmers under the supervision of the extension agent. The number of such plots increased from 3,200 in 1994/95 to 600,000 in 1996/97. The plan for the 1997/98 season was to increase the number of participants to 2.9 million. Being convinced of the results obtained, the Government has given its full support to PADETES. Input packages have also been developed for wet areas, drier area, livestock and high value crops such as vegetables, pulses and oil seeds.

The new extension system has sharply increased fertilizer consumption of the peasant sector. Total fertilizer consumption of the sector increased from 171,000 tons in 1994 to 260,258 tons in 1998 (Annex II). Similarly the use of improved seeds and chemicals (for weed and insect control) among small farmers is believed to have increased considerably.

One common feature of all development activities in agriculture is dependence on donors for funding and technical assistance. The agricultural development projects implemented under the Imperial and the military governments were mainly financed by donors. There was a clear lack of government commitment to technological transformation of smallholder agriculture. The absence of a core operating budget has meant that project activities are terminated once the project period is over and donors are not willing to extend their support. More importantly, local and national institutions to sustain donor's effort were given scant attention in Ethiopia. Public and private institutions necessary to provide research, extension and input marketing remained underdeveloped and dependent on donor funding. It should be noted that the major part of the finance for importing chemical fertilizer, the most important input promoted by the new extension system of the current government, also came from IDA credit and grants from various bilateral sources. Government share in the total fertilizer import was only 22% during the period of 1995/96 and 1997/98 (Table 1). It appears that the extension system can operate only if donors are willing to put up the necessary foreign exchange for importing fertilizer.

Agricultural development strategies and policies also lacked continuity and people's participation. Development projects and priorities are changed or terminated and new ones are initiated without much effort to draw lessons from previous experiences. Several projects have come and gone within a span of less than one generation. The result has been farmers' lack of confidence in new schemes that purport to assist them. The problem is compounded by lack of people's participation in the formulation and implementation of development projects. With no democratic grassroots institutions, the top-down approach (that reflected the needs of the bureaucrats) has failed to ensure sustainability of agricultural development efforts.



Limited resources, lack of capacity and corruption have also reduced the impact of the recent move to decentralize the system of governance.

**Table 1: Fertilizer Import (metric ton) and source of fund for three years (1995/96-1997/98)**

Source of fund	DAP	Urea	Total
Ethiopian Government	240337.00	25000.00	265337.00
%	28.18	7.54	22.40
IDA (credit)	200000.00	100000.00	300000.00
%	23.45	30.16	25.33
Italian government (grant)	92371.00	0.00	92371.00
%	10.83	0.00	7.80
Netherlands (grant)	63200.00	50000.00	113200.00
%	7.41	15.08	9.56
EU (grant)	83000.00	25000.00	108000.00
%	9.73	7.54	9.12
Sweden government grant	0.00	28000.00	28000.00
%	0.00	8.45	2.36
Japan government (grant)	4274.00	31537.00	36811.00
%	0.50	9.51	3.02
German government (grant)	119669.00	72000.00	191669.00
%	14.03	21.72	16.18
ADF(credit)	50000.00	0.00	50000.00
%	5.86	0.00	4.22
<b>Total</b>	<b>852851.00</b>	<b>331537.00</b>	<b>1184388.00</b>

### 3. TRENDS OF GRAIN PRODUCTION AND YIELD LEVELS

Cereal production averaged 5.7 million ton over the period 1980 to 1997. On the average, 4.8 million ha of land was cultivated to grow cereals, giving a yield of 11.9 quintals per hectare. Average annual pulse and oilseed production amounted to 0.7 and 0.1 million tons, respectively, over the same period. Only 0.75 and 0.27 million ha of land was allocated to the production of pulses and oilseeds. Yield levels were also low, averaging 9.3 quintals for pulses and 4.0 quintals per hectare for oilseeds (Table 2).

Cereal output increased by only 0.9% (significant at less than 1 percent) per annum between 1980 and 1997,<sup>2</sup> while no significant growth rates were recorded for pulses and oilseeds. Overall, the performance of field crops remained very poor, especially when compared to the rapid population growth (nearly 3% per annum).

<sup>2</sup> Annual growth rates were computed using the least squares method. The log-linear growth rate was estimated by regressing the logarithmic values of output, area or yield against time.



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Cereal production fluctuated between 3.9 and 5.3 million tons (averaging 5.2 million tons) under the Derg government (before 1991). Area under cereal production also stayed at less than 4.7 million hectares (4.4 million ha on the average) over the same period. The production of pulses and oilseeds showed a declining trend declined sharply under the military government.

The performance of field crops production appeared to have improved after 1994 owing to improved policy environment, increased availability of inputs such as fertilizer and the relatively good weather. In particular, there was a strong recovery of production between 1994 and 1996. Cereal production rose to 8.6 million tons, while area harvested jumped to 6.7 million hectares in 1996. A similar positive trend was observed with respect to pulses and oilseeds over the period 1994 to 1996. However, the momentum was not sustained as cereal production plunged by nearly 25% in 1997/98 due to bad weather conditions. Ethiopian agriculture is still as vulnerable as it was 20 or 30 years ago.

The trends in yield levels are of greater concern. Cereal yield increased by only 0.3% per annum between 1980 and 1997.<sup>3</sup> Yields remained unchanged in the case of pulses and oilseeds. What is more worrying is the fact that there is no indication that yields have significantly improved since 1994, in spite of the sharp increase in fertilizer and other input use. Cereal yields in 1996 (the year of record harvest) were not better than those attained in some of the earlier years. The recent increase in production is largely attributed to increase in cultivated area. Area under cereals increased by 0.6 % per annum between 1980 and 1997. It should be mentioned that the area expansion was achieved through cultivation of hillsides with high slopes, reducing or eliminating fallow land, and converting pasture, woodland and forest areas into farmland, with obvious negative implications for sustainable farming.

