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**AGRICULTURAL MACHINERY
INDUSTRIAL SYSTEM IN ETHIOPIA**

SUMMARY

This report forms part of a UNIDO study examining the application of the programme approach to project identification and formulation in the Agricultural Machinery Industry system (section 1.1). A systems approach is used, with a base diagram indicating the main components of the system, their linkages and the policy environment (Diagram 1.1).

The study confirms that AMI in Ethiopia is characterised by mainly artisanal level producers (ie Group 3 of the AMI typologies identified by UNIDO) (Chapter 8). A number of initiatives are being taken to develop the manufacturing capability and industrial infrastructure. However, the pace of change is constrained by the wider agricultural and industrial policy environments. It is only by addressing the broader policy environment that the specific AMI programmes and projects identified will be really effective (sections 9.1 and 9.2).

Priority has been placed on selecting programmes which enable fuller use to be made of existing capabilities and potentials in the manufacturing industry, whilst ensuring the range of agricultural tools and equipment meets the needs of the agricultural sector. Due to the many initiatives already underway, the indicative programmes outlined below include a number of technical assistance projects to more closely identify specific needs.

The programmes address:

- agricultural mechanisation strategy formulation (9.3.1);
- increasing the quality and range of hand tools (9.3.2);
- extending the range of oxen activities (9.3.3);
- improving the use of tractors (9.3.4);
- developing the capabilities of the agricultural manufacturing industry (including projects for increasing the supply of scrap metal, establishing market research departments at national enterprises and establishing a foreign exchange credit line for use by small scale production)(9.3.5).

The justification for these programmes and projects lies in the analysis of the AMI system. They reflect the Government's stated policy objectives for developing agriculture as the backbone of the economy and the industrial sector for achieving economic development (Chapter 2).



UNIDO

INDUSTRIAL INFORMATION SYSTEM - WORKSHEET

New	Update

Control Number	18872	Document Date (00) #1	1991	Call Number (00) #2	
Personal Author(s) (10) #3	Bishop, Clare				
Corporate Author(s) (11) #4	UNIDO				
Conference (22) #5					
Title (20) #6	(R) AGRICULTURAL MACHINERY INDUSTRIAL SYSTEM IN ETHIOPIA.				
Project Number (38) #7					
Source (30) #8	Vienna, 1991. viii, 74 p., tables, diagram.				
Abstract (40) #9	<p>/UNIDO pub/ on /agricultural machinery/ industrial system in /Ethiopia/- covers (1) project background; /methodology/ (2) /economic conditions/; /trade/; /political aspects/ (3) the agricultural sector: performance, production, policies; /farming/ systems (4) /agricultural mechanization/; /agricultural equipment/ (5) /agro-industry/, /public sector/; /rural industry/ (6) /import/s of agricultural machinery and /equipment/; /raw material/s import (7) /institutional framework/; /agricultural credit/; /agricultural extension/ (8) institutional support for /industrial sector/: industrial /credit/; industrial /research and development/; /technical education/ (9) relevant /development planning/; constraints. /Bibliography/. /Statistics/, /diagram/s. Additional references: /industrial policy/, /hand tools/, /economic planning/, /cooperative/, /industrial services/. /Restricted/.</p>				
Language(s) (05) #10	Arabic <input type="checkbox"/> Chinese <input type="checkbox"/> English <input type="checkbox"/> French <input type="checkbox"/> Russian <input type="checkbox"/> Spanish <input type="checkbox"/>			Exp. #11 Life (00)	99
Document Number(s) (37) #12	:::		Country Code (02) #13	141	
Classification (48) #14	312		Price (08) #15		
PROCESSING CONTROL	Date	Initials	REVISED	Date	Initials
				3/9/91	CC

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The main thrust of agricultural policies has been towards developing state farms and establishing producer cooperatives in order to facilitate the introduction of large scale, mechanised agriculture (section 3.3). Despite this policy focus, the peasant sector remains dominant; typically cultivating small areas using a mixture of hand- and animal-power, and generating low cash incomes (section 3.4.1). On producer cooperatives (section 3.4.2) and large scale settlements (section 3.4.5) farm operations are predominantly performed by oxen with limited recourse to tractors. It is only in the state farm and plantation sectors that tractor technology is widely used at present (section 3.4.3 and 3.4.4).

The industrial sector is of growing significance but the basic metal and engineering sub-sectors are at a very low level of development (section 4.1). Manufacturing of agricultural equipment takes place at three levels (section 4.2). Local artisans, using traditional methods of production, are the main producers of hand tools and animal-drawn equipment. Rural and small scale producers are being developed through the initiatives of the Rural Technology Promotion Department and HASIDA to manufacture improved and new equipment, using modern, appropriate technology. National enterprises, coordinated by NMWC, represent relatively capital-intensive production, dependent on imported machinery and raw materials. They produce improved hand tools, pumps and post-harvest equipment, and assemble tractors. They will play a central role in production as the market becomes more aware, and able, to buy improved inputs.

Imports are central to agricultural mechanisation, both in terms of agricultural equipment (section 5.1) and raw materials for the manufacturing industry (section 5.3). Recent activities of importers, both private and Government agencies, have been constrained by foreign exchange (section 5.2).

The distribution network, including the role of specialist corporations, is discussed (section 6.1) and repair and maintenance facilities noted (section 6.2). A range of institutions provide services to facilitate the development of the agricultural (section 7.1) and industrial (section 7.2) sectors.

It is expected that the programmes identified in this study will contribute towards strengthening the existing industrial base and support initiatives already underway; together, they will provide a basis for continuing development.

Acknowledgement is due of the assistance received from UNIDO staff in Addis Ababa and from all the people consulted during the study.

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ABBREVIATIONS

AETSC	Agricultural Equipment and Technical Services Corporation
AIRIC	Agricultural Implements Research and Improvement Centre
AID Bank	Agricultural and Industrial Development Bank
AISCO	Agricultural Inputs Supply Corporation
AMI	Agricultural Machinery Industry
AMC	Agricultural Marketing Corporation
AMSC	Agricultural Mechanisation Service Corporation
EDDC	Ethiopian Domestic Distribution Corporation
FTSS	Farmer Technical Services Stations
HASIDA	Handicrafts and Small-scale Industries Development Agency
IAR	Institute of Agricultural Research
ILCA	International Livestock Centre for Africa
MEPS	Methodology for Evaluation and Programming of Industrial Systems
MOA	Ministry of Agriculture
MOI	Ministry of Industry
NMWC	National Metal Works Corporation
ONCCP	Office of the National Committee for Central Planning
PTA	Preferential Trade Area
PDRE	People's Democratic Republic of Ethiopia
PA	Peasant Association
PC	Producer Cooperative
PDSU	Programme Development Support Unit
RRC	Relief and Rehabilitation Commission
RTP Dept	Rural Technology Promotion Department
SC	Service Cooperative
UNIDO	United Nations Industrial Development Organisation

1 INTRODUCTION

1.1 Background

UNIDO established the Programme Development Support Unit (PDSU) in 1989 to promote the application of the programme approach to project identification and formulation. To date, the Unit's work has mainly focussed on the preparation of the 1990/91 Industrial Development Decade for Africa programme for the development of selected agro-food industrial systems (agro-food, agricultural machinery, fertilisers and pesticides).

The programme approach is applied at three levels. The first uses cluster analysis to group countries according to their patterns of development for a specific industrial system. For the Agricultural Machinery Industry (AMI) study, 50 African countries were grouped into six typologies with the following characteristics:

- Group 1: relatively well developed AMI facilities;
- Group 2: countries with good potential for AMI development;
- Group 3: mainly artisanal level producers;
- Group 4: mainly importing countries;
- Group 5: countries with small markets for agricultural machinery; and
- Group 6: countries with low domestic priority on AMI.

From the sector typology, it is possible to identify group-specific development strategies and determine likely technical assistance, investment and policies for implementing the strategies.

In the second stage of the programme approach, indicative programmes are prepared for representative countries in each group. A systems approach is used with a base diagram indicating the main components of the system, their linkages and the policy environment. Integrated packages of policies, technical assistance and investment projects are formulated to address the bottlenecks and constraints identified in the system. These programmes are 'indicative' in the sense that they should also be relevant for other countries in the same cluster.

The third stage covers the preparation of integrated sector development programmes for individual countries. It will include quantitative analysis using the Methodology for Evaluation and Programming of Industrial Systems (MEPS).

1.2. Objective of This Study

This study is broadly concerned with the second stage of the programme approach; its objectives are fourfold:

- (i) to confirm that the AMI classification identified in stage one is accurate with regard to the positioning of Ethiopia in Group 3;
- (ii) to suggest indicative programmes that could facilitate the development of the Ethiopian agricultural machinery industry in line with Government policy;
- (iii) to assist the PDSU in the preparation of indicative programmes for African countries in Group 3; and
- (iv) to collect quantitative data for use in stage three of the programme approach.

1.3. Methodology

The consultant visited Ethiopia for three weeks in January-February 1990 to collect primary data and draw on secondary data where available. The itinerary and a list of organisations consulted are at Appendix 1.

1.4 Structure of the Report

The report addresses two main topics:

- firstly, the AMI system in Ethiopia is set in the context of the state of the economy, agriculture and farming systems, local manufacturing industry, import sector, infrastructure and institutions (Chapters 2 to 7); Chapter 8 confirms the classification of Ethiopia in Group 3 of the AMI typologies.
- secondly, indicative programmes and projects for facilitating the development of AMI in Ethiopia are identified (Chapter 9).

1.5 An Overview of AMI System in Ethiopia

The systems diagram places the Agricultural Machinery Industry in the context of the broad policy environment, as well as identifying the key components in the system. Diagram 1.1 highlights the main organisations and Ministries associated with AMI in Ethiopia. The chapter numbers on the diagram indicate where these organisations are discussed in the text.

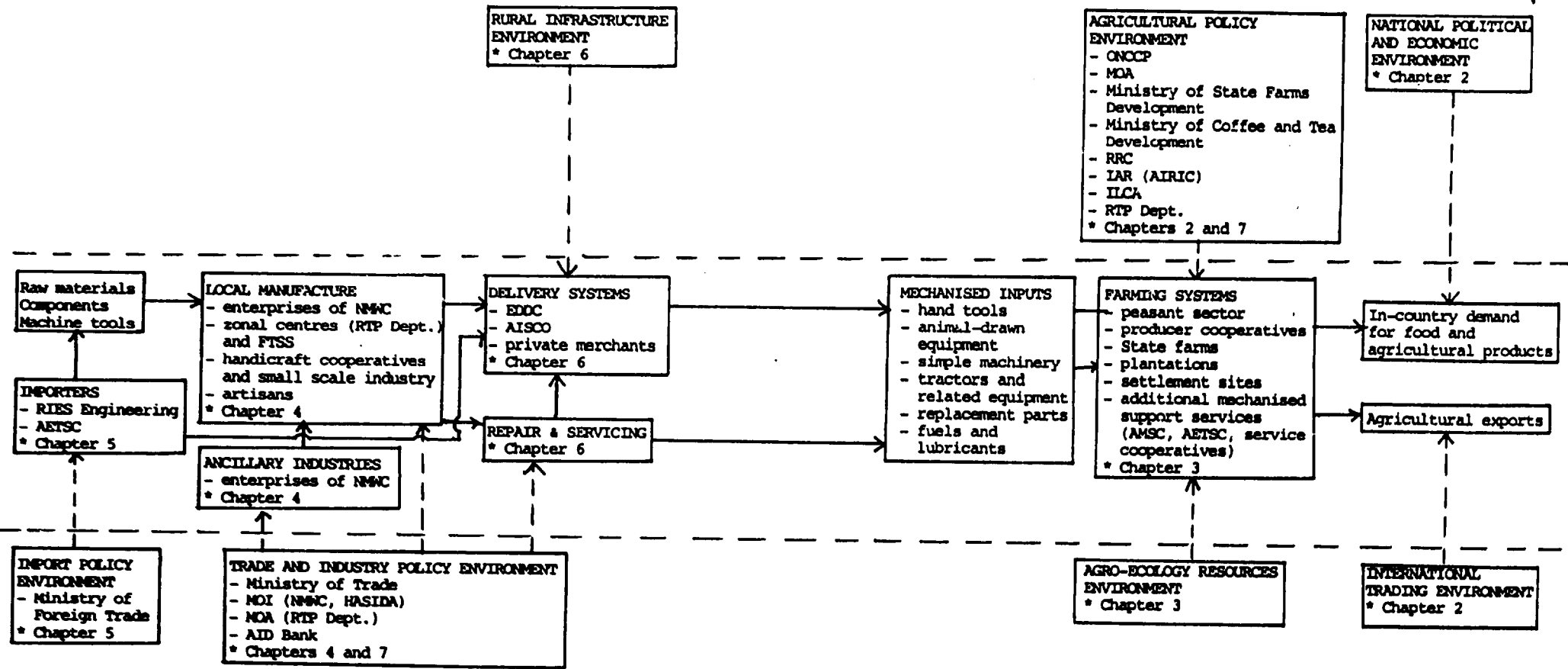


Diagram 1.1: AMI system in Ethiopia

2 COUNTRY BACKGROUND

Ethiopia is located in the hinterland of the Horn of Africa. With a land area of 1.22 million sq km and a population of 50 million in 1990, it is the tenth largest country in Africa and has the third largest population.

Following the deposition of Haile Selassie in 1974, the country has been subject to widespread socialist economic and political reforms: with nationalisation of land and large private companies, introduction of centralised planning and reorganisation of the economy. The People's Democratic Republic of Ethiopia (PDRE) was proclaimed in 1987, replacing the Provisional Military Administrative Council.

The population is growing at an annual rate of 2.8%. The urban population (12% of total) is growing more quickly, at 5% pa. Urban unemployment and underemployment is high. The principal towns include Addis Ababa (the capital), Asmara, Dire Dawa, Nazareth, Gondar, Dessie, Harar and Makele. The population density is highest on the fertile Highlands.

2.1 State of the Economy

Table 2-1: Composition of GDP (at constant 1980 factor cost)

Sector (%)	1982	1983	1984	1985	1986
Agriculture	51.5	49.2	46.2	41.2	41.9
Mining and quarrying	0.1	0.1	0.1	0.2	0.2
Manufacturing	8.7	11.3	12.1	13.1	13.1
Electricity, gas and water	0.8	0.8	0.9	1.1	1.2
Construction	3.5	3.5	4.0	4.1	4.0
Commerce	16.8	16.9	17.4	18.5	18.2
Transport and communications	4.8	4.8	5.3	6.2	5.9
Public administration and defence	7.5	7.4	7.6	8.3	8.3
Other services	6.3	6.0	6.4	7.3	7.2
Total (US \$m)	3806	4009	3847	3597	3670

Source: UN (1988)

Agriculture forms the mainstay of the economy, contributing over 40% to GDP (Table 2.1) and accounting for over 75% of the economically active population (Table 2.2). However, this dominance is declining. The manufacturing and commercial sectors are of increasing significance, generating 13% and 18% of GDP in 1986, respectively (Table 2.1). At present the mining sector is small, although it has potential. Energy resources are poorly developed.