A major factor behind the low and stagnating yield is limited application of modern inputs: only 35 and 2 percent of the total cereal area receives chemical fertilizer and improved seeds, respectively (Annex III). The rate of fertilizer application is only 35 kg per hectare, compared with the recommended rate of 200 kg per hectare. Most farmers using fertilizer do not use improved seeds, thus achieving limited gain from the input which absorbs nearly all their cash expenditure. In spite of the rampant insect and disease problems, only 9% of the cereal area is treated with pesticides.

Agriculture is dependent on rainfall which has become increasingly erratic in recent years. Irrigated cereal production covered only 0.6% of the total area (Annex III). Inadequate and variable rains have made the use of improved seeds and other technologies very risky and less profitable. Weather problems have also caused extreme fluctuation in food grain production.

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<sup>3</sup> The coefficient of time in a simple regression of yield against time is also significant.



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Table 2: Nation wide total area Harvested of Cereals, Pulses and Oil seeds

YEAR	CEREALS		PULSES		OIL SEEDS	
	Total Production in (' 000 quntals)	Total Area Harv in (' 000 hectares)	Total Production in (' 000 quntals)	Total Area Harv in (' 000 hectares)	Total Production in (' 000 quntals)	Total Area Harv in (' 000 hectares)
1980	53214.902	4501.236	8682.613	749.204	971.072	190.082
1981	50833.486	4384.166	8412.205	801.949	816.421	223.552
1982	64058.096	4777.449	9918.659	808.116	1246.418	260.894
1983	55019.305	4735.654	7342.502	784.935	1000.75	260.378
1984	39372.133	4535.617	5125.275	756.601	1024.201	279.578
1985	44192.51	4688.208	4829.103	692.426	992.921	289.304
1986	52363.771	4519.559	5431.51	593.854	822.885	211.885
1987	51105.213	4340.569	5338.517	699.863	773.578	188.129
1988	50754.506	4133.632	5574.606	610.266	719.936	203.327
1989	54438.716	4141.129	6319.359	598.883	897.243	224.186
1990	54265.744	3976.603	9778.026	687.582	995.884	248.003
1991	46584.787	3911.863	6366.677	714.622	887.431	212.313
1992	53186.794	3961.72	5956.071	723.73	719.071	215.019
1993	52737.336	4084.585	5352.903	725.166	788.076	207.323
1994	64188.306	5993.088	8055.569	916.255	1202.089	350.125
1995	82697.14	6652.56	8141.44	904.39	1952.61	391.58
1996	86293.32	6688.56	8026.28	905.35	2132.79	478.45
1997	64987.83	5601.88	6801.92	837.61	1836.96	410.01
Growth rate Log-lin.(%)	0.89	0.62	-0.081	0.343	1.34	0.34
Level of Signific.	0.016	0.06	0.865	0.203	0.038	0.203

Source: CSA, Agricultural Sample Survey, Various issues.



#### **4. KEY PROBLEMS AND ISSUES IN INCREASING FOOD PRODUCTION**

Transforming agriculture and expanding its productive capacity is the prerequisite for sustained economic growth in Sub-Saharan Africa. It is impossible to stabilize the macroeconomy without stabilizing the rural economy. Food prices are so important in the overall welfare of consumers and producers that some reasonable degree of stability is essential (Timmer, 1993). Faster agricultural growth increases supply and stockbuilding of food, hence restraining and stabilizing local price of food staples. The main beneficiaries of lower prices are poor households who spend 40 to 60 percent of their income on food items. Moreover, agriculture is often more labor intensive and faster agricultural growth is expected to generate more employment for landless and near-landless groups.

Agricultural development efforts of the last three decades have failed to address the problem of food in Ethiopia. There is a need for a critical examination of past experiences and identifying the reasons for lack of success. It is argued in the following pages that deficiencies in land policy, inadequate system of technology development and dissemination, underdeveloped markets, and limited people's participation in the development effort are among the key constraints to increasing foodgrain production in Ethiopia.

##### **4.1. The Problems of Efficient Land Utilization**

The average farm size in Ethiopia has declined to just one ha. due to the rapidly growing population. Over one-third (36%) of the rural holdings are less than 0.5 ha. (Table 3). Given the low level of productivity, nearly all produce is devoted to home consumption for households with smaller plots. There is little surplus for investment and for input purchase. Empirical studies have also shown that the probability of adopting fertilizer and improved seeds decreases with decline in farm size (Croppenstedt, et al., 1998; Mulat et al., 1998; Wolday, 1998). Sub-economic holdings, operated by poverty-stricken farmers, are not favorable for widespread dissemination of new agricultural technology.

**Table 3. Distribution of Holding Size**

Landholding (ha)	Number of Households	Cumulative (%)
Under 0.1	634560	7.45
0.10 – 0.50	2556940	37.47
0.51 – 1.00	2166350	62.91
1.01 – 2.00	2029560	86.74
2.01 – 5.00	1060840	99.2
5.01 – 10.00	62280	99.93
10 +	5940	100

Source: CSA, Agricultural Sample Survey 1995/96, Vol. IV, Reported on Crop Land Utilization, Bulletin No. 152, 1996.