Table 2-2: Economically active population by sector

Sector (%)	1982	1986
Agriculture	78.7	76.7
Industry	8.3	9.1
Services	13.0	14.2
Total ('000)	17978	19505

Source: UN (1988)

The average annual rates of growth have varied markedly between the sectors of the economy (Table 2.3). Whilst the total industrial sector (and manufacturing and transport, storage and communications in particular) have performed consistently well (achieving 3.6% and 4.6% pa, respectively for the period 1970-1987), agriculture has had mixed fortunes, particularly in the 1980s (-2.6% pa for 1980-87). These rates compare unfavourably with those identified in the Three Year Plan for 1986/87-1988/89: agriculture was expected to grow at 6.8% pa, industry at 8.3% pa and services 4.7% pa (ONCCP, 1986).

Table 2-3: Comparative average annual rates of growth by economic sector (at constant 1980 prices)

Sector (%)	1970- 1980	1981- 1987	1970- 1987
Agriculture	0.7	-2.6	0.1
Total industrial activity (incl MVA)	2.3	4.1	3.7
Manufacturing	2.3	3.7	3.6
Construction	-0.6	2.9	1.3
Wholesale and retail trade, hotels, etc	1.2	2.1	1.9
Transport, storage and communications	3.9	6.7	4.6
Other services	5.7	3.4	4.7
GDP per capita	-0.4	-1.0	-0.2
MVA per capita	-0.1	1.9	1.4

Source: UNIDO (1990)

With reference to the World Bank classification of GNP per capita, Ethiopia is the poorest country in the world (US \$120 in 1986) (IBRD, 1988). This is well below the average for the whole of Africa. During the period 1970-1987, the country experienced an average annual growth rate of -0.2%, at constant 1980 prices (whereas the continental average was 0.0%) (UNIDO, 1990). Focusing on the 1980s, the growth rate was -1.0% pa for the years 1981-87 (this was better than the continental average of -1.9% pa).

Several factors can account for the country's poor performance: growth in agriculture has been negligible and the sector has been disrupted by a series of severe droughts (in 1972-74, 1980-81, 1984-85, 1987-88 and 1989-90); world price for coffee, the primary export, has fallen; and the civil war has absorbed scarce resources (estimated at 15% GDP and 50% Government budget in 1987, and incurred substantial external debts (EIU, 1989)). Low levels of domestic saving are reflected by the country's small annual expenditure on gross capital formation (less than 10% GDP in 1986 (UN, 1988)).

Inflation has been kept in check by tight domestic credit and restraint in government expenditure in the early 1980s (EIU, 1989). Despite the tendency for prices to escalate during droughts, the overall rate for the consumer price index for 1982-86 was 3.8% pa, -4.6% pa for 1986-87 and 7% pa in 1988.

2.2 Trade

The currency, the Birr, has been pegged to US Dollar at 2.07 Birr = US\$ 1 since 1974; it is considered to be overvalued by the World Bank. Generally the government keeps tight control on foreign exchange with strict currency restrictions and sparing allocations of import licenses.

Exports are dominated by agricultural products and, most significantly, coffee (Table 2.4). Hence the level of export earnings is partly influenced by world coffee prices (which boomed in 1985/86 and have slumped subsequently) and by drought (eg 1985 exports). Severe droughts also influence the pattern of imports; in 1985/86 imports of food and vehicles increased significantly due to famine relief.

Table 2.4: Composition of exports and imports

Exports (%)	1980/ 81	1985/ 86	Imports (%)	1980/ 81	1985/ 86
Coffee	62	72	Food and live animals	6	24
Hides and skins	11	12	Crude petroleum	21	10
Live animals	1	2	Machinery (incl aircraft)	15	12
Pulses	3	1	Vehicles	12	13
Oilseeds	3	1	Chemicals	6	4
Total (incl others) Birr m	851	924		1384	2211

Source: EIU (1989)

The current account has persistently deteriorated in the 1980s (Table 2.5) even though the balance has been assisted by the export of services and increases in private and public transfers. The main destinations for exports are West Germany (18% total in 1988), Japan (13%) and USA (12%) whilst the main sources of imports are Italy and USSR (both at 16%) and USA (12%) (IMF, 1989). The country has a good reputation for debt

management and repayment; however, during the latter part of the 1980s the level of external debt has risen substantially with implications for debt servicing.

Table 2.5: Foreign trade and debt

US \$ million	1985	1987	1989 *
Exports fob	333	355	310
Imports cif	993	1066	950
Current account	106	-468*	-550
Public external long term debt	1753	2434	na

* estimates

Source: EIU (1990)

Despite being one of the poorest country's in the world, Ethiopia received low levels of Official Development Assistance per capita in the early 1980s. Following the droughts of the mid-1980s, assistance has increased. Many western donors have made increased funding contingent on economic liberalisation and a peaceful settlement to the civil war (EIU, 1990).

At present (February 1990), the economy is facing another severe famine, the continuing civil war, a widening trade deficit and shortages of foreign exchange.

2.3 Policy Environment

The Ten Year Perspective Plan 1984/85-1993/94 was introduced by the Provisional Military Government. It was set in the context of the National Democratic Revolution Programme, covering the transition of the economy to socialism.

The stated objectives of the Plan were:

- improving gradually the material and cultural well-being of the people;
- accelerating the growth of the economy through expansion of the country's productive capacity;
- ensuring structural balanced development of the national economy by expanding domestic resource-based industries;
- conserving, exploring, developing and exploiting rationally the natural resources of the country;
- expanding and strengthening socialist production relations;
- raising the level of education and skills of the people;
- laying down the basis for the development of national science and technology capability;
- eliminating unemployment gradually;
- alleviating social problems; and
- ensuring balanced and proportional development of all regions of the country.

The Plan was to be implemented through three medium term plans, covering the periods 1984/85-1985/86, 1986/87-1988/89, and 1989/90-1993/94. The decision to approve the third plan was postponed in 1989 and the country proceeded with a one year plan. The full plan may be finalised in 1990 or 1991.

3 AGRICULTURAL SECTOR

3.1 Performance of the Agricultural Sector

Agriculture is the predominant sector in Ethiopia, in terms of its contribution to GDP, employment and foreign exchange earnings. Accordingly, the Ten Year Perspective Plan aims to develop agriculture as "the foundation of the country's economy".

The following objectives and strategies were identified for this sector:

- to attain a level of production which would ensure self-sufficiency in food supply and the holding of three months stocks of food reserves; specific activities included increasing the area under cultivation, expanding small scale irrigation schemes, increasing the supply of improved agricultural inputs, and training farmers to adopt better farming techniques, particularly improved harvesting and storage methods;
- to make the supply from domestic production of agricultural raw materials for industries adequate and reliable: to be met by the peasant, cooperative and state farm sectors;
- to increase foreign exchange earnings by expanding the output of exportable agricultural products, predominantly within the state farm sector;
- to enhance socialist production relations in the countryside through programmes of villagisation and cooperativisation;
- to explore, conserve, develop and properly utilise the country's agricultural resources, with special reference to soil and water conservation, tree planting and forest management, and wildlife;
- to strengthen agricultural research and development and to create effective linkage between research and development institutions and other agricultural development institutions; and
- to intensify the resettlement of people displaced by natural and man-made problems in areas where they could be self-supporting.

However, the agricultural sector's performance has been disappointing with an annual rate of growth of -2.6% for 1981-87 (in comparison with a target rate of 6.8% pa over the period 1986/87-1988/89). This has had an adverse effect on the economy as a whole. Many of the factors which have contributed to this poor performance are discussed below (section 3.4).

In principle, opportunities do exist for agriculture to make a greater contribution to the economy. Currently only 15% total area is cropped, 51% is used as pastureland, 4% under forests and 8% shrubland. The Perspective Plan notes lowland regions and river valleys could be developed and 2-3 million hectares could be brought under irrigation (in the mid-1980s only 100000 ha were irrigated).

3.2 Agricultural Production

The country has two wet seasons. The main season, 'krempt', lasts from July to mid-September, with rains borne on the northern movement of the Inter-tropical Convergence Zone. Levels of rainfall vary from the south west Highlands (2200 mm pa) to the north east Highlands (550 mm pa). A second, shorter, rainy season, 'belg', borne on south west winds, is important for the south eastern part of the country.

Three agro-climatic/altitudinal zones are traditionally recognised in Ethiopia (FAO, 1986). They are:

- 'kolla' (hot zone): land below 1500 metres above sea level (masl). Nomadic livestock systems predominate on semi-arid savannah rangelands; little cropping is undertaken.
- 'woina dega' (intermediate zone): between 1500 to 2500 masl. Vegetation ranges from tropical and sub-tropical, to temperate. (NB land over 2000 masl is free of the malaria mosquito).
- 'dega' (cold zone): areas above 2500 masl where frost becomes a major constraint for certain crops and temperate crops (wheat and barley) predominate. Above 3000 masl there are very limited cropping opportunities and vegetation becomes sub-alpine.

Currently most of the production is concentrated on the Highlands (land above 1500 masl) and its associated valleys. Although it only accounts for 44% total area of the country, it has 95% of the regularly cropped area, 67% livestock, 88% population, and over 90% of the country's economic activity (FAO, 1986).

The yields of many of the principal crops and livestock products have risen over time (Table 3.1). Nevertheless the average yield level remains low.

Table 3.1: Principal crops and livestock products

Crops (estimates, 000 t)	1986	Growth %pa	
		1970-80	1980-85
Wheat	700	-0.3	2.7
Barley	1000	0.7	-1.4
Maize	1500	0.4	8.1
Millet and sorghum	1300	4.4	-13.4
Other cereals	1220	na	na
Roots and tubers	1275	na	na
Chickpeas	135	-2.3	-1.7
Dry peas	125	1.5	-3.3
Dry broad beans	500	13.0	1.3
Sugar cane	1725	na	na
Sesameseed	37	-7.7	0.0
Cotton lint	22	5.4	-3.2
Coffee	225	1.0	6.0
Vegetables and fruit	770	na	na
Livestock (estimates, 000 t)			
Beef and veal	216	-2.1	0.5
Cows' milk	600	1.3	0.2
Cattle hides	41	-1.8	0.5

Source: Economist (1987) and Europa (1989)

3.3 Agricultural Policy

Since the introduction of socialist policies, major changes have occurred in the agricultural sector. Land tenure has been reformed through redistributing it up to a maximum of 10 ha per farmer, and by abolishing individual land titles. Resettlement and villagisation programmes have been introduced: the purpose of the first is to resettle drought victims on more productive land, and that of the second is to group scattered peasant households in order to supply economic and social services more efficiently.

There are five principal farming systems: the peasant sector, producer cooperatives, state farms, plantations and settlement sites (each is examined below). The main thrust of agricultural policies has been towards developing state farms and establishing producer cooperatives in order to facilitate the introduction of large scale, mechanised agriculture. Nevertheless, despite this policy focus, the peasant sector remains dominant: in the mid-1980s peasants cultivated more than 90% of the total crop area and produced 84% of the total output of cereals and pulses (Table 3.2). However, these levels have fallen slightly over time as the producer cooperative sector has grown to cultivate 4% area and produce 3% output. This is a substantial shortfall on the target set in the Three Year Plan of cultivating 5.8% area and producing 6.8% crop output by 1988/89 (ONCCP, 1986). In contrast, the state farm sector has been relatively stable, achieving parity

between the area cultivated and the quantity produced (4% each). Again this falls short of the target of producing 7.8% crop output by 1988/89.

Table 3-2: Crop area and production of cereals and pulses by sector

Sector (%)		1980/1 - 83/4	1984/ 85	1985/ 86	1986/ 87
Peasant	area	94	93	92	na
	output	91	90	86	84
Cooperative	area	2	3	4	na
	output	1	2	2	3
State farm	area	4	4	4	na
	output	4	5	4	5
Total area (000 ha)		5708	5190	5524	na
Total output* (000 t)		6705	4505	5945	6830

* including production from other sectors

Source: EIU (1989) (adapted)

3.4 Farming Systems

3.4.1 Peasant sector

In the peasant sector, land is cultivated individually by approximately seven million farmers. They are organised voluntarily into 20,500 Peasant Associations (PA) for administrative purposes. Each PA allocates land (in theory totalling 800 ha per PA) to individuals (who may number between 300 - 500 heads of household, depending on the area available). The area cultivated ranges from 1-2.5 ha per household.

(i) Farm operations

People and animals represent the main sources of power in this sector (Table 3.3). An average household consists of 5-7 people; in addition labour may be exchanged or hired (MOA, 1987). The majority have one ox (32% peasant households) or an ox pair (25% total); only 6% have more than two oxen and 37% have no oxen. Most oxen-based operations require a pair; thus farmers with one ox may swap with a neighbour and those with no oxen may rent or borrow them (reciprocating with labour). Currently, only a few operations are performed by oxen (namely, tillage, seed covering, and threshing) and annual utilisation is low (160 hours or less) (Pathek, 1987).

Table 3.3: Source of power for farm operations in peasant sector

Operation (%)	Hand	Hand tool	Draught animal	Pack animal	Not Performed
Land clearance		42			58
Tillage			100		
Sowing	100				
Seed covering		8	92		
Fertiliser application	100				
Weeding	58	42			
Harvesting		100			
Threshing		38	62		
Winnowing		100			
Transport	68		3	29	

Source: Pathek (1987) (adapted)

Cultivation requirements, although partly influenced by soil type and crop rotation, vary substantially between crops (Table 3.4). Teff (an indigenous cereal) is the most demanding: it requires a finely tilled soilbed and always has priority with regard to ploughing time and the number of ploughings (MOA, 1987). Wheat, barley and millet also receive frequent ploughing. Chemical fertilisers, when used, are generally applied to teff and wheat. The number of weedings will, in practice, reflect labour availability; this operation is highest for maize, teff and sorghum. Overall the lowest operational requirements are for chickpea, field pea and sorghum.

Table 3.4: Number of operations by crop type per annum

Crop	Ploughing	Fertilising	Weeding
Teff	3 - 12	1 - 2	1 - 3
Wheat	1 - 6	1	0 - 2
Barley	2 - 6	0 - 1	0 - 2
Maize	1 - 4	0 - 2	1 - 3
Sorghum	1 - 2	0 - 1	0 - 3
Horsebean	1 - 6	0 - 1	0 - 2
Millet	3 - 8	na	0 - 2
Chickpea and field pea	1 - 2	na	0 - 1

Source: Pathek (1987) and MOA (1987)

Not only do the cultivation requirements vary between crops, but also the length of time to perform each task (Table 3.5). There are many operational overlaps, particularly between early and late sown or maturing crops.

Table 3-5: Time taken to perform farm operations by crop type and average yields (1)

Crop	hours/ha		average yields 1983-4 (t/ha)
	weeding	harvesting	
Teff	235	200	0.6
Wheat	230	210	0.65
Maize	140	100	0.93

1. Ploughing: ox pair 0.25 ha/day

Source: Pathek (1987) (based on study in Shoa, 1986)

(ii) Constraints

A number of constraints hinder productivity in the peasant sector (Pathek and MOA (1987 and 1989)):

- shortage of land and fragmentation of holdings which is caused by an expanding population, and the PAs reallocating land to new members and producer cooperatives;
- shortage of oxen which is exacerbated by dry season feed shortages at the time of year when they are required to do most work and by the fact that oxen currently perform a limited range of activities. This results in restricting the area cultivated per household and untimely operations (particularly tillage and threshing);
- shortage of labour causes bottlenecks in the cropping calendar, particularly for harvesting and, to a lesser extent, weeding and planting. Farmers take remedial action (eg weeding less than is necessary and broadcasting seed) with a consequent reduction in yield and post-harvest losses;
- non-availability and expense of improved inputs (eg fertiliser and seed);
- poorly designed and fabricated tools, constructed from mild steel. This causes inefficient use of power, poor work quality, low yields and working parts to wear out quickly;
- Agricultural Marketing Corporation (AMC) marketing arrangements with quota requirements and low product prices;
- low net cash income per family (non-farm activities are not common). In a study conducted mainly in the central and southern regions in 1987-88, net cash incomes typically ranged from 35-175 Birr per unit but rose to over 300 Birr per unit where high value crops were grown (MOA, 1989);
- poorly developed credit facilities;
- crop damage by pests, diseases and wild animals;
- uncertain weather conditions; and
- livestock diseases and shortage of grazing land/fodder crops.

3.4.2 Producer cooperatives

A producer cooperative (PC) is formed by a group of at least three farmers within a PA, pooling their land, managing it collectively and sharing the proceeds. A second stage exists where all productive assets are pooled (not many have reached this stage yet). Only one PC is established in each PA as it is expected to gradually absorb individual farmers into cooperative production. About 16% of PAs have a PC.

In the Ten Year Perspective Plan, PCs have been a priority sector. It was envisaged that by organising farmers into cooperatives, it would facilitate the application of modern technology in agriculture, including mechanisation. Assistance has been offered in the form preferential access to production inputs and credit, specialist cooperative staff employed in the Ministry of Agriculture (MOA), and training.

In practice, the growth of the cooperative sector has fallen far behind expectations. The Plan stated that by 1993/94 the expected membership of 15,344 PCs would account for over 50% of all farmers and cultivate four million hectares. By 1989 there were over 3300 PCs with around 300,000 members and approximately 0.5 million hectares of cultivable land.

(i) Farm operations

The main power source is oxen because there are only a limited number of tractors (Table 3.6).

Table 3.6: Resources of producer cooperatives

	1982	1984	1986
Area cultivated	151759	165407	292247
Oxen	42643	82166	191447
Equines	na	960	5130
Tractors	na	76	137
Combine harvesters	-	-	8
No of oxen/ member	0.71	0.87	1

Source: IAR (1987)

(ii) Constraints

Development of the cooperative sector has been frustrated by a number of factors:

- weak internal management of cooperatives resulting in members not working together and embezzlement;
- a scarcity of production inputs, including oxen, results in cooperatives not cultivating the total area available;
- labour shortages at ploughing, sowing and harvest times; and

- an inability to pursue their interest in mechanisation due to limited foreign exchange, a lack of skilled management and experience in handling equipment, and a shortage of maintenance services and spare parts.

3.4.3 State Farms

Despite being one of the primary beneficiaries of Government support for agriculture, the performance of state farms has been disappointing. They occupy the prime agricultural land, absorbed 40% of government expenditure on agriculture between 1980 and 1985, received more than 75% of fertiliser, improved seed and credit allocations; yet they only generated between 4-5% of agricultural output (EIU, 1989).

There are 42 state farms cultivating a total area of 205665 ha and producing a wide range of crops (Table 3.7); a further 16 farms specialise in dairy and cattle production. Seventeen agro-industries, under the Horticulture Corporation and Ethiopian Animal Development Corporation, process vegetables, milk, meat, and animal feed.

Table 3-7: Corporations of Ministry of State Farms Development

Development Corporations	Number of Enterprises	Main crops and livestock
North West Agricultural	2	maize + sorghum
Southern Agricultural	3	wheat + barley
Awash Agricultural	2	cotton
Horticulture	3	vegetables, fruit + flowers
Ethiopian Animal		beef fattening + milk, chicken + eggs, crops for animal feed
Agricultural Equipment and Technical Services		not relevant
Seed		not relevant

Responsibility for the state farm sector lies with the Ministry of State Farms Development. Planning for state farms is conducted primarily at the Corporation and Enterprise levels under the direction of the Planning, and Research and Advisory Departments. Day-to-day decisions are executed at the farm level where permanent employees, including a farm manager, tractor and workshop operators, are supported by many seasonal labourers.

(i) Mechanisation on state farms

It is estimated that approximately 70% of all farm operations are mechanised with the balance made up by hand-power (animal power is not used in the state farm sector) (Ministry of State Farms Development, 1986). All land preparation and the harvesting of certain crops are mechanised (Table 3.8). Based on the tractor population in 1986, the available horse power per cropped area was estimated to be 1.87 hp per ha; on average combines harvested 320 ha each (well above the world average of 260 ha per season).

Table 3.8: Degree of mechanisation of operations on state farms

Farm operations	Source of power
Waste disposal	20% mechanised; 80% burning
Soil cultivation	100% mechanised
Planting	90% mechanised (large seed crops: cotton, maize)
Drilling	5% mechanised of wheat + barley areas
Seed broadcasting	97% mechanised (small seed crops: excluding rape, sesame, teff)
Fertiliser application	70% mechanised
Weed and pest control	86% aerial spray in early growth manual weed control later
Harvesting	100% mechanised (wheat and barley) occasionally mechanised (maize) 100% hand (cotton and vegetables)

Source: Ministry of State Farms Development (1986)

The equipment inventory for four Corporations is given in Table 3.9. The changes in inventory levels during the period 1985-1988/89 reflect a mixture of influences: a shortage of money and foreign exchange to support new purchases; improved maintenance of existing equipment; and a reduction in the area cultivated. (When the sector commenced it was charged with cultivating all land allocated to it, regardless of suitability. Subsequently the area cultivated has contracted in order to preserve some natural resources.)

Table 3-9: Inventory of farm machinery and equipment on state farms *

Equipment	1986	1988/89
Tractor	3165	2832
Slasher/chopper	61	na
Sub-soiler	111	na
Plough	1503	1115
Harrow	614	712
Cultivator	234	354
Leveller	112	70
Ridger	134	140
Ditcher	66	8
Planter	406	493
Seed drill	178	na
Fertiliser spreader	194	181
Sprayer	115	198
Combine harvester	428	440
Sheller	40	na
Trailer	838	1024

* for farms in the Agricultural Development Corporations of North West, Southern and Awash, and Horticulture Development Corporation

Source: Ministry of State Farms Development (1986 and 1989)

Support for farm mechanisation in this sector is provided at three levels:

- workshops on state farms have facilities for servicing, maintenance and undertaking minor repairs. They are often pushed beyond their capabilities to repair engines and gearboxes because the existing central workshop facilities are overloaded (see below). Farm workshops follow an annual preventative maintenance programme introduced three years ago. Mechanics have benefited from an extensive training programme in which senior mechanics were trained as 'transmitters' to conduct training courses at the farm level;

- the Agricultural Equipment and Technical Services Corporation (AETSC) has a central workshop in Addis Ababa and four mobile workshops to service all state farms and others. In an attempt to expand and decentralise facilities, a series of regional workshops are planned (one is already under construction). AETSC also provides technical training for mechanics and operators. (AETSC is discussed further in Chapter 5); and

- the Engineering Department of the Ministry of State Farms Development provides advice to Corporations about the engineering aspects of their activities within three broad categories: agro-industries, construction, and farm machinery and vehicles.

The knowledge and skills regarding the use and maintenance of equipment has greatly improved. This is reflected in improved

utilisation capacity of equipment from only 35% in 1986 to 65% in 1989. Spare parts requirements have also been streamlined to concentrate on the fast-moving parts.

(ii) Constraints.

Mechanisation activities on state farms have been frustrated by a number of factors:

- the more highly qualified personnel are concentrated in the Ministry Departments or Corporations rather than at the farm level. Farm operators are dependent on the former for advice and technical support. The situation is exacerbated by the fact that people employed on the farms, dissatisfied with poor living conditions and low rates of remuneration, often leave (particularly those with some form of technical skill). Hence state farms are frequently training new employees;

- the technology acquired has not been well suited to the needs of state farms. The farms are located in different agro-climatic zones but equipment allocations have not always reflected their differing needs. Some equipment was of poor quality and had inappropriate specifications (eg. machines had non-tropicalised parts which were liable to break or the engines were too small for the area to be cultivated and the altitude). Overall, this resulted in poor performance, available capacity not matching the area to be cultivated, untimely operations and high costs on repairs and maintenance (in 1986 it was estimated that more than 45% of agricultural production costs were attributable to the operation of tractors and implements);

- limited foreign exchange at the farm level has resulted in shortages of spare parts. Consequently, equipment has been poorly maintained, cannibalised for parts, and not replaced; and

- the introduction of new mechanised activities has been restricted either by a shortage of money at the Ministry level (eg for cotton harvesting) or by growing varieties which are not suitable for mechanisation (eg the maize variety grown is prone to lodging).

3.4.4 Plantations

Under the Ministry of Coffee and Tea Development there is one coffee plantation and two tea enterprises, with the respective processing facilities. Farm operations are mechanised when possible, for example, for land clearing and road construction. Other activities will be performed by hand: for example, picking coffee and tea. In 1988 there were 14000 ha under coffee in the state sector, with plans for 50000 ha by 1992; the vast majority of produce comes from the smallholder sector.

There are two sugar estates under the Ministry of Industry. Operations are fully mechanised with the exception of harvesting.

3.4.5 Settlement Sites

Since the drought of 1972-74, the Government has undertaken a number of resettlement projects through the work of the Relief and Rehabilitation Commission (RRC). They fall into three main categories:

- Large-scale or conventional settlements. These occurred from 1975 to 1980 and moved a large number of people from the drought-stricken north to previously uncultivated, yet fertile, lands in the south. A settlement site was divided into a number of units (the actual number depended on the area available but typically ranged from 5 to 15 units). In theory a unit consists of 500 head of family who are jointly responsible for managing an area of 1250 ha. In practice, an average site would consist of 350 head of family, cultivating around 600 ha. Of the 80 or so sites established, only 40 remain with RRC (see discussion below); some have achieved the RRC goal of becoming self-sufficient and receive extension advice from MOA, whilst many have been abandoned.

- Small scale or low cost settlements. They were used during 1979 and 1980 and had several features which distinguished them from large-scale settlements. Firstly, they focussed on transferring people from high density areas to less densely populated regions close to their original homes; the number of settlers per site was low (in the order of between 10 to 30 head of family); and up to 2 ha was allocated per head of family for individual cultivation. This method proved successful, with settlers receiving technical assistance and certain inputs from RRC only in the first year (seeds, a set of hand tools and one ox per head of family). Subsequently they have received extension services from MOA, in the same way as other smallholders.

- Following 1984-85 drought both conventional and integrated settlements have taken place. Under the latter, RRC is responsible for household equipment (eg food, clothing and cooking equipment), handtools and animal-drawn equipment whilst development activities are undertaken by the Ministries of Agriculture and Construction. Settlements consist of 300 head of family, cultivating land individually. This approach has been used to establish more than 40 units and is also proving more successful than the original method.

(i) Mechanisation on conventional settlements

RRC provides a range of services to the units, including technical, agronomic and mechanical support. In addition to the head and regional offices, RRC has coordination offices at the site level and managers are placed on individual units. The latter are responsible for coordinating the day-to-day activities of their unit through liaising with the elected representatives of the settlement. The land is operated as one unit (although families will have a small area for individual gardens) and labour is drawn from among the settlers.

When these sites were established, tractors and farm equipment were allocated, free of charge, according to the workplan for each site. The inventory was of mixed origin: some was imported for RRC use; some was donated by aid agencies; and other items had been nationalised after the Revolution. This resulted in a wide variety of makes, ages, and conditions of farm equipment.

Thus repair and maintenance activities have been necessary from the outset. RRC established a three-tiered system of farm mechanisation support:

- preventative and routine maintenance is carried out at the settlement unit (a field mechanic employed by RRC is posted to each unit);

- major repairs are undertaken by a central garage in the coordination office (which covers all the units at one settlement site). The workshops are equipped with mainly imported equipment which needs replacing every two to three years. Money for the workshop (excluding the salaries for technicians who are RRC employees) is drawn from each unit's account. The repair services are provided free of charge although the spare parts or raw materials have to be bought by the unit. Mobile mechanics from RRC head office provide additional skilled manpower for activities beyond the capabilities of these staff; and

- for repairs requiring specialist workshop facilities, equipment is repaired outside RRC in Addis Ababa.

RRC's mobile workshops no longer operate due to a lack of re-investment in equipment. RRC provides training for operators and mechanics, supervision of mechanisation, and engages (to a limited extent today) in purchasing and supplying spare parts and consumables.

The strategy towards mechanisation has been reorientated recently with increased emphasis on oxen-based systems. It is now recognised that the fully-mechanised approach originally adopted is not appropriate. It represented a jump to high-powered technology, largely dependent on imported parts (and hence foreign exchange) and requiring skilled manpower. With limited budgets and foreign exchange, shortages in spare parts have resulted in an aging inventory. Some items of equipment have been cannibalised in order to keep other pieces going. Moreover, there has been no re-investment in mechanised equipment once it is obsolete. As a result it has been difficult for settlers to achieve the RRC goal of self-sufficiency in the short term.

It is envisaged that tractors will account for around 15% of the farm operations and hand- and animal-power will cover 85% operations (Table 3.10). Most of the draught oxen have been provided by donor agencies, although some have been bought by the settlers. Hand tools are bought by settlers or distributed by RRC.