Apart from the population pressure, the land policy has significantly contributed to declining farm size and tenure insecurity. Since the 1975 land reform which made all rural land public property, the possession of land plots has been conditional upon residence in the village. The transfer of land through long-term lease or sales has been forbidden and periodic redistribution has been carried out to give land to new entrants. Despite the reform aimed at creating a free market economy, the present government has decided to maintain public ownership of all rural and urban land. In 1996, land redistribution was carried out in the Amhara Regional State. Land was given to landless youth and returnee ex-soldiers by reducing the holding of farmers who were reportedly associated with previous governments. Communal grazing and woodland was allotted to new claimants in other regions. Increasing population in the rural areas was thus absorbed in agriculture through leveling down of holdings, rather than through alternative forms of employment.

Given the absence of any contractual or lease agreement with the government (owner of land) and the general belief that the next round of land redistribution will take place any time, the incentive to invest on land improvement is minimal. This situation, coupled with the high level of poverty and subsistence pressure, has discouraged long-term investment and exacerbated the problem of land degradation. The soil in many areas have lost some biological productivity and physical properties needed for optimal plant growth (FDRE, 1996). Removal of the distortions in the land market is a major prerequisite for agricultural transformation in Ethiopia:

#### **4.2. Technology Development and Dissemination**

As indicated above, low level of technology utilization is one of the major factors behind the poor performance of foodgrain production. Local seeds with low genetic potential have resulted in low yield. Neither organic nor chemical fertilizer is used for growing food crops by the majority of Ethiopian farmers. Crop losses due to insect damage, disease and storage pests are considerable. Many farm operations including land clearing, weeding, thinning, harvesting and threshing are carried out with simple and basic hand tools. Hoe cultivation is a common practice in the eastern and southern parts of the country. Transport activities related to agricultural operations are carried out mainly with humans.

Though oxen are widely used for land preparation, the traditional tillage tool is inefficient in terms of depth, width of operation and pulverization of the soil. The traditional plough, which remained unchanged (perhaps since its introduction between 1000 and 400 BC), require several passes to prepare land for planting. In most highland areas, some 5 or 6 months of the year are spent on seed-bed preparation. Of the estimated 31 million head of cattle, about 9 to 10 million are used for draught purposes. Apart from taking most of the agricultural labor time and requiring large number of draught animals, the existing technology of land preparation is of little use for turning the stubble and weeds into the soil (Abiye and Saleem, 1996).



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Lack of technical progress in Ethiopian agriculture reflects weakness in the system of technology development and dissemination. Agricultural research, extension and seed production suffer from serious capacity and institutional limitations. A weak seed industry has undermined linkage between research and extension.

### **(a) Agricultural Research**

Agricultural research in Ethiopia has produced over 250 improved crop varieties, animal breeds, farm implements, and various other technologies over the last three decades. Improved crop varieties (mainly wheat and maize) constitute the largest proportion of the technologies generated so far. Nevertheless, the fact that less than 2% of the farmers use improved seeds suggests that farmers have yet to benefit from the Ethiopian National Agricultural Research System (NARS). Most of the improved seeds are adapted to the few localities and favorable agro-ecological conditions in which they were generated. Those that are released for use are not replaced on time, hence many of the available seed varieties have become outdated.

Agricultural research activities are not geared towards bringing about broad-based technical change. Research on soil fertility management needs to be stepped up to reverse the decline in soil fertility due to the breakdown in traditional soil fertility restoring techniques such as fallowing and crop rotation especially in densely populated areas. Given the extent of nutrient mining and land degradation, both organic and inorganic supply of nutrients must be expanded.<sup>4</sup> Location specific agronomic research on land preparation, crop rotation, level of fertilization and control of weed, insects and diseases could have a substantial impact on land and labor productivity. The positive contribution of improved farm implements in raising agricultural productivity should also be appreciated.

Lack of adequate resources is among the major factors constraining broad-based technical change in agriculture. Budgetary expenditure on technology development is inadequate especially when viewed against the diversity of agricultural production in the country and the recommended level of expenditure. For instance, agricultural research expenditure amounted to 26.6 million birr (or 5.3 million USD) in 1993/4, compared to agricultural GDP of roughly 14 billion. This would mean that research expenditure in Ethiopia (only 0.2% of the agricultural GDP in 1993/94) falls far below the recommendation which calls for a target of 2% of agricultural GDP to be invested in agricultural research.<sup>5</sup> Lack of funds have meant that it is difficult to engage adequate number of scientists in agricultural research.<sup>6</sup> It has also become

<sup>4</sup> Eicher, C. K. and D. Byerlee. 1997. 'Accelerating Maize Production: Synthesis' in C. K Eicher and D. Byerlee (eds.), *Africa's Emerging Maize Revolution*, Lynne Rienner Publishers, Boulder.

<sup>5</sup> ISNAR. 1988. *Role of Research in Transforming Traditional Agriculture: An Emerging Perspective*. The Hague, International Service for National Agricultural Research.

<sup>6</sup> For instance, there are only three full-time researchers holding Ph.D degrees (two breeders and one agronomist) currently working on wheat. According to the National Wheat Coordinator, the optimum number for full-time Ph.D researchers is 16.



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increasingly difficult to retain senior researchers as wages and working conditions (including schools for children) in the research centers are unattractive relative to jobs in the major cities or opportunities abroad. Since private research is non-existent in Ethiopia, largely due to the absence of a strong commercial agriculture, individuals resigning from research often join a non-research profession.