Table 3-10: Mechanisation of farm operations on a typical large-scale settlement unit

Farm operation	Source of power
Ploughing	mainly oxen supported by tractors (particularly for new lands)
Seeding	hand
Fertilising (1)	hand
Weeding (2)	hand
Harvesting	hand
Transporting	traditionally use tractors
Threshing	teff: old combines + oxen others: animals

1. Little fertiliser is used
2. No herbicides are applied

(ii) Constraints

In addition to the reasons underlying the shift from tractors to animal-based systems, other factors have hindered farming operations:

- a major constraint is the lack of money in the farming system. Settlers can neither afford to purchase inputs which would increase yields, such as fertiliser (sometimes improved seeds are purchased), nor spare parts and fuel for existing machinery;
- due to the reliance on a limited number of oxen the area cultivated is restricted and operations are not performed on time;
- using animals to thresh teff (because the threshers are very old) is a time-consuming activity and may delay the next farming operation;
- new animal-drawn equipment supplied by the Italian Government proved unsuitable: the ploughs were too heavy for the oxen and settlers were not familiar with the harrows; and
- two features unique to the early schemes have acted as constraints to the units achieving self-sufficiency: many settlers were not formerly farmers hence it inevitably took time for them to acquire new agricultural skills; and land was operated as one unit rather than individual plots. Both issues have been addressed in subsequent settlement projects.

3.5 Additional Agricultural Mechanisation Services

The section above has examined agricultural mechanisation available within each farming system. In addition, certain sectors have access to mechanisation services provided by other organisations.

3.5.1 Agricultural Mechanisation Service Corporation (AMSC)

AMSC was established in 1985 in the Rural Infrastructure Main Department of MOA with the primary objective of introducing mechanised technology to the small-scale sector through operating an equipment hire scheme. Two types of service are provided:

- fully subsidised hire of equipment to farmers on settlement sites established since 1984-85 drought. They are often located in areas which are unsuitable for animals (due to tsetse fly) and thus need access to mechanised inputs. In total, this service covers 60000 ha.
- equipment hired out to peasants and producer cooperatives predominantly in the south east, north west and central regions (covering 40000 ha). Due to the small size of individual holdings, AMSC only services groups of individual farmers (organised by their service cooperatives). Producer cooperatives may hire equipment in their own right since they cultivate a larger area and have a legal identity; they also benefit from preferential hire rates. The hire rates are set by government and are based on what farmers can afford to pay (Table 3-11). It is estimated that the service costs cover all operating costs but only contribute between 10-15% of fixed costs.

Table 3-11: AMSC hire costs

Activity	Producer coop Birr/ha	Individual Birr/ha
Ploughing		
light soil	97.52	117
medium soil	106.08	127
heavy soil	113.11	135
Discing		
light soil	27.25	32.70
medium soil	28.52	34.22
heavy soil	29.79	35.74
Second discing/ seed covering	25.04	30.04
Drilling		
seed + fertiliser	48	57.60
seed	40	48
Fertiliser spreading	8	9.60
Harvesting		Birr/quintal
combine (wheat)	5	6
shelling (wheat)	2	3.5
shelling (teff)	4.25	5
Transporting produce	35.19	42.22

Source: AMSC (1990)

The AMSC, with a total of 2000 employees, operates through seven main stations, 21 brigades and a number of mobile work teams (with usually 20 to 25 employees per work team). AMSC provides training for tractor and combine operators from the Corporation and other organisations.

AMSC's current inventory is presented in Table 3-12. AMSC initially purchased equipment through AETSC; it is now able to buy direct through its own Purchasing, Procurement and Distribution Department. When tendering for new items, AMSC does not necessarily select the cheapest source; account is also taken of the manufacturer's after sales service, reputation and any previous experience in Ethiopia. Stocks for tractors and combines are purchased at the rate of 10 - 15% of value of the original purchase. It is estimated that tractors and combines will be replaced every seven years, and implements every eight to nine years.

Table 3-12: AMSC equipment inventory, 1990

Equipment	Number
Tractor	
65 hp	67
75-80 hp	671
100 hp	562
Plough	903
Harrow	463
Cultivator	29
Ridger	3
Seed drill	8
Fertiliser spreader	14
Combine harvester	135
Trailer	274

Small workshops at the main stations and brigades are capable of general overhaul and minor repairs and maintenance. (Sometimes engines and gearboxes are stripped but they are not really equipped to do this). Four mobile workshops from Head Office provide additional expertise and equipment. AETSC is generally used for major engine overhauls. AMSC operates a maintenance programme which could be improved.

AMSC's experience of operating this hire service has been favourable. There is a demand for mechanised services among the peasants and producer cooperatives (although some comment that it is expensive). The use of this equipment, in association with the provision of extension advice through MOA, results in increased yields. Therefore this approach appears to be meeting its objective of introducing farmers to new technology and providing backup support (eg maintenance and spare parts). Although AMSC is meant to be self-financing, continuing Government support will be necessary since farmers have a very low level of technical knowledge at present. In the long-run it is hoped the hire service will be localised once producer cooperatives start to buy their own equipment; AMSC will continue to provide technical support for repair and maintenance.

3.5.2 Agricultural Equipment and Technical Services Corporation (AETSC)

AETSC, of the Ministry of State Farms Development, manages a hire service, principally for state farms. A fleet of heavy construction equipment (eg levellers and dozers) is hired out for:

- land development (clearing and levelling) to state farms others (producer cooperatives, MOA and Ministry of Coffee and Tea Development (until they recently acquired their own equipment)); and
- the construction of in-farm roads and feeder roads to farms.

AETSC has two other major functions: to import agricultural equipment and spare parts (again principally for state farms); and to provide comprehensive repair facilities. These are discussed in detail in Chapter 5.

3.5.3 Service cooperatives (SC)

Service cooperatives are formed between three to ten PAs; currently there are around 4000 SCs with 4 million members, representing about 75% of PA membership. Of particular relevance to agricultural mechanisation, many SCs have crop-processing facilities (grain mills) and some own tractors and combine harvesters for hire. SCs may also be involved with promoting rural industry through establishing workshops (see section 4.4.2).

In addition, SCs are empowered to procure, store and distribute inputs and consumer goods, act as a credit channel, and purchase and store crops. They also provide broad social services; for example, kindergardens, training in cooperative management and political education.

3.6 Outlook for Agricultural Mechanisation

3.6.1 Structure of production

Small scale individual producers are likely to remain the backbone of the agricultural sector. They typically cultivate small areas using a mixture of hand- and animal-power, and have only limited cash incomes.

Producer cooperatives have, in many instances, not lived up to expectations, in part due to internal organisational problems. Along with large scale settlements, farm operations are predominantly performed by oxen, with limited recourse to tractors.

State farms and plantations will continue to fulfil a specialist role, operating in areas where economies of scale can be exploited (for example, using irrigation) and producing crops for industrial use or export. The system is predominantly mechanised. It has been suggested that state

farms may become more financially-independent and commercially-orientated at the farm level. They may concentrate on lowland areas, leaving the Highlands for the small scale sector.

3.6.2 Priorities for agricultural mechanisation

In the context of the structure of production outlined above, attention should broadly focus on the following areas;

- improving the quality and quantity of hand tools and animal-drawn equipment;
- increasing the availability of oxen and the range of activities they can perform; and
- increasing the supply of post-harvest equipment for use by PCs and SCs.

The role for tractor-based systems is limited, at present, to state farms, plantations and AMSC. This is appropriate since the system demands a comprehensive infrastructure in terms of access to repair and maintenance facilities, technical skills and foreign exchange for spare parts and re-investment. In time, PCs will want to make more use of tractors and implements, particularly to overcome labour and oxen constraints and to expand the area cultivated.

These points are developed more fully in Chapter 9 where various programmes and projects are identified. Constraints in the policy environment and institutional infrastructure are also discussed since they are central to effective programme formulation and implementation.

4 AGRICULTURAL MANUFACTURING SECTOR

4-1 Performance of the Manufacturing Sector

The industrial sector is of growing significance in Ethiopia. By 1986 this sector generated 19% of GDP and employed 9% economically active population at an average growth rate of 4.1% pa (1981-87). Manufacturing is the most important sub-sector, based predominantly on food processing, beverages, textiles and chemicals (petroleum refining) (Table 4.1). The most valuable exports are tanning and leather finishing, meat and meat products, and sugar and sugar products. The basic metal and engineering industrial sub-sectors are at a very low level of development at present (NMWC, 1989).

Table 4-1: Gross value of production of manufacturing establishments, 1985/86

Industrial sector	%
Food	20
Beverage	14
Tobacco	5
Textiles	15
Leather and shoe	5
Wood and wood products	1
Paper, printing and publishing	4
Chemical	27
Non-metallic mineral products	3
Metal products	6
Total (Birr m)	2841

Source: MOI (1989)

The public sector is very active in manufacturing, particularly in establishments which are at least 50% owned by the Government and supervised by the Ministry of Industry (MOI) (Table 4.2). The other public sector industries encompass Government-owned industrial establishments. The private sector covers manufacturing establishments which employ ten or more people and use power-driven machinery. Thus these figures take no account of the contribution of smaller scale operations.

Table 4.2: Contribution of public and private sector establishments to manufacturing, 1985/86

Contribution	Industrial sector (%)			Total
	MOI administered	Public Other	Private	
No of establishments	40	12	48	405
Permanent employees	83	11	6	93268
Gross value of production	71	25	4	2841m Birr
Value added (factor cost)	70	28	2	0.69m Birr
Export value	88	11	1	99.8m Birr

Source: MOI (1989)

In the Ten Year Perspective Plan, the industrial sector was identified as the vehicle for achieving rapid economic development, and was to contribute 24% to GDP by 1993/94. In particular, the sector was to:

- produce manufactured goods required by the population for basic necessities;
- supply agricultural equipment and other manufactured inputs required by the agricultural sector;
- provide sufficient equipment and materials for the Government's civil construction programme;
- contribute to the national effort to eradicate underemployment and unemployment;
- increase foreign exchange savings (through import substitution); and
- to attain, as much as possible, balanced regional distribution of industrial development.

The Plan recognised that many factors, such as obsolescent machinery, shortage of spare parts and uneven supplies of raw materials, would aggravate the development of the industrial sector. Attention was to focus upon strengthening the handicrafts sector which accounts for more than 50% of total industrial production. Most manufacturing activity (92% total) is concentrated in and around Addis Ababa (Shoa region), Asmara (Eritrea) and Dire Dawa (Hararghe).

4.2 Agricultural Manufacturing System

In the formal sector in 1986, the manufacture of agricultural equipment contributed less than 1% to both the gross value of production and to the value added (at factor cost) by all manufacturing industries (MOI, 1989). These enterprises are coordinated by the National Metal Works Corporation (NMWC) of MOI. Much of the production of hand tools and animal-drawn

equipment takes place in the informal sector, with support from the Rural Technology Promotion Department of MOA and Handicrafts and Small-scale Industries Development Agency (HASIDA).

4.2.1 Public sector establishments

The NMWC oversees four enterprises directly engaged in producing agricultural equipment (hand tools, pumps, grain mills and maize shellers) and assembling tractors. A fifth is ready for construction.

The operations section of NMWC facilitates the production process at the factory level through arranging finance, administration, centralised purchasing, maintenance, and planning, monitoring and controlling production. The development section deals with long term issues (eg factory rehabilitation, expansion and new initiatives). Each factory is an independent cost centre and is responsible for day-to-day decisions.

(i) Kotebe Metal Tools Factory

Kotebe Metal Tools Factory was established over 20 years ago as a share company between the governments of Ethiopia and Poland; it was nationalised after 1974. On average, the factory produces 0.5 million agricultural hand tools pa; it also makes hand tools for the construction industry (Table 4.3). It includes a sickles factory which is operating under the same management and has a maximum production capacity of 0.5 million sickles pa.

Table 4.3: Description of Kotebe Metal Tools Factory

Area of site	18000 sq metres
Area of buildings	3000 sq metres
Production departments	design, press, forge, heat treatment, tools, assembly, woodwork, maintenance, sickle production,
Total assets	4m Birr
Annual turnover	5m Birr (70% agricultural; 30% construction)
Employees	248
Operating capacity	65% utilisation

Apart from the reliance of imported raw materials and production equipment, the production process is self-sufficient with the design office working with the tools department to produce prototypes and dies. Employees' skills range from semi-skilled school leavers to university graduates.

About 2000 tonnes of various steels are imported each year. Wood for handles (300 cubic metres pa) is bought locally (about 20% products are sold with handles). It is estimated that the factory doubles the value of the raw materials (Table 4.4).

Table 4.4: Output of Kotebe Metal Tools Factory, 1989

	Number	Ex-works price
Hand tools		
Hoe	20000	7.22
Pickaxe	70000	8.58
Spade	100000	4.03
Shovel (1)	90000	4.62
Axe (2)	40000	8.51
Machete	20000	7.29
Pitchfork	10000	8.00
Sickle	200000	3.92
Animal drawn		
Plough (3)	1000	180.00
Scoop (3)	1000	200.00

1. Some used in construction industry
2. Average price for several varieties of axe
3. Special production for MOA projects

The majority of sales are to merchants (for onward sale to individuals and producer cooperatives) and MOA; other purchasers include state farms, settlement farms, Ministry of Education (for its demonstration centres), aid agencies and EDDC (see section 6.1.1).

At present, Kotebe is the sole producer of improved hand tools (ie using better quality raw materials) in the country and supplies approximately 3% of the total market; the majority is supplied by artisans and small scale producers making cheap tools using traditional production methods. This may be explained partly by the fact that farmers are not aware that improved versions are available and partly by the nature of Kotebe's production. Kotebe is engaged in mass production using a standard design and is unable to meet regional requirements whereas artisans are able to be much more responsive to individual farmers' needs.

Specific constraints experienced in production include:

- the absence of market research which resulted in the first sickle design not being adapted to Ethiopian conditions;
- acquiring spare parts for the Polish manufacturing equipment; and
- foreign exchange for raw materials.

(ii) Akaki Pump Factory

The factory is the sole producer of pumps in Ethiopia. It was established in 1987 under NMWC with assistance from North Korea (Table 4.5). The factory was to produce surface pumps (hand-operated and centrifugal) mainly for irrigation purposes to substitute for imports. In practice, the activities are

divided equally between producing centrifugal pumps for agricultural and non-agricultural uses. Hand pumps have not yet been commercially produced; the original design proved unsuitable and is being modified by the factory's design office.

Table 4.5: Description of Akaki Pump Factory

Area of site	33000 sq metres
Area of buildings	4200 sq metres
Production units	design office, drawing office, pattern making, laboratory, forge, foundry, machine shop, testing, painting, heat treatment, crushing unit, workshop
Capital	
fixed	10m Birr (State Treasury)
international credit	4m Birr
working	2.2m Birr (overdraft)
Employees	180
Operating capacity	60% utilisation

With the exception of the prime mover, all components are made at the factory. Nevertheless, the production process uses a high proportion of foreign exchange: it is planned that 2m Birr raw materials will be purchased annually of which 70% will be foreign exchange. Imported raw materials include pig iron (240-300 tonnes pa), bentonite powders (30-40 tonnes pa), ferrous metals and steel bars; sand and scrap metal are purchased locally. Manufacturing value-added is estimated to be 63% on imported raw materials costs.

Since the factory (which has an annual capacity of 1500 pumps when fully operational) commenced operation, between 400-450 pumps have been produced; in the third year it is hoped to produce 300-350 pumps. An equivalent number of engines are imported. Prices are given in Table 4.6.

Table 4.6: Akaki pump ex-works price list (including engines), 1990

Pump (Birr)	Electric	Diesel
5CP-27	2150	-
10CP-17	2430	5700
20CP-17	4560	15530
6.5CP-27x3	4690	10020
10CP-11.5x5	7930	19070

The factory screens all import requests for pumps and only those which cannot be produced by Akaki are imported. The main purchaser has been MOA; others include producer cooperatives, dairy farms and ETRUIT.

As part of the sales service, factory engineers visit potential customers to recommend appropriate pumps, customer training is provided and equipment has a two year guarantee.

Expenditure on replacement parts is small (5-10% of initial cost).

During the first two years of operation, the factory faced two major constraints. Firstly, an information campaign was mounted to overcome the public's lack of awareness that pumps were being produced in Ethiopia. This was also designed to stimulate demand since only a limited number of people in rural areas knew of the potential for pumps and had the ability to use them. Secondly, it was not possible to utilise fully the production capacity due to the absence of an appropriate design for the hand pump. However, components were made for other factories (eg grain mills).

Two plans are afoot to improve the distribution system. Arrangements are underway to distribute pumps through a private agent (with several branch offices) who will also import the engines and provide after sales service. MOA may become involved in distributing pumps to individual farmers and producer cooperatives in order to encourage irrigation.

(iii) Grain Mill Manufacturing Workshop, Kaliti Metal Factory

The workshop is located at the Kaliti Metal Factory which produces a range of metal products (eg sections and tubes, angle iron, plain and various pressed shapes from galvanized, black and aluminium sheets, and fabricated structures for industrial buildings). The workshop commenced operations in 1989 (Table 4.7), producing hammer grain mills and maize shellers, with the objectives of:

- alleviating the existing shortage of grain mills in Ethiopia;
- introducing technologically-modern hammer grain mills;
- expanding engineering industries in the country; and
- saving foreign exchange.

Stone mills are imported and they have a greater milling capacity but are very expensive. There is one other local manufacturer of hammer mills.

Table 4.7: Description of Grain Mill Manufacturing Workshop

Area of workshop	1440 sq metres
Workshop sections	sheet metal working, welding, painting, assembly
Capital	
fixed	0.75m Birr (Gov Treasury)
working	6.64m Birr (local bank loan)
Employees	46
Operating capacity	50% utilisation

Manufacturing equipment was purchased from Italy and Italian technical assistance was received. It is estimated that 5-10%

of the final product is imported complete (eg engines, fuel pipe and other small accessories) whilst the majority is fabricated on site (using imported raw materials (black sheet metal, stainless steel sheets, round bars and tubes)). Some internal parts are cast at Akaki Pump Factory. The manufacturing process adds approximately 20% value to the cost of inputs.

Table 4-8: Production of grain mills and maize shellers

	Proportion of total production (%)	Ex-works price Birr
Grain mill		
U300 - electric	20	11300
- diesel	55	20300
C170 - electric	10	5800
- diesel	10	11200
Maize sheller		
electric }	5	2200
manual }		1800

In the first year the workshop operated at 50% capacity, producing 850 units. The planned annual output is 1400 grain mills and 200 maize shellers (although the actual balance will depend on market demand). The most popular product to date is the Universal 300 grain mill, diesel driven (Table 4.8). The majority of sales are to individual mill owners; other purchasers include peasant associations, producer cooperatives, service cooperatives, state farms, and urban dwellers associations. Only five maize shellers have been sold (to state farms) since the technology is not widely known. An advertising campaign has been mounted to inform the public of the product range.

The sales service includes an instruction manual, direct training on operating mills, and maintenance services. Spare parts for engines are imported.

The factory faces some challenges: the general lack of awareness of maize sheller technology (traditionally it is done manually); difficulties in transporting maize shellers to isolated rural areas; and a shortage of cash with which to purchase mills and shellers (although credit is available through AID Bank). To date no problem has been experienced on the production side but there would be difficulties if a shortage of foreign exchange restricted the purchase of raw materials and engines.

(iv) Nazareth Tractor Assembly Plant

The plant was established with two objectives:

- to improve the productivity of the agricultural sector by introducing modern farming techniques; and

- to lay the basis for the development of engineering industries. It was envisaged this would occur through three phases of development: assembly, local manufacture of parts, and, finally, complete manufacture in Ethiopia.

The plant commenced operations in 1984 under a contract with Promach-Export of USSR and is currently assembling 80 hp tractors (with either two or four wheel drive) which have been imported in a semi-knocked down state. The value added by assembly is approximately 15% to the basic costs of imports (Table 4.9).

Table 4.9: Description of Nazareth Tractor Assembly Plant

Area of site	73000 sq metres
Area of buildings	4700 sq metres
Production departments	assembly, painting, machine shop and auxiliary facilities
Fixed capital	
state capital	11.87m Birr
general reserve	87000 Birr
Employees	128
Operating capacity	50% utilisation

The annual production capacity is 1000 but currently only 500 are produced pa with approximately 300 held in stock. Sales fluctuate: 500-600 tractors in 1988 and 350 tractors in 1989. Most of the demand for tractors is met by imports even though Nazareth tractors are substantially cheaper than imported equivalents (32000 Birr ex-works price for four wheel drive in comparison with 45000 Birr or more for an imported tractor). Sales are made through MOA and AETSC (to the Ministry of State Farms Development). AETSC is responsible for after sales service, training and importation of spare parts.

Factors which may contribute to lack of sales include the small size of tractor (state farms are switching to 100 hp as a more appropriate size) and the fact that the plant plays a passive role in marketing its products (ie it does not often sell directly to end users).

(v) Improved Farm Implements Factory

The construction of a factory for manufacturing animal- and tractor-drawn implements is planned to start in 1990. It will be based at Nazareth. The project is to be assisted by the Bulgarian Government. Prototypes of implements, produced in Bulgaria to specifications prepared by MOA, Ministry of State Farms Development and Institute of Agricultural Research, have already been field-tested in Ethiopia.

4.2.2 Small-scale industries, handicraft cooperatives and artisans

It has been estimated that the artisanal sector produces over 80% of the supply hand tools in Ethiopia. In addition to producing a range of hand tools, sickles and maresha, artisans

also undertake modest repairs and maintenance work. Their level of production is influenced by the seasonal demand for products, their need for cash income, and the availability of scrap metal. They operate using traditional technology and methods of production.

As producers, artisans have several advantages over large scale national enterprises. They are locally-based and are able to meet local equipment specifications; their labour costs and overheads are low. In contrast, Kotebe Metal Tools Factory is reliant on imported raw materials and production equipment, has to meet high overheads, is distant from the market and only able to produce standardised equipment in order to gain economies of scale. At present, it is probably unable to compete either on price or quality with local producers.

In the Ten Year Perspective Plan priority was placed on promoting and strengthening socialist modes of production in the small scale industry and handicrafts sub-sectors. Industrial and handicrafts producer cooperatives were given preferential treatment in terms of access to credit and taxation. Productivity was to be improved through technical assistance, training programmes and strengthening the organisational structure of the Handicrafts and Small-scale Industries Development Agency (HASIDA)(see section 7.2.2).

Producer cooperatives also use traditional methods of production. Small scale industry uses more developed technology (eg power tools). HASIDA's activities are largely concentrated in urban areas with cooperatives and industries predominantly producing consumer goods and textiles, and processing food. HASIDA has developed the concept of 'pilot industrial cooperatives', establishing modern industrial-type producer cooperatives to demonstrate machines and new production methods to traditional cooperatives and artisans. A pilot Metal Stamping and Forging Cooperative was established with 0.7 m Birr capital investment, to produce, among other things, small farm implements. This project, support by UNDP, has ceased operations: the jump in technology was too great for the workers, they lacked technical management skills, and problems were faced in marketing the products.

A second UNDP project, currently at the study stage, aims to establish two small pilot industrial centres, one in a settlement region and the other in a drought-affected region. In each there will be 20 industrial units, producing a range of basic consumer goods and services (and probably including improved farm tools).

In general, industrial activities have been hampered by physical, financial and policy constraints:

- lack of technical manpower;
- shortages in the domestic supply of raw materials;

- foreign exchange shortages restricting the purchase of imported raw materials and machinery used in production. (HASIDA has a backlog of projects approved totalling 25m Birr which can not be implemented due to an inability to import equipment);

- labour law which restricts dismissal after three months employment; and

- profit tax: individuals have paid up to 89% and business organisations, 50%; cooperatives are exempt.

Recently, the business environment has been made more attractive by the provisions of the 'Small-scale Industry Development Council of State Special Decree' introduced in July 1989. Capital ceilings for individuals are now up to 2m Birr for establishing a small-scale industry (with a total of 4m Birr for expansion) and for business organisations 4m Birr and 8m Birr respectively. Cooperatives have an establishment limit of 4m Birr, with no limit for reconstruction or expansion.

In addition, machinery imported for the establishment, reconstruction or expansion of small-scale industry is exempt from import customs duties. Moreover, any person establishing a small-scale industry producing export products is, under certain conditions, exempt from income tax for four years from commencement of production.

4.2.3 Rural Industry Supported by Rural Technology Promotion Department

The Rural Technology Promotion Department forms part of the Rural Infrastructure Main Department of MOA (see section 7.2.2). Its general remit is to popularise agricultural and other technology in rural areas. Within this framework, two initiatives have been taken to promote and develop rural small scale industry. Zonal Rural Technology Promotion Centres are being established by MOA and, at the service cooperative level, Farmer Technical Services Stations (FTSS) are being formed. Both are engaged in the production of agricultural equipment for the rural community.

(i) Zonal Rural Technology Promotion Centres

Rural Technology Promotion Centres aim to promote new technology to users and producers by:

- producing prototypes and providing technical services;
- improving small agricultural implements;
- promoting rural industries; and
- promoting and developing rural energy.

Production activities at these centres are secondary; in the long run it is intended that this function will be largely passed on to FTSS. At present, three centres are fully operational and another four are promoting technology and supplying equipment produced at other centres. The link between the centres and the rural community is through MOA's

Development Agents. The latter, and FTSS workers, are trained in the use of new equipment and production methods.

At each centre, the average capital investment is US\$ 2.5-3m and there are 80 MOA employees. A major problem is finding raw materials: three centres consume approximately US\$ 2m pa; this will increase to US\$ 5-6m when all seven centres are engaged in production. Metal is purchased from EDDC and some has been received through an EEC-funded programme. Some components are manufactured by NMWC establishments, Akaki Spare Parts Factory and Akaki Pump Factory.

The centres are the sole producers for the range of agricultural, household and industrial products they manufacture (Table 4-10). Sales are made directly from the centres to individuals (for the low priced items) and through SCs for more expensive items.

Table 4-10: Range of agricultural products produced annually by seven zonal centres by 1994

Product	Total production pa	Birr
Wooden-frame spike tooth harrow	800-1000	61.33
Single row maize planter	550	119.42
Animal-drawn cart with pneumatic wheel and axle	2000	1008.41
Wheel barrow	1500	71.13
Beehive	3000	131.03
Maize sheller (1)	500	3836.94
Barley/wheat thresher	400	
Rice huller	25-30	

1. originally designed with pto from tractor but now use an independent engine (it was decided that the original method did not make most effective use of the limited tractors available). Price quoted for sheller with propellor shaft.

The manufacturing value added is more than 50%; hence these activities not only stimulate demand for improved equipment and develop farmers' technical capabilities but also serve as a major means of injecting incomes into rural areas.

(ii) Farmers' Technical Services Stations (FTSS)

The purpose of FTSS is to improve the status of rural industry and promote technical skills of a good standard. They are established by service cooperatives if the latter satisfy certain criteria (good management and book keeping, suitable location, number of members, a potential for development and, most importantly, farmers' interest). At present, there are 152 FTSS in operation. Technical assistance is provided by the zonal centres.

Table 4-11: Description of FTSS workshop

Area of workshop	200 sq metres (concrete floors, open walls, roof)
Equipment	welding, forge, anvil, hammers, steel saw
Employees	2-3

The programme commenced in 1988 with support from EEC for workshop equipment (Table 4.11) and some raw materials. The building is constructed by the service cooperative, costing in the region of 25000- 30000 Birr (excluding the cost of labour) and representing 50% of the costs of establishment. Local farmers are employed as workers and at least two are sent for basic technical skills training at a zonal centre. Overall management is provided by the board of the service cooperative.

Table 4-12: Range of agricultural products produced by FTSS

Product	Retail price (1)
Hoe	4.15
Shovel (2)	5.75
Axe	7.50
Weeding fork	2.15
Sickle (with handle)	1.75
Winnowing fork (2)	3.00
Maresha (plough tip)	13.10
Plough hook	3.00

1. Based on a sample of 12 FTSS in Wollo Region
2. Prices from FTSS in Harara

In addition to the range of agricultural equipment produced (Table 4-12), FTSS also manufacture other household products (eg tables, chairs, beds, spoons, and knives). The value added by these activities is traditionally low. Development Agents from MOA assist the FTSS in setting realistic product prices to cover the costs of production and overheads. Prices vary between regions, partly because the size of products vary regionally (for example, the maresha). The pattern of production is seasonal, broadly reflecting the agricultural calendar.

The priority for sales are to SC members through the cooperative shop. Production in excess of the cooperative's needs may be sold at the local market. The main purchasers are local farmers, producer cooperatives and settlement farms. In terms of total market supply, FTSS are not likely to supply much beyond the demands of the SC members.

FTSS undertake some minor repairs and provide maintenance services for SC-owned equipment, other local agricultural equipment and lorries.

FTSS have faced several constraints on production:

- raw materials are not readily available: not all FTSS are located near to an EDDC branch;
- scrap metal is of varying quality and expensive;
- shortage of funds to provide on-the-job training for developing workers beyond the basic skills; and
- a lack of awareness (and hence demand) for new equipment by the farming community.