Weak institutional base to provide adequate and predictable guidance and framework for governance, coordination, follow-up and evaluation system of the Ethiopian NARS is another major impediment to effective research. The mode of research administration and priorities have changed with government changes and policy shifts. The most recent changes reorganized IAR and brought many research centers under the control of regional administration. New strategies and long-term plans for crops, livestock and natural resources are under preparation. It remains to be seen how the new arrangements and approaches influence research output. But it should be noted that it takes 10 to 20 years for agricultural research to bear fruit in increased production. Ethiopian NARS has been reorganized several times since its establishment some 35 years ago. The indications are that research programs and emphasis in Ethiopia have lacked stability and continuity.

### **(b) Extension**

Similar to research, agricultural extension in Ethiopia is an entirely a public sector activity and suffers from lack of institutional stability and shortage of funds. The Ministry of Agriculture, responsible for extension, has gone through a number of organizational changes in the last 20 to 30 years (Goshu, 1995). It was reorganized several times under the former government in order to implement unpopular policies such as collectivization and compulsory quota delivery. Since extension agents are the only public employees deployed very close to farmers, they have become indispensable in executing policies and administering affairs pertaining to rural areas. They were an important part of the administrative machinery of the previous government.

Under the new extension approach, a development agent is expected to serve about 1000 households. The agent is responsible for introducing some seven or more different packages to farmers under his domain.<sup>7</sup> Every year, he/she receives instructions on the number of farmers that need to participate in the demonstration program. At national level, the number of participating farmers increased from 3,200 in 1994/95 to 2.9 million in 1997/98. A given extension agent could be required to work with over 200 farmers.<sup>8</sup> In addition, disbursement and collection of input loans is

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<sup>7</sup> There are packages for crop production (mainly wheat package), soil and water conservation, forestry, agroforestry, livestock, forage and horticultural crops.

<sup>8</sup> An extension agent contacted around Kulumsa Research Center worked with 227 participant farmers. He was assisted by 45 model farmers (farmers who previously participated) and three high school students. No payment or compensation was made to the farmers nor to the students. The students provided free service in return for support letters that would help them find employment or join training institutions.



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largely handled by the agents. Development workers are operating under heavy work load. The problem is compounded by lack of resources and means of transport to move from one household plot to the next. The perception that the role of agents is to facilitate input distribution has undermined the main purpose of agricultural extension, i.e. assist in knowledge transfer mainly through the process of diffusion.

Most development agents have only nine months of training after graduation from high schools. The training covers a wide range of agricultural activities, ranging from crop production to cooperative movement. Often they lack practical farming knowledge and specific information about the packages that they try to promote. The existing approach does not include adaptive research, which used to be conducted by extension staff in collaboration with IAR/EARO. In the absence of local adaptive research, it has meant that farmers are told by in-experienced agents to adopt technologies the local profitability and adaptability of which is not always known.

The potential to increase yield through improved management practices is not given sufficient attention in Ethiopia. The effort directed towards enhancing technical skill and management capacity of small farmers leave much to be desired. The research system has yet to develop location-specific optimal fertilizer rates and management practices. Extension system operates based on recommendations that show little variation (blanket recommendations) across different environments. Given the variability of growing conditions, extension agents have very little to offer in terms of profitable management practices. They also lack the capacity to choose 'best' farm practice and provide advice based on indigenous knowledge.

### **(c) Seed Production**

Large-scale distribution of improved seeds to farmers started with the launching of the Chilalo Agricultural Development Unit in 1967. In 1978, the Ethiopian Seed Enterprise (ESE) (formerly known as the Ethiopian Seed Corporation) was established as a government parastatal under the now defunct Ministry of State Farms, Coffee and Tea Development. ESE dominates the production and distribution of seed in Ethiopia, accounting for over 93% of the total seed supply in 1996/97 (Afri-Tech Consult, 1998). It handles seeds of some 16 different crops and several varieties of each crop types.

The quality of improved seeds in Ethiopia is low due to various reasons. It is adversely affected mainly by loss of genetic quality due to long period of repeated use and seed production under rain-fed conditions. For instance, about 10% of the demonstration plots in two regions (Oromia and SNNP) which were planted with one particular variety of maize (BH - 660) faced germination problems during the 1998/99 cropping season. Similar problems were reported for wheat in all areas where the



variety HAR 1685 was distributed. Losses of up to 100% were reported on some plots.<sup>9</sup> Seed quality can be adequately maintained when produced under irrigation.

The multinational firm, Pioneer Hybrid, is the only other major actor in Ethiopia and it is interested in hybrid maize only. It started operation in 1990/91 and produced 7000 and 8725 quintals in 1996 and 1997, respectively. The company imports parent seed from Zimbabwe, where the parent company operates one of its two main research centers in Africa (the other is located in South Africa). No other private seed producer has been licensed so far. A few private and state farms currently producing seeds operate under contract from ESE. The legislation for licensing private seed producers is under preparation.<sup>10</sup> Lack of access to land is expected to constrain private sector participation even after the legislation is issued.<sup>11</sup>

### **4.3. Underdeveloped Markets**

Agricultural markets play a critical role in increasing production and stimulating economic development. Efficient and integrated markets ensure optimal allocation of resources in agriculture and motivate farmers to increase output. Underdeveloped output, input and capital markets could negate any effort aimed at increasing agricultural production and productivity.