The recent submission for assistance from EEC under Lome IV has addressed some of these points. A total of US\$ 20m has been requested by the Rural Technology Promotion Department; it includes providing technical support for the zonal centres, equipment for 200 workshops, training and the purchase of raw materials (for use by existing and new FTSS).

4.3 Manufacturing Infrastructure

A number of enterprises under the NMWC provide infrastructural support for the manufacturing industry. Their key features are:

Status	Main products
(i) Operational	
- Ethiopian Iron and Steel Foundry, Akaki	re-bars, nails, other wire products
- Akaki Spare Parts and Hand Tools Factory (with Italian Government)	industrial spare parts, engineering hand tools, cutlery
(ii) Pipeline	
- Engineering Design and Tools Centre (MOI/NMWC + UNIDO-UNDP)	design, prototypes, dies, moulds, jigs, training
- Pilot Demonstration Foundry (MOI/NMWC + UNIDO-UNDP)	castings, training, research
(iii) Under study	
- Spare Parts Factory for Transport and Agricultural Equipment	spare parts

4.4 Outlook for Agricultural Manufacturing Sector

Developing the capabilities of the manufacturing sector is necessary not only to improve the quality and quantity of agricultural equipment but also to offer a technical infrastructure to support the use of more mechanised equipment

in the agricultural sector. Its pace of change is going to be largely determined by the disposable income available in the farming system.

The production of hand tools and animal-drawn equipment will remain predominantly in the artisanal sector. Thus their productive capacity should be enhanced through improving access to raw materials and providing technical assistance. The initiatives of both HASIDA and the Rural Technology Promotion Department should result in establishing businesses of an appropriate scale and well suited to conditions in the informal sector. They will also act as a vehicle for developing technical capabilities beyond simple manufacture, repair and maintenance.

A novel feature of the Rural Technology Promotion Department's approach is the programme of active 'popularisation' of agricultural technology which will, in turn, stimulate a demand-led growth in the manufacturing industry.

The production system of the four establishments under NMWC is capital intensive and geared to volume production generally using imported materials. At present, they operate at only 50-65% of their production capacity. This may be attributed to foreign exchange and raw materials shortages, inappropriate product designs (eg sickle and hand pump) and a lack of awareness of a new technology (eg pumps and maize shellers). It is essential that full use is made of these facilities and relevant projects are identified in Chapter 9.

These establishments will play a central role in producing improved agricultural tools and equipment as the market becomes more aware, and able, to buy improved inputs. All recognise the need for product diversification. Potential opportunities may exist for manufacturing hand pumps and large scale surface pumps for state farms, exporting grain mills and pumps (particularly to Preferential Trade Area (PTA) members), and assembling 100 hp tractors.

5 IMPORTS OF AGRICULTURAL EQUIPMENT AND MACHINERY

5.1 Overview

Imports are central to agricultural mechanisation, both in terms of agricultural tools and machinery, and equipment and raw materials for the manufacturing industry. Regardless of need, the level and composition of imports in any one year will be influenced by the availability of foreign exchange and the state of the economy. Nevertheless, general trends are discernable and, during the 1980s, imports of all machinery declined and in 1985/86 accounted for 12% of total imports (see Table 2.4).

In the Ten Year Perspective Plan the objectives set for the manufacturing sector included import substitution. Local industry produces the majority of hand tools: one study in the mid-1980s estimated that imports accounted for 6% of total supply (although accurate calculations are difficult because hand tools are distributed by donor agencies and are smuggled into the country). In contrast, the agricultural sector is still heavily dependent on imports for engine-driven machinery (Table 5.1). Most expenditure is on tractors and parts (totalling US\$ 14.5m in 1988), equipment for soil preparation, harvesting and threshing, and parts for agricultural machinery and pumps. The main suppliers range from west and east Europe, to China and India, and to Djibouti, Benin and Israel.

The country has two major ports on the Red Sea at Assab and Massawa but many activities have been disrupted due to the civil war. A significant proportion of Ethiopia's trade passes through the port of Djibouti which is linked to Addis Ababa by rail.

From the Special Decree of July 1989, machinery imported for use in small-scale industry is exempt, under certain conditions, from customs duties. This concession could usefully be extended to agricultural equipment, spare parts and industrial raw materials.

5.2 Importers of Agricultural Equipment and Machinery

Both private sector companies and Government agencies are engaged in importing agricultural equipment into Ethiopia. Two case studies are presented below. The first, RIES Engineering Share Company, is the largest importer of agricultural equipment in the country, accounting for approximately 30% market share (and more in some product lines); a range of smaller dealers have between 3-5% market share each. The second, AETSC, coordinates the importation of equipment primarily on behalf of the state farm sector.

5.2.1 RIES Engineering Share Company

RIES Engineering Share Company started over 30 years ago as a subsidiary of RIES and Sons Ltd. It is now an independent share company with local and foreign shareholders. Based in Addis Ababa, it specialises in importing and distributing

Table 5.1 : Imports of agricultural tools and equipment, 1988 FY

	Quantity	Weight (tonnes)	Value* (US\$m)	Main supplier
Hand tools				
Shovel	20,400	24.1	0.06	Benin
Pick	4,486	11.2	0.02	China
Axe	334	0.2	0.002	Italy
Sickle	178,260	33.5	0.4	Djibouti
Other	-	74.4	0.4	Djibouti
Agricultural machinery				
Plough	52	35.8	0.3	UK
Seeder and planter	12	74.2	0.8	UK
Cultivator, etc.	129	224.8	1.4	Israel
Other equipment for soil preparation or cultivation	-	222.6	3.5	UK & France
Combine harvester & thresher	na	0.7	0.03	Yugoslavia
Other harvesting & threshing machines, etc.	160	134.9	2.5	Holland
Winnowing, etc., parts	49	30.4	0.6	Holland
Milking machines				
Milking machines	4	0.04	0.004	Italy
Other dairy machines	349	6.9	0.1	GDR
Parts	-	6.5	0.1	Holland
Other agricultural & horticultural machines				
Parts	21	9.8	0.1	FRG
	-	131.6	2.1	Hungary
Wheeled tractors				
Parts	201	877.6	6.6	USSR
	-	629.6	7.9	Italy
Pumps				
Parts	140	75.1	0.9	India
	-	204.0	5.5	Italy

* Before duties and taxes

Source: Ministry of Foreign Trade (unpublished)

agricultural and industrial equipment, and providing service and spare parts facilities. The industrially-related activities are the dominant side of the business (Table 5-2). In addition to workshops, a testing ground and stores, there is a training centre and a clinic.

Table 5-2: Features of RIES Engineering Share Company

Area of site	30000 sq metres
Annual turnover	15 m Birr (40% agricultural: 60% industrial)
Buildings value	3 m Birr
Parts stock	7-8 m Birr
Employees	210 (35% agricultural: 65% industrial)

(i) Imports

RIES Engineering competes for contracts to import equipment on behalf of several government organisations (MOA, state farms (through AETSC), Sugar Corporation and coffee plantations), as well as for individuals and producer cooperatives. Annual purchases have varied substantially during the last 15 years (from 124 tractors in one year to 8 in another) but the overall trend is falling (Table 5-3). Agricultural equipment is mainly imported from UK and USA.

Table 5-3: Imports of agricultural machinery and equipment by RIES Engineering Share Company, 1974-1989

Equipment	Number (approx)
Tractor (1)	880
Plough	800
Combine	8
Baler	120
Harrows etc (2)	400
Specialist (3) equipment	290

1. Mainly 80hp tractors until NATFA commenced operations
2. Purchased at the rate of one harrow: two tractors
3. Purchased at the rate of one item: three tractors (includes ridders, planters, sprayers etc)

Tractors and implements are imported in a knock-down state and are assembled at RIES. Stocks are imported separately from equipment. The dealer margin charged is narrow (2.5-7.5%) because the tendering environment is very competitive. A 12 months warantee is provided (which may be increased to 24 months for some items). Equipment is delivered free of charge to farms and practical training is available for users, either at the training centre or on-farm.

(ii) Repair and maintenance services

Facilities are available at the workshop to undertake routine servicing through to rebuilding engines. Producer cooperatives make the greatest use of the after-sales service.

(iii) Outlook

The major constraint which faces RIES Engineering is the ability of potential purchasers to secure foreign exchange. With the exception of stock items, all imports are secured against orders. Thus the level of import activity is largely beyond the company's control but there is the capability to handle a larger volume of business.

RIES Engineering is exploring the possibility of a tractor rehabilitation project. Tendamho tractors were widely used until 10 years ago and it has been estimated that 100 tractors could be rehabilitated. A pilot project rehabilitated one tractor but it proved expensive because all the parts were imported. The idea is still under discussion with the Ministry of State Farms Development (they have a large stock of Tendamho tractors) and may prove viable.

5.2.2 Agricultural Equipment and Technical Services Corporation (AETSC)

AETSC of the Ministry of State Farms Development has three main areas of activity:

- to import agricultural machinery, implements and spare parts;
- to provide comprehensive repair facilities; and
- to hire out construction equipment for land development (described in section 3.5.2).

Key features are given in Table 5.4.

Table 5.4: Resources of AETSC

Area of site	11000 sq metres
Central stores	
area	2244 sq metres
agricultural stores (1)	47.7 m Birr (end of 1989)
spare parts for agric +	3-3.5 m Birr
construction equipment	
Central workshop	
area	3024 sq metres
capital assets	32.2 m Birr (end of 1989)
Total employees	1050
central workshop	150
mobile workshops	40 (approx)

1. Includes agro-chemicals

(i) Imports

AETSC imports agricultural machinery and implements at the request of the Ministry of State Farms Development (which accounts for more than 80% total), Ministry of Coffee and Tea Development, and MOA (until AMSC took over this function). The quantity and value of imports has declined dramatically during the last five years, largely due to the difficulty of securing foreign exchange (Table 5.5).

Table 5.5 : AEFISC purchases of agricultural machinery, implements and spare parts
(value C + F, million Birr)

	1985		1986		1987		1988		1989	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Agricultural machinery										
Tractor	272	7.3	600	15.4	50	3.4	-	-	-	-
Combine harvester	56	3.1	69	2.8	52	2.6	-	-	-	-
Implements										
Plough	69	0.5	1031	5.7	-	-	80	0.2	10	0.06
Harrow	90	0.6	756	3.6	-	-	91	0.9	-	-
Cultivator	-	-	-	-	59	0.3	9	0.06	-	-
Ridger	10	0.02	-	-	29	0.07	-	-	-	-
Planter	50	0.1	-	-	136	1.1	-	-	-	-
Seed drill	15	0.1	-	-	-	-	-	-	10	0.2
Sprayer	285	0.08	198	0.05	862	0.4	390	0.2	240	0.03
Pump	-	-	-	-	-	-	-	-	10	0.01
Trailer	343	2.5	400	2.7	-	-	-	-	-	-
Sub total	-	14.3	-	30.2	-	7.9	-	1.4	-	0.3
Spare parts for:										
Tractor	-	10.7	-	7.8	-	6.7	-	3.5	-	2.5
Combine harvester	-	5.0	-	5.3	-	6.7	-	0.5	-	1.3
Implements	-	4.8	-	1.7	-	1.6	-	1.8	-	2.3
Sub total	-	20.5	-	14.8	-	15.0	-	5.8	-	6.1

Purchases are often influenced by bilateral trade agreements. Thus many of the tractors and combines are of East German and Yugoslavian origin. Implements are most frequently bought from Italy, UK and Brazil. All items are imported complete and a dealer margin of 10-20% is charged. Warrantees are offered on all imports for a period of 12 months or 1000 hours, whichever is the shortest.

Stocks are imported with new purchases to the value of 10-15% cif. Spare parts for GDR and Yugoslavian tractor fleet are held by AETSC; others are bought directly from the in-country distributors. The purchases of spare parts are also restricted by foreign exchange shortages; consequently the inventory in the central store has decreased (Table 5.5).

(ii) Repair services

AETSC offers two repair services. At the central workshop (donated by GDR) facilities exist for component reconditioning, engine overhaul and repairs. This work is divided between agricultural equipment (70% of the total) and construction equipment and small vehicles (30%). The turnover has increased steadily to almost 3 m Birr in 1989.

In addition, more than ten mobile workshops provide repair services to state farms, plantations and producer cooperatives which have purchased equipment through AETSC.

Both services are fully utilised. Their full costs are met by user charges. All capital equipment has been imported and only a minority of spare parts are manufactured locally. The employees are mainly technical school graduates and a few mechanical engineers.

(iii) Outlook

AETSC activities are hampered by firstly, a shortage of foreign exchange in state farms to purchase new and replacement equipment; and secondly, difficulties in finding steel suitable for repairs locally.

Several proposals have been suggested which may improve the functioning of this organisation; some are already underway:

- six regional equipment maintenance workshops are planned in order to decentralise services from the central workshop. One is under construction at Wallega but it felt that the current rate of mechanisation on farms does not justify a widespread regional network at present;
- it has been suggested that AETSC and AMSC, which offer similar services to different farming groups, could merge into one organisation to prevent unnecessary duplication of resources;

- AETSC is participating with the Ethiopian Management Institute in the training initiatives to improve the maintenance and management of agricultural equipment on state farms; and

- a committee has been established to examine the opportunities to increase the capabilities to produce spare parts in Ethiopia.

5.3 Imports of Raw Materials

The country imports a variety of raw materials for use in the manufacturing and construction industries (Table 5.6). The largest expenditure is on iron and steel (plates, sheets, bars, rods etc). Major suppliers are FRG, Japan and Italy.

5.4 Outlook for the Import Sector

At least in the short term, there will be continued foreign exchange shortages. Export earnings are being squeezed with the slump in coffee prices yet demand for imports remains strong.

Table 5.6 : Imports of raw materials, 1988 FY

	Weight (tonnes)	Value (US\$m)	Main supplier
Iron and steel scrap	256	0.3	Kenya
Ores and C of non-ferrous based metals FEM	21.9	0.07	UK & Italy
Non-ferrous metal scrap and waste	1.5	0.02	UK & Italy
Stone, sand and gravel	7.4	0.02	FRG
Pig iron, sponge iron, iron and steel powders, shot and ferro-alloys	121.4	0.2	FRG
Ingots and other primary forms of iron and steel	1,149.6	1.4	UK
Iron and steel bars, rods, angles, shapes and sections	20,900	20.7	FRG
Universal plates and sheets of iron and steel	22,900	36.4	Japan
Hoop and strip of iron and steel	3,400	3.0	FRG
Iron and steel wire (excluding wire rod)	1,400	1.9	Korea
Tubes, pipes and fittings of iron and steel	6,600	16.0	Italy
Iron and steel castings and forgings	51	0.04	USSR

Source: Ministry of Foreign Trade (unpublished)

6 INFRASTRUCTURE

The infrastructure which supports the agricultural machinery industry includes the distribution system and repair and maintenance services.

6.1 Distribution Network

An overview of the system through which agricultural equipment is distributed from manufacturers and importers to end users is given in Table 6.1. In some instances, the same organisation performs the function of sourcing and distributing equipment. In others, use is made of two specialist distribution corporations which are described below. Merchants are the major source of local implement sales.

Table 6.1: Distribution system for agricultural tools and equipment

Source	Distribution channel				
	merchant	SC	EDDC	AISCO	direct sale *
Local manufacture					
artisans	x	x			x
zonal centres + FTSS		x			x
national enterprises	x	x	x	x	x
Importers		x	x	x	x

* direct sale to end user in farming system

6.1.1 Ethiopian Domestic Distribution Corporation (EDDC)

EDDC, under the Ministry of Domestic Trade, is responsible for the wholesale distribution of industrial goods throughout the country. The Corporation operates through a network of eight regional offices and 96 branches, with a total staff of 3300. The annual turnover is 1.5 bn Birr.

The goods traded include farm implements, construction and building materials, general merchandise, foodstuffs, textiles, paper and stationery, and selected items for vehicles. Annual requirements are aggregated from branch through regional to head office, and then EDDC negotiates with a producer for supplies.

The major sources of supply are: from local factories under the Ministry of Industry which manufacture goods; products from the Ministry of Coffee and Tea Development; and items imported through the Ethiopian Import Export Corporation. In the long run EDDC intends to also distribute products from small-scale industries and handicraft cooperatives when they are standardised and supplied in adequate quantities for wholesale distribution.

EDDC has a mark up of 4.5% on all costs (except transport). Twenty per cent of EDDC's transport requirements are met by its own vehicles; National Transport Corporation trucks are used for the balance. There is some coordination with AMC to utilise transport on return journeys; there are no links with AISCO.

EDDC has recently started distributing a range of hand tools; these are all purchased from Kotebe Metal Tools Factory (Table 6-2). In 1990, the organisation expects to sell approximately 1.5 m Birr of hand tools. EDDC does not expect to become involved with distributing heavy equipment.

Table 6-2: EDDC sales estimates of Kotebe hand tools, 1990

Hand tool	Value (Birr)
Machete	48000
Hoe	31000
Sickle	325000
Pickaxe	170000
Spade	299000
Shovel	227000
Axe	257000
3-pronged hoe	172000
Plough hook	16000

Goods are supplied to four main groups: government organisations (including state farms, plantations and settlements); marketing cooperatives (SCs for onward sale to PAs and PCs, and Urban Dwellers Associations); industrial producer cooperatives (important for their supply of raw materials); and private retail merchants. In 1988 it was reported that EDDC's annual sales were allocated in the following proportions, respectively: 26%, 26%, 17% and 31% (Ministry of Domestic Trade, 1988). EDDC does not offer credit on sales; loans for SCs may be secured through AID Bank.

6-1-2 Agricultural Inputs Supply Corporation (AISCO)

AISCO, under MOA, is responsible exclusively for the procurement, marketing and distribution of agricultural inputs: fertiliser (the main product), improved seeds, pesticides, knapsack sprayers (selling between 3000 - 5000 pa), and veterinary medicines. The Corporation has occasionally distributed hand tools as part of aid projects.

Sales are made to SCs, for onward sale to PAs and PCs, and directly to end users, such as state farms, coffee and tea plantations, settlement sites and NGOs. The organisation has a network of 700 outlets, staffed by MOA employees who also act as extension agents, providing advice on the correct use of inputs and liaising with banks about loans for SCs.

AISCO would like to relieve sales agents of extension duties so they can concentrate on the distribution of inputs and sales. Over time they will be under pressure to handle a growing product range and ensure their timely delivery (which is particularly important for inputs with seasonal use). The timeliness aspect is exacerbated by a shortage of adequate vehicles: the Corporation has 14 trucks and also uses the National Transport Corporation. AISCO also needs foreign exchange for purchasing inputs to be available on time.

6-2 Repair and Maintenance

Repair and maintenance services are available at a variety of levels, from local artisans to the comprehensive facilities of AETSC and importers (Table 6-3). In addition to their use by the farming system, others also use them (eg service cooperatives, MOA and AMSC). They are described in detail in chapters 3, 4 and 5.

Table 6-3: Repair and maintenance system for agricultural tools and equipment

Facility	PA	PC	state farm	plantation	settlement
Producers					
artisan	x	x	x	x	x
zonal centres + FTSS	x	x			
national enterprises *	x	x	x		
Gov organisations					
Ministry of State Farms Development			x		
AETSC		x	x	x	x
RRC					x
Importers		x	x	x	

* Kaliti Grain Mill Manufacturing Workshop

7 INSTITUTIONS

A number of institutions provide services to facilitate the development of the agricultural and industrial sectors.

7.1 Institutional Support for the Agricultural Sector

7.1.1 Agricultural credit

Through a network of 30 branches, Agricultural and Industrial (AID) Bank extends credit to the rural sector. Short term loans (repayable within one crop year) are available for inputs and working capital. Medium term loans are available for hand tools and animal-drawn equipment (usually repaid in two to three years), and tractors and implements, threshers, mills, shellers, animal carts, oxen and livestock for fattening (to be repaid in five years). Long term loans, for five to ten years, may be used for irrigation and dairy equipment, coffee hulleries and combine harvesters.

Loans are usually made in-kind with AID Bank making the purchases on behalf of the borrowers. If the Bank has a line of credit from an international organisation (eg IFAD or EEC), it can offer the facility of purchasing imports (Table 7.1). Usually the use of this credit is specified in the original loan. Equipment is purchased using open market bids (sometimes the country from which the equipment must be purchased is also specified).

Table 7.1: Imports of agricultural equipment by AID Bank, 1985-1990

Equipment	Total
Hoe	6000
Machete	74786
Sickle	50000
Oxen	100000
Carts (1)	450
Tractor and implements (2)	181
Combine harvester	15
Thresher	113
Sheller	182
Pump	200
Grain mill	800
Oil mill	22
Animal feed mill (1)	1

1. To test new product
2. Implements: plough, harrow and trailer

This credit is available to registered farmers' cooperatives (PCs and SCs) and state farms. Short term loans are also available to unregistered cooperatives. The interest rate is 5%. SCs can on-lend short and medium term credit to

individual members, charging an additional 1.5% above the base rate.

No collateral is required from cooperatives but implements can not be sold until the loan has been repaid. Certain items must be insured (eg heavy machinery at the rate of 0.57% of original value pa for the length of the loan, and oxen at 2.24% of purchase price pa for four years).

SCs are the main clients, with approximately 75% of all SCs having term loans (only roughly 10% of PCs hold loans). The repayment rate is usually good for cooperatives (eg on average 70% for farm machinery loans). State farms have greater problems in meeting debt repayments. They face higher overheads and operate under non-commercial conditions.

Overall, the Bank does not perceive credit to be a constraint on mechanisation at the farm level. It recognises that access to foreign exchange could be a constraint but credit lines have been available recently.

7-1.2 Research

Two organisations based in Ethiopia are concerned with research about agricultural tools and machinery. The first is a Governmental body specifically concerned with in-country issues; the second is an international agency based on the outskirts of Addis Ababa.

(i) The Agricultural Implements Research and Improvement Centre (AIRIC) was established at the Institute of Agricultural Research, Nazareth in 1984 to draw together research efforts about agricultural implements. A workshop, built by the Government and equipped by UNDP, has facilities for milling, welding, forging and heat treatment. There are seven employees.

In the first phase of the Centre's work, attention focussed on the needs of small farmers, investigating hand tools and animal-drawn equipment (Table 7.2). Priorities for research were identified in a survey which examined the use of equipment at the farm level and noted shortcomings in equipment design and opportunities for new applications. The Centre undertakes equipment testing and modification of imports.

Table 7-2: Equipment studied in Phase 1 of AIRIC's work

Equipment	Nature of research
Plough	multi-purpose plough for heavy soils mouldboard plough
Harrow	to meet the needs of different soil types, capabilities of oxen, skills of operators
Seeder	modified
Weeder	hand-operated inter-row weeder
Harvester	
Thresher	small engine driven, multi-crop
Animal cart	inclusion of bearings on axle

In the second phase (awaiting signature in February 1990) AIRIC hopes to broaden the area of study to include mechanical-powered equipment, of particular interest to state farms, and certification of equipment if it is suitable to Ethiopian conditions. A sub-committee will be established to oversee the adoption of research equipment by farmers.

In the course of its work, the Centre has established links with other organisations. Prototypes from Bulgaria to be manufactured at the Improved Agricultural Implements Factory (under NMWC) have been tested by AIRIC. Contacts have been developed with the International Livestock Centre for Africa (see below) with regard to animal traction work. In phase two, AIRIC will test equipment developed by RTP Department prior to evaluation by farmers. Despite these contacts in the country, the Centre is isolated from similar work elsewhere in the African region.

The main challenge facing the Centre is ensuring that its recommendations are compatible with the socio-economic conditions in the farming system (in particular, income levels and receptiveness to new technology); the trade-off is often between cost and quality. Access to raw materials for the workshop is becoming a problem.

(ii) The International Livestock Centre for Africa (ILCA) focuses on animals and animal-drawn equipment. Its general philosophy is to research technology which matches local conditions (ie it is easy to use and simple to maintain).

Several studies have been undertaken with regard to Ethiopia:

- potential exists to expand the area of cultivation and increase yields from the vertisols in the Highlands through the introduction of appropriate tillage equipment. An international team, including representatives from IAR, MOA and University of Alemaya, have designed a broadbed maker. The traditional ploughing system has been adapted to an ox pair using two traditional ploughs joined together. It has been designed around existing technology in order to facilitate adoption. It has already been tested with farmers; other accessories such as a blade harrow and planter are still at the test stage. ILCA sees the broadbed maker as only one component in a complete package for improved vertisol

management. If the early planting of crops is to be successful, the extension service and the distribution system will have to ensure farmers have access to improved varieties and fertiliser;

- since many farmers own only one ox, ILCA has attempted to design a plough to be pulled by a single ox. However, this system did not work satisfactorily on heavy soils. The research needs to be continued in light soil areas; and

- in rainfed agriculture, draught animals are idle for over half the year. By developing an animal-drawn scoop, oxen can be used to construct ponds for villages.

The main bottleneck facing ILCA is the fact that research is not strongly linked to extension.

7.1.3 Agricultural extension

The peasant and producer cooperative sectors receive extension services through one of two organisations, depending on their location. Those farming in predominantly coffee-growing regions (totalling 252000 ha) are served by the Peasant Coffee Development and Project Implementation Department of the Ministry of Coffee and Tea Development. The extension service of MOA concentrates upon predominantly field crop areas. MOA has six small training centres and one multi-purpose training centre.

Their challenge is how to effectively meet the needs of the large agricultural population with limited staff and resources. Currently, they tend to focus on meeting immediate needs rather than having the opportunity to look to future development.

7.1.4 Agricultural education

Specialist education in agriculture, including agricultural mechanisation, is available at the Agricultural University of Alemaya (at degree level), and at one polytechnic and three Junior Agricultural Colleges (at diploma level). Agriculture is also a component in the high school curriculum.

7.2 Institutional Support for the Industrial Sector

7.2.1 Industrial credit

Industrial credit is extended to the small scale industrial sector through AID Bank. To date, only one such loan has been taken out for the manufacture of agricultural equipment. Loans are available for up to 70% of total project costs (although people are advised to contribute as much as possible from their own funds). The repayment period depends on the liquidity of the project (maximum 15 years): loans for small scale projects are normally repaid in seven to ten years. The standard rate of interest is 9%. Concessionary terms are available for cooperatives with 6% interest rate and no requirements for collateral.

The provision of industrial credit, and hence industrial projects, has been constrained by the lack of credit lines from international organisations to facilitate purchases of imports. This is partly because most of the aid to the country has focussed on agriculture to the detriment of industry. The Bank perceives the latter has been starved of foreign exchange even though it has a high foreign exchange requirement (for manufacturing equipment and continuing supplies of raw materials). A credit line is currently under negotiation.

7.2.2 Industrial research and extension

Two bodies provide extension services to the industrial sector: HASIDA and the Rural Technology Promotion Department. The latter also engages in research related to the needs of the rural community. Discussions are in progress about creating an organisational structure to ensure a coordinated approach and to avoid duplication between institutions responsible for rural development (Mesfin, 1990).

(i) Handicrafts and Small-scale Industries Development Agency (HASIDA)

HASIDA, established in 1977 as a semi-autonomous body, is currently preparing to become part of the Ministry of Industry. Its attention has focussed largely on developing producer cooperatives and small-scale industries in urban areas. There are 852 registered cooperatives and 8000 small-scale industries, together contributing 50% to the value of the manufacturing sector. Recent initiatives involving the rural sector and the manufacture of agricultural implements have been described in section 4.2.2 above.

HASIDA has two national workshops (in Addis Ababa and Awassa), with facilities for training workers in modern production methods in the areas of metal working, pilot foundry, wood working, bamboo making, weaving and sewing. Six mobile training workshops provide training at cooperative sites.

(ii) Rural Technology Promotion Department

The Rural Technology Promotion Department is part of the Rural Infrastructure Main Department of MOA. It was formed five years ago with the general remit to popularise agricultural and other technology in rural areas. This is pursued through programmes to develop and promote small scale agricultural equipment, rural small scale industry, and rural energy. The philosophy is to provide technical and managerial assistance whilst utilising the manpower and financial resources of the peasant sector.

The Department's initiatives for facilitating the production of agricultural equipment through Zonal Rural Technology Promotion Centres and FTSS have been described above (section 4.2.2). This section focuses on activities for promoting new technologies. The Department has a staff of 300 which will

increase to 700 when all seven zonal centres are fully operational.

The zonal centres act as the catalyst for introducing improved production methods and new equipment to rural communities; the link is affected through the Development Agents of MOA. The centres also interface with Farmers Technology Testing and Promotion Stations, established to bridge the gap between the environment in which technology is developed and that in which it is used. The stations test equipment (which may be imported or designed by the Department or zonal centres) in farmers' own environment. Farmers are free to criticise and adapt new technology, and help set priorities for development. Once an item is accepted, it may be produced by the zonal centres. 'Popularisation' will take place through the agricultural extension service.

There are 50 testing stations, mainly attached to producer cooperatives. The latter are suitable because they cultivate a reasonable area of land, they have organisation and structure, and they can afford to take some (modest) risks.