#### **(a) Output Marketing**

Output marketing in Ethiopia suffers from a number of constraints, including inadequate transport network, limited number of large-interregional traders with adequate storage and working capital, high handling costs, inadequate market information system, weak bargaining power, and underdeveloped processing industrial sector. Transport and communication system leaves much to be desired in Ethiopia. The whole country is served by a total of 4,109 km asphalt road, 9,287 gravel and 5,610 rural roads. The average road density is only 21 km per 1,000 sq. Km or 0.44 km per 1,000 population, one of the lowest in Africa.<sup>12</sup> An estimated 75% of farms are more than a half-day walk from an all-weather road. Inadequate roads, both within Ethiopia and between Ethiopia and neighboring countries, inflate transport costs and impede the viability of grain trade that would otherwise moderate extreme price fluctuations. Lack of adequate transport (especially for milk marketing) is also a major constraint to adoption of more productive dairy breeds.

Large inter-regional traders are small in number and are in the process of establishment following the lifting of the restriction imposed on grain trade in the early

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<sup>9</sup> Based on the report of the Committee organized in 1998 by the National Seed Industry Agency to investigate the problem of seed germination.

<sup>10</sup> Pioneer was licensed as foreign investor and lack of legislation did not apply in this case.

<sup>11</sup> Land for commercial purposes is obtained through lease from the government. Investors have access to unoccupied land only which is often located in remote or inaccessible areas. Such land may not be attractive to seed producers.

<sup>12</sup> The figures refer to 1994 as reported by the Ethiopian Road Authority,



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1990s. Small traders have limited capacity of handling large quantities for longer duration. Hence, the volume of grain marketed falls sharply in years of poor harvest and prices rise considerably. Grain prices, on the other hand, are seriously depressed in good years and immediately after harvest. Handling and transport costs are also high due to the small quantities that farmers bring to market places (often small bags carried on head or on the back of pack animals) and the absence of grading and standards. Grain has to be unbagged and rebagged each time it changes hands, partly to inspect quality.

With large number of small traders in the market, it is difficult for the Ethiopian Standards Committee to effectively inspect weighing scales or the bureaus of trade to monitor trading activities. Traders in many village markets use containers of different sizes, not proper weighing scales (Wolday, 1999). A good part of the margin that goes to traders comes from the inappropriate measuring instruments (underweighing), not just price differentials. Unfair trading practices, combined with lack of accurate and timely market information and high rate of illiteracy among farmers, have widened the gap between the price paid by consumers and the price received by farmers. Since there are no cooperatives or marketing societies, the bargaining power of farmers is weak relative to traders.<sup>13</sup> A more efficient marketing system calls for a more timely and widely disseminated market information (Asfaw and Jayne, 1997) and establishment of an effective monitoring system.

Storage problems coupled with the need to repay loans and meet other financial obligations (e.g. taxes) compel farmers to sell maize immediately after harvest. It is estimated that about 79% of farmers' annual grain sales occur immediately after the harvest season (January to March) (Gebremeskel, et al., 1998). As a result, prices drop when most farmers are selling and rise later during the year when many poorer farmers run out of stock and start buying from the market. Net income per hectare and per labor day would increase by an estimated 9-17% if storage losses in maize were reduced by half (Howard, et al., 1998). High seasonal price fluctuation is also likely to make surplus producing farmers reluctant to make important investment in inputs such as fertilizers and improved seeds.

### **(b) Input Marketing**

Liberalization of fertilizer market has removed price regulation and allowed private sector participation. Nonetheless, fertilizer importers and distributors face considerable uncertainty. Fertilizer import in Ethiopia is financed mainly through foreign grants and loans that are obtained at unspecified times of the year and are often granted with restrictive conditions such as source of supply. Unlike the weekly auction for all other imported commodities, foreign exchange for fertilizer import is offered for tender whenever donations are received. The timing of the tender does

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<sup>13</sup> Cooperative movement in Ethiopia has not recovered from the disastrous experience under the former socialist government.



not necessarily correspond to seasons of low fertilizer price in the world market. Moreover, the amount of foreign exchange available in any one tender is too small (equivalent to lots of 25,000 tons or less) to gain from economies of scale in import and shipment. These and other related problems have raised the cost of fertilizer by at least 13% (Mulat et al., 1997). Since fertilizer is by far the biggest financial cost component of production, reducing the cost of fertilizer will enhance technology adoption.

Fertilizer distribution is marked by regional monopolies and lack of level-playing field. Contrary to the national goal of developing a free market, local authorities in Amhara and SNNP regions limit market share to importers and companies that have close links with the government (owned by parties and local governments). The regional governments control fertilizer loan and limit credit sales to the preferred companies, making the market less competitive and unpredictable. A survey in 1998 found that fertilizer prices were about 5% higher in regions that restricted competition (Stepanik, et al., 1998). Policy uncertainties have also raised the cost of investing in the fertilizer sector and discouraged new entrants (Howard, et al., 1998). These problems, together with the devaluation measure and removal of subsidies, have further increased the price of fertilizer.

The seed market is less developed than the fertilizer market. Improved seeds are not always available in the open market. Private sector participation in marketing improved seeds is minimal. ESE's sales to farmers are carried out largely by the bureaus of agriculture, not by retailers of seed (seed-lots stockists) (Afri-Tech Consult, 1998). Non-participant farmers (in the extension program) have no access to improved seeds. Low demand for ESE's seeds (except for maize and newly released varieties of wheat) has also discouraged private sector participation. Pioneer Hybrid appointed private dealers in 1998 but sales are constrained by lack of credit for seed buyers (outside the extension system), high prices and limited awareness about high quality hybrid seeds (Afri-Tech Consult, 1998). Its prices are relatively higher (8.20 birr/kg in 1998, compared to 5.68 birr/kg of ESE). Lack of coordination of seed supply, fertilizer distribution, credit and output marketing is one of the major impediments to technical change in agriculture.