When the testing centres first started operating, ploughing was the prime target. Attention now focuses on reducing wastage at harvest and storage (as much as 20% total crop production is lost). Corn shellers have a good adoption rate when popularised. It has been recognised that new equipment must not only be technologically suitable but also affordable for farmers.

7.2.3 Industrial education

Education in mechanical engineering is available at Addis Ababa University and one polytechnic. NMWC recently noted that the shortage of skilled manpower in manufacturing is in design process, production process and tool engineering.

7.2.4 Industrial forum

The Ethiopian Chamber of Commerce and urban Chambers located in major towns draw together representatives from government and public organisations, cooperatives and peasant associations, and private organisations. They provide discussion forums and training, publicise export products to foreign markets, and establish contacts with Chambers of Commerce in other countries.

8 CLASSIFICATION OF ETHIOPIA IN AMI GROUP 3

The UNIDO study (1989), *Development Strategies for African Agricultural Machinery Systems*, identifies six typologies of countries with common characteristics and needs with regard to AMI. Ethiopia is placed in Group 3 with 'mainly artisanal level producers'.

The review of AMI in Ethiopia (Chapters 2 to 7) confirms this classification. Government policy is developing medium scale enterprises under the NMWC, Ministry of Industry, as well as providing support to smaller and rural-based industries. Together they produce improved hand tools and animal-drawn equipment, grain mills, maize shellers and pumps, and assemble tractors. Nevertheless, the majority of hand tools and animal-drawn implements are manufactured by artisans, whilst a substantial quantity of agricultural machinery is imported.

The generalised development strategy outlined in Chapter 4 of that study is also highly relevant to Ethiopian conditions. The complement of indicative programmes and projects for enhancing the performance of the AMI sector in Ethiopia is discussed below in Chapter 9.

9 PROGRAMMES AND PROJECTS FOR AMI DEVELOPMENT

The study has demonstrated that a number of initiatives are being taken to develop the manufacturing capability and industrial infrastructure in Ethiopia. However, the pace of change is constrained by the wider agricultural and industrial policy environments: in particular, low disposable farm incomes; limited access to foreign exchange, raw materials and spare parts; and an absence of market stimulus.

It is advocated that a systems approach is taken to facilitate the development of the Agricultural Machinery Industry. It is only by addressing the broader policy environment that the specific AMI programmes and projects identified below will be really effective.

Priority has been placed on selecting programmes which will enable fuller use to be made of existing capabilities and potentials in the industrial sector, whilst ensuring the range of agricultural tools and equipment produced meets the needs of the agricultural sector. Due to the many initiatives already underway, the indicative programmes outlined below include a number of technical assistance projects to more closely identify specific needs.

9.1 Constraints in the Agricultural Policy Environment

For an AMI system to function there needs to be effective demand for its products at the farm level.

It has been noted that peasant farmers are likely to remain the mainstay of the agricultural sector for the foreseeable future (section 3.6.1). Their farming is characterised by low cash incomes, small and fragmented holdings, limited resources (including access to oxen) and low levels of awareness of technological developments. PCs will continue to operate where they offer tangible benefits to members in terms of economies of scale; this will have implications for the introduction of intermediate scale technology. A specialist role is envisaged for state farms and plantations. They will remain fully-mechanised, concentrating on a range of products primarily for industrial use or export. Consequently, the principal mechanisation requirements for the short and medium term will be hand tools, animal-drawn implements, and stationary engines for post harvest activities (section 3.6.2). These should form the priority areas for the development of AMI. The role for tractor-based systems is limited to state farms, plantations and AMSC.

At present, performance is inhibited by a number of factors which results in limited market demand for agricultural tools and equipment.

(i) In the Ten Year Perspective Plan policies have been focussed on producer cooperatives and state farms. This has resulted in a concentration of resources on these two sectors. Nevertheless actual performance has fallen short of

expectations (section 3.3). Development resources should be focussed on improving the productivity of the peasant sector, including extension and access to improved inputs.

On-going and pipeline projects: Peasant Agriculture Development and Extension Project (PADEP) schemes in a number of different regions (with funding from EEC, ADB, ADF, IFAD and IDA).

(ii) AMC's marketing system of quotas and fixed prices. The requirement to sell specified amounts to AMC at prices often substantially below free market prices has contributed to low levels of cash income in the farming system (section 3.4.1(ii)). This has probably been a major constraint on developments at the farm level. These requirements need to be relaxed and prices raised in order to stimulate production and increase farm incomes.

On-going projects: in response to pressure from the World Bank, AMC requirements have been amended slightly since December 1987. This process should continue.

(iii) fragmentation and small size of holdings in the peasant sector. This is a consequence of an increasing population and the reallocation of land by PAs to new members and PCs.

Appropriate policy responses include promoting land consolidation, expanding the area under cultivation, and developing irrigable agriculture.

(iv) policy initiatives to stimulate private investment in industry should be extended to agriculture.

9.2 Constraints in the Industrial Policy Environment

Manufacturing of agricultural equipment takes place at three levels (section 4.2):

- local artisans, using traditional methods of production, are the main producers of hand tools and animal-drawn equipment;
- rural and small scale producers are being developed by initiatives through the Rural Technology Promotion Department and HASIDA to manufacture improved and new equipment, using modern, appropriate, technology; and
- national enterprises, coordinated by NMWC, represent relatively capital-intensive production, dependent on imported machinery and raw materials. They produce improved hand tools, pumps and post harvest equipment, and assemble tractors.

In addition to constraints specific to each production group, operations in the industrial sector are hindered by some general features of the policy environment. If industrial activity is to be stimulated and productivity increased, these points need to be addressed.

(i) To stimulate the industrial sector, in 1989 investment ceilings were raised and imports of certain items of production equipment were exempt from import duties (section

4.2.2). Similar liberalising policies could be adopted towards labour law and profit tax.

(ii) Industry should have priority allocations of the limited foreign exchange: for manufacturing raw materials, spare parts for existing equipment and production machinery, and investment in new machinery for manufacture.

(iii) Most of the industry and manufacturing skills are concentrated in and around principal urban centres. Non-agricultural activities need to be stimulated in rural areas, with support for rural infrastructure, the provision industrial incentives and an effective system for distributing industrial raw materials.

9.3 Programmes and Projects for AMI development

Specific programmes for developing AMI in Ethiopia are as follows.

9.3.1 Programme for Agricultural Mechanisation Strategy Formulation

A number of initiatives are already underway with regard to developing the agricultural machinery industry, through NMWC, MOI, HASIDA and Rural Technology Promotion Department (section 4.2.2). Similarly, a range of organisations are involved with developing the farming system, with implications for agricultural mechanisation: MOA, Ministry of State Farms Development and Ministry of Coffee and Tea Development (section 3.4). They are supported by research bodies (AIRIC and ILCA) and other institutions (AMSC, AETSC and AID Bank).

For effective AMI development, coordination is essential between these key institutions, the manufacturing sector and agriculture.

(i) Project: Training in Agricultural Mechanisation Strategy Formulation

It will be necessary to train a cadre of staff who will be responsible for strategy formulation. The training course will:

- be held in-country for 2 weeks;
- introduce course participants to the concepts, methodology, techniques and processes required for strategy formulation;
- involve case studies and field work.

Inputs: agricultural economist and agricultural engineer for 1 week preparation and 2 weeks training

Cost: Fees + daily allowance: 6 weeks @ US\$ 400/day	16800
Travel	6000
Training materials + consumables	15800
Total	US\$ 38600

Institutions: attach to MOA and MOI
- liaise with Agricultural University of Alemaya, Ethiopian Management Institute

(ii) Project: Establishing a National Agricultural Mechanisation Centre and Coordination Committee

The purpose of the centre will be to implement and support the agricultural mechanisation strategy. Its work will be overseen by a coordinating committee.

A feasibility study will:

- confirm the need for a National Agricultural Mechanisation Centre;
- identify a suitable location (a possibility is co-location with IAR);
- determine the range of activities the centre will undertake (for example maintaining an information base on agricultural mechanisation needs, available technology and local manufacturing; prepare guidelines of equipment design and fabrication for local manufacture; tractor certification; provide a forum for greater integration between research, production, extension and agriculture);
- identify resources and staffing requirements;
- identify an appropriate structure for the organisation and members of the coordinating committee;
- investigate the opportunities and requirements for establishing an East African regional network for agricultural mechanisation.

Inputs: agricultural economist for 6 weeks

Cost: Fees and daily allowance: 6 weeks @ US\$ 400/day	16800
Travel	4000
Total US\$	20800

Institutions: MOA, MOI

- liaise with AIRIC, NMWC, HASIDA, Rural Technology Promotion Department, AID Bank, AMSC, AETSC, Ministries of Foreign and Domestic Trade

9.3-2 Programme for increasing the quality and range of hand tools

Hand tools are the primary agricultural implement for many farming operations, particularly in the peasant sector (section 3.4.1, Table 3.3). Yet they have been characterised by poor design and quality (section 3.4.1(ii)).

(i) On-going Project: Research on hand tools: Agricultural Implements Research and Improvement Centre, Institute of Agricultural Research (with FAO)

The research work on hand tools at AIRIC (section 7.1.2(i)) should continue. New equipment which could be evaluated include hand tools for soil conservation, battery-operated saws for stumping coffee trees, improved digging equipment for planting coffee trees and small manually-operated coffee pulpers.

9.3.3 Programme for extending the range of oxen activities

Animals represent a major source of power in the peasant and producer cooperative and settlement sectors (sections 3.4.1(i), 3.4.2(i) and 3.4.5(i)). Their contribution is limited by the fact they only perform a limited range of activities (Table 3.3) and oxen are in short supply and face fodder shortages at times of the year when they are required to do most work (3.4.1(ii)).

(i) Project: Examine the feasibility for extending the use of oxen-power

A feasibility study will:

- identify the opportunities for increasing the range of activities performed by oxen;
- identify sources of oxen in Ethiopia and the need for a breeding programme to increase supplies;
- review methods to improve the availability of fodder supplies;
- examine the need for establishing a draught animal-power training unit (a possible location could be IAR, Nazareth);
- examine the need for subsidiary regional training units;
- identify staff resources and facilities required at training centres;
- identify staff training programmes;
- identify farmer training programmes.

Inputs: draught-animal specialist for 6 weeks

Cost: Fees and daily allowance: 6 weeks @ US\$ 400/day	16800
Travel	4000
Total US\$	20800

Institutions: IAR, MOA, ILCA, Improved Farm Implements Factory, Rural Technology Promotion Department

(ii) On-going Projects: Research on animal-drawn equipment: AIRIC (with FAO) and ILCA

The research and field-trials on animal-drawn equipment at AIRIC (section 7.2.1(i)) and ILCA (section 7.2.1(ii)) should continue. The specialist recruited for Project (i) above should maintain close contact with these organisations.

9.3.4 Programme for improving the use of tractors

Tractors are widely used on state farms and plantations (sections 3.4.3(i) and 3.4.4). PAs, PCs and settlement sites have some recourse to tractors through the hire services of AMSC (3.5.1). Operations on large scale settlements have shifted from tractor-based to largely oxen-based systems (3.4.5(i)).

Opportunities exist to make more effective use of tractor technology on state farms. Some machines have been of poor quality and had inappropriate specifications (ie non-

tropicalised parts or insufficient power for the altitude) (section 3.4.3(ii)). This resulted in poor performance, limited horse power in relation to the area to be cultivated, untimely operations and high repair and maintenance costs.

(i) Project: Certification of Agricultural Machines

In the second phase of AIRIC (awaiting signature in February 1990), the Centre will test and certify mechanical-powered equipment if it is suitable for Ethiopia. Tractors should also be certified. This project will form part of the activities of the National Agricultural Mechanisation Strategy Centre.

(ii) Project: Tractor Rehabilitation

RIES Engineering Share Company has undertaken a pilot rehabilitation of a Tendaho tractor with a view to establishing whether a full rehabilitation project would be viable (section 5.2.1(iii)). These tractors were widely used ten years ago, particularly by state farms, and a study estimated that 100 tractors could be rehabilitated. The scheme is still under discussion between RIES Engineering and the Ministry of State Farms Development.

A detailed feasibility study will:

- determine the number of Tendaho tractors and their condition;
- identify the spare parts required for tractor rehabilitation and their sourcing (from existing stock, imports or local manufacture);
- assess the skills and facilities required to undertake the rehabilitation and confirm they are available at RIES Engineering;
- conduct an economic appraisal, taking account of foreign exchange requirements for spare parts and savings in new tractor purchases, economic life of rehabilitated tractors, and gains in terms of improved productivity or area cultivated by state farms;
- identify the resources and training needed to mount a longer-term programme of tractor rehabilitation (identify other makes of tractors which could economically be rehabilitated and a suitable local agent for undertaking this work).

Inputs:

- an agricultural engineer or mechanical engineer for 6 weeks
- an agricultural economist for 4 weeks

Cost: Fees + daily allowance: 10 weeks @ US\$ 400/day	40000
Travel	7000
Total	US\$ 47000

Institutions:

- attach to RIES Engineering Share Company and Ministry of State Farms Development;
- liaise with AETSC (as the main organisation servicing equipment used by state farms (section 5.2.2)).

9-3.5 Programme for developing the capabilities of the agricultural manufacturing industry

(i) Project: Feasibility study for increasing the supply of scrap metal for use by the manufacturing industry

The imports of raw materials are dominated by iron and steel (Table 5.6). A major constraint faced by many levels of the manufacturing industry is the supply of steel. For example, Kotebe Metal Tools Factory (section 4.2.1(i)) and the Rural Technology Promotion Department (4.2.3) cited difficulties in securing foreign exchange for raw materials, whilst others noted that locally-available scrap metal is of varying quality and availability.

The feasibility study will:

- assess the market demand for metal of different qualities at different prices;
- identify sources and quantities of scrap metal available in the country and imports (include transport to the country);
- determine whether pre-treatment of scrap metal is necessary and, if so, what facilities are needed (and do they exist already);
- conduct an economic analysis of the alternatives;
- identify an effective distribution system which would reach all parts of the manufacturing industry.

Inputs:

- one metallurgist for 6 weeks

Cost: Fees + daily allowance: 6 weeks @ US\$ 400/day	16800
Travel	3000
	Total US\$ 19800

Institutions:

- attach to NMWC
- liaise with Ministries of Foreign and Domestic Trade, EDDC

(ii) Project: Feasibility study for establishing market research departments at national enterprises

The four national enterprises under the NMWC currently operate at between 50-65% of their production capacity (section 4.2.1). In addition to shortages of foreign exchange and raw materials, this reflects inappropriate product designs (eg sickle (4.2.1(i)) and hand pump (4.2.1(ii))), and a lack of awareness of new technologies