### **(c) Rural Credit Market**

The capacity of the formal banking sector to serve the rural areas is limited. In 1997, the CBE and DBE had only 150 and 35 branches, respectively. Most of these branches are concentrated in the major urban areas. Only 21% of the woredas in the country have bank branches (Mulat et al, 1998). Moreover, because of massive default, both CBE and DBE are reluctant to supply seasonal input loans.

The majority of farmers in Ethiopia (over 80%) buy fertilizer on credit. But there is no effective mechanism to enforce repayment. One commonly applied measure to enforce repayment is to require all members of a service cooperative or peasant



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association repay all previous loans before a new loan for the current season is approved. Fertilizer sales may be suspended even when the number of defaulters is small and when the reasons for default are legitimate (e.g. crop failure). Delays in fertilizer sales often result in delays of planting time.

In order to improve credit access to input loans, the regional governments were made responsible for loan disbursement and gave guarantee for full settlement of the loan in 1996. The banks transferred all the money for the fertilizer loan to the regional states which in turn distributed to farmers. Credit disbursement and collection was carried out (entirely or mainly) by the regional administration for a minimal charge included in the interest paid by farmers. Unpaid loans were deducted from the regions' budget by the Federal Government and paid to the banks. This has significantly improved both credit access and loan recovery, but there is no guarantee that this will continue. Credit administration is taking too much time of the local authorities. Standard banking practices and procedures are often compromised when credit is handled by non-professionals or civil servants (working for local governments) with no training in banking or basic accounting (Mulat et al, 1998). In spite of the guarantee, there still exists a significant amount of unpaid or long overdue loans. The Commercial Bank of Ethiopia, for instance, reported long overdue loans of 37.4 million birr as of July 31, 1998.<sup>14</sup> Repayment rates have declined in recent years (e.g. 1997/98) mainly due to poor harvest.<sup>15</sup>

Recognizing the need to improve the provision of financial services, the Government issued Proclamation No. 40/1996 for promoting microfinancing institutions. The Proclamation provides the legal basis for investing in medium and small banks, which specialize in catering the credit and savings needs of the urban and rural poor who are willing to undertake productive micro ventures. But interest to undertake microfinancing business has so far come mainly from domestic NGOs working closely with the regional governments.

### **4.4. Rural Infrastructure**

Irrigation works, soil and water conservation structures, drainage systems, and transport infrastructure are poorly developed in Ethiopia. The share of irrigated land in the total cropland is very low (less than 1% (Annex III)), in spite of the recurrent drought affecting a large part of the country. Almost 75 percent of the Ethiopian highlands are estimated to need some kind of soil conservation measures if they are to support sustained production of crops (FAO, 1986).

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<sup>14</sup> The regional distribution was given as 24.3 million in Oromiya, 1.5 million in Amhar, 10.1 million in SNNP, 1.1 million in Addis Ababa and 0.3 in Tigray. See for instance, Fisseha Jima, *Agricultural Credit for Fertilizers: Review of Performance in 1998 and Plan for 1999*, paper presented to the Third Annual National Fertilizer Workshop, Sept. 30 - Oct. 2, 1998, Addis Ababa, Ethiopia.

<sup>15</sup> Field observations around Wolliso, Debre Zeit and Assela (Oromiya region) have shown that enforcing repayment has become increasingly difficult. Local authorities have to use extreme measures such as imprisonment and forced sale of asset (e.g. oxen and other livestock) to recover loans.



Public investments in irrigation, roads and communications, check-dams and surface/subsurface drainages structures have contributed to the growth of agricultural output and the reduction of rural poverty in several Asian countries. A significant increase in productivity can be achieved through investment in small-scale, farmer-managed irrigation schemes, which seem to have greater social benefit than large-scale irrigation (Jazairy, 1992). Increasing cropping intensity through irrigation has been the major instrument to increase income and productivity in countries which experienced a successful green revolution (Ghatak, 1995:298).

Investment in roads should pay special attention to rural link roads which can directly support access of smallholders to inputs and markets. Infrastructure will not, however, raise crop yields without complementary investment in social services such as education, health, water supply, sanitation and nutrition. These investments not only improve the quality of life, but also help increase productivity (Jazairy, 1992). With adult illiteracy rate of 65%, the process of agricultural transformation in Ethiopia would not be so easy.

#### **4.5. People's Participation**

People's participation in the economic, social, cultural and political process helps maximize the use of human capabilities, increases the level of social and economic development and contribute to the attainment of sustainable, balanced and equitable patterns of growth. Local people's institutions with strong organizational capacity are essential for effective mobilization of resources and formulation as well as execution of development projects. It is widely believed that the absence of independent farmers organizations/ institutions and lack of effective decentralization are among the major reasons for lack of sustainable growth in Ethiopia.

The former military government encouraged the formation of various farmer organizations such as peasant associations, service cooperatives and various associations (e.g. youth, women, etc.). But these institutions were established to serve the interest of the government, the ruling party and later the collectivization drive. Hence, most of them, with the exception of the peasant associations, collapsed with the fall of the military government. Bad experience in the past has also slowed down the attempt to reorganize service cooperatives by the present government.

A more favorable policy, legislative and institutional framework is required to induce the formation of self-reliant cooperatives, independent farmers' unions and other groups. This would ensure effective farmers' participation in critical development issues such as land policy, programs for community and public work schemes, and strategies concerning agricultural marketing, credit, research, extension and other related matters.

Delegating governance to local officials and politicians which are more accountable to local communities is an important means of enhancing people's participation. The



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recent move to decentralize power has given the regions the power to mobilize resources and execute local development programs. However, there is very little decentralization of decision-making authority and responsibility from regional level to woreda and zonal level of administration. Zonal and woreda administrations operate as appendages of regional governments and are bureaucratically and hierarchically controlled by authorities at regional level (Meheret, 1998). Decentralization would not lead to fuller political participation if power remains concentrated in the hands of few elites.

Greater emphasis should be placed on strengthening democratic institutions and traditions and promotion of peasant organizations to prevent local corruption and abuse of power by elected leaders. Decentralization would also fail if local talent and initiative are lacking. The absence of adequate managerial and technical capacity at local level may breed inefficiency and constrain the capacity to initiate and execute development projects. Centralization may be required for functions where economies of scale are important. Sometimes it can be more efficient to centralize certain activities like research, higher education and large-scale development projects. The central government is also expected to counteract tendencies which restrict the free mobility of labor and capital.



**REFERENCES**

- Afri-Tech Consult, (1998), Seed Marketing Study, Volume I, Main Report. National Seed Industry Agency, Addis Ababa: Ethiopia.
- Asfaw Negassa & T.S Jayne, (1997), The Response of Ethiopian Grain Markets to Liberalization, Working Paper #6, GMRP, MADaC, Addis Ababa.
- Abiye Astatike and M. A. Mohammed Saleem, (1996), 'Draught Animal Power for Land-Use Intensification in the Ethiopian highlands', WAR/RMZ 86.
- Croppenstedt, A., Mulat Demeke and M. Meschi. (1999) 'An Empirical Analysis of Demand for Fertilizer in Ethiopia', *Ethiopian Journal of Agricultural Economics*, 3(1).
- Dejene Aredo. 1990. 'The Evolution of Rural Development Policies' in Siegfried Pausewang, et al. (eds.) *Ethiopia: Rural Development Options*. London: Zed Books Ltd.
- FAO 1986, Ethiopian Highland Reclamation Study, Ethiopia. Final Report. Rome.
- FDRE 1996, Food Security Strategy, Prepared for the Consultative Group Meeting of December 10-12, Addis Ababa, Ethiopia.
- Gebremeskel Dessalegn, T.S. Jayne and J.D. Shaffer 1998, Market Structure, Conduct and Performance: Constraints on Performance of Grain Markets. Working Paper No. 8, GMRP, MEDaC.
- Ghatak, S. (1995). Introduction to Development Economics. London: Routledge.
- Goshu Mekonen 1995, Agricultural Research and Extension in Ethiopia: An Overview, in Dejene Aredo and Mulat Demeke (eds.) *Ethiopian Agriculture: Problems of Transformation*, Proceedings of the Fourth Annual Conference on the Ethiopian Economy.
- Jazairy, I., M. Alamgir and T. Panucio 1992, The State of World Rural Poverty: An Inquiry into Its Causes and Consequences. IFAD.
- Howard J., Mulat Demeke, V. Kelly, M. Maredia, J. Stepanik. 1998. Can the Momentum be sustained? An Economic Analysis of the Ministry of Agriculture/ Sasakawa Global 2000's Experiment with Improved Cereals Technology in Ethiopia, Department of Agricultural Economics, Michigan State University, E. Lansing, Michigan
- Meheret Ayenew (1998), Some Preliminary Observation on Institutional and Administrative Gaps in Ethiopia's Decentralization Processes. Working Paper No. 1, RLDS, Addis Ababa University.
- Mulat Demeke et al. 1998. The Response of Ethiopian Grain Market to Liberalization, Working Paper 6, GMRPO, MEDaC, Addis Ababa.
- Mulat Demeke, Ali Said and T.S. Jayne.1997. Promoting Fertilizer Use in Ethiopia: The Implication of Improving Grain market Performance, Input Market Efficiency and Farm Management, Working Paper 5, GMRP MEADac, Addis Ababa.



## **The Challenge of Increasing Food Production in Ethiopia**

Mulat Demeke (1989), The Production Efficiency of Foodgrain Producers in Ethiopia: The Case of Some Farmers in Arsi Province. Ph.D Dissertation, Department of Economics, University of Strathclyde.

Stepanek, J., V. Kelly and J. Howard (1998), From a Sasakawa Global 2000 Pilot Program to Sustained Increases in Agricultural Productivity: The Critical Role of Government Policy in Fostering the Ethiopian Transition. (Unpublished Memo).

Timmer (1993), Keynote Address: Setting the Stage, EPAT/Winrock International, Agricultural Transformation in Africa, Arlington: USA.

Wolday Amaha (1998), The Use of Improved Seeds in Ethiopia. (unpublished memo).



Annex I: Ethiopia: Sectoral Contribution of GDP (1980/81-97/98)

Year	Growth rate of Real GDP	Agriculture		Growth rate of per Capita GDP
		As % of GDP	Growth rate	
1980/81		58.1		
1981/82	0.51	55.7	-3.6	-2.4
1982/83	10.1	57.5	13.6	6.9
1983/84	-6.3	53.7	-12.5	-9
1984/85	-9.7	47.0	-20.9	-12.4
1985/86	9.9	49.6	16.0	6.4
1986/87	14.0	51.7	18.8	10.4
1987/88	-0.1	50.3	-2.8	-3.0
1988/89	0.3	50.6	1.0	-2.7
1989/90	4.1	51.2	5.3	0.9
1990/91	-4.2	56.3	5.2	-7.2
<b>Average</b>	<b>1.9</b>	<b>52.9</b>	<b>2.0</b>	<b>-1.2</b>
1991/92	-3.7	56.8	-2.7	-6.7
1992/93	12.0	53.8	6.1	9.0
1993/94	1.6	51.0	-3.7	-1.6
1994/95	6.2	49.7	3.4	2.9
1995/96	10.7	51.5	14.7	7.4
1996/97	5.6	50.5	3.4	2.4
1997/98	0.5	46.4	-7.6	-2.6
<b>Average</b>	<b>4.7*</b>	<b>51.4</b>	<b>1.9</b>	<b>1.6</b>

\* The average growth rate of GDP for the years 1992/93 – 97/98 (i.e. excluding the year 1991/92 which was a year of political instability) is 6.1% and the corresponding per capita GDP growth rate is about 3%.

Source: MEDaC, National Income Accounts, Revised Series, 1998.



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**Annex II: Fertilizer Consumption of the Peasant Sector (MT)**

Year	Sales to the Peasant Sector		
	DAP	Urea	Total
1971	811.0	136.0	947.0
1972	1744.0	303.0	2047.0
1973	7666.0	710.0	8376.0
1974	12413.0	667.0	13080.0
1975	13209.0	770.0	13979.0
1976	33636.0	1409.0	35045.0
1977	32535.0	1455.0	33990.0
1978	32217.0	1717.0	33934.0
1979	48277.0	3010.0	51287.0
1980	40742.0	2545.0	43287.0
1981	29668.0	1444.0	31112.0
1982	30255.0	1418.0	31673.0
1983	42047.0	3008.0	45055.0
1984	42147.0	4737.0	46884.0
1985	22296.0	1823.0	24119.0
1986	74345.0	8918.4	83263.4
1987	99076.0	22196.0	121272.0
1988	107108.0	22404.0	129512.0
1989	107011.0	22460.0	129471.0
1990	117866.0	27843.0	145709.0
1991	117392.0	29573.0	146965.0
1992	135467.0	17191.0	152658.0
1993	84368.0	11600.0	95968.0
1994	156000.0	15000.0	171000.0
1995	198199.0	44410.0	242609.0
1996	205348.0	40524.0	245872.0
1997	164778.0	45164.0	209942.0
1998	182798.0	77460.0	260258.0
Growth Rate in Log-linear(%)	6.29	8.6	6.56
Level of sign.	0.00	0.00	0.00



## Mulat Demeke

Annex III: Estimate of Improved Seed, Irrigation, Fertilizer Applied Area and Quantity of Commercial Fertilizer Applied  
(1997/97) Area (000'HA)

CROP TYPE	TOTAL CROP		IMPROVED SEED APPLIED		IRRIGATED		PESTICIDE APPLIED		FERTILIZER APPLIED*		COMMERCIAL FERTILIZER		RATE
	AREA	AREA	%	AREA	%	AREA	%	AREA	%	(000'QUINTALS)	%	QT./HA	
<b>CEREALS</b>	6688.56	152.52	2.28	39.22	0.59	604.05	9.03	2501.98	37.41	2361.73	35.31	0.353	
Tef	2167.77	37.24	1.72	4.79	0.22	318.55	14.69	1175.65	54.23	1163.90	53.69	0.537	
Barely	697.67	1.01	0.14			34.84	4.97	207.60	29.76	177.30	25.41	0.254	
Wheat	772.23	50.29	6.51	0.80	0.10	158.83	20.57	443.69	57.46	568.39	73.60	0.736	
Maize	1316.87	60.34	4.58	13.69	1.04	23.45	1.78	445.52	33.83	318.94	24.22	0.242	
Sorghum	1399.95	3.84	0.26	18.97	1.36	62.78	4.48	107.98	7.71	71.05	5.08	0.051	
Millet	290.66					2.93	1.01	102.39	35.23	65.21	22.44	0.224	
<b>PULSES</b>	905.35					8.78	0.97	78.10	8.63	74.21	8.20	0.082	
<b>OILSEEDS</b>	461.21							33.04	7.16	32.25	6.99	0.070	
<b>OTHER TEMP.</b>													
<b>ALL TEMP. CROPS</b>	8233.64	153.52	1.86	46.74	0.57	516.35	6.27	2670.68	32.44	2527.34	30.70	0.307	
<b>ALL PERM. CROPS</b>	591.76	11.86	2.00	21.47	3.63	7.83	1.32	174.18	29.43	63.74	10.77	0.108	
Chat	81.23			4.53	5.58	2.00	2.46	25.14	30.95	48.65	59.89	0.599	
Coffee	191.63	11.74	6.13	6.11	3.19		0.00	27.92	14.57	8.91	4.65	0.046	
Enset	260						0.00	112.98**	43.45	2.99	1.15	0.012	
Cotton	16.21						0.00	0.30	1.85	0.00	0.00	0.00	
Tobacco	2.09						0.00	0.31	14.83	0.00	0.00	0.00	
Fruits	17.74			3.87	21.82		0.00	2.74	15.45	0.00	0.00	0.00	
Other perm.	22.86			4.61	20.17		0.00	4.79	20.95	1.03	4.25	0.045	
<b>ALL CROPS</b>	8825.4	165.38	1.87	68.21	0.77	624.18	7.07	2844.86	32.23	2577.65	29.21	0.292	

Source: CSA Statistical Abstract, 1997.

\* Includes manure. \*\* Mainly refers to manure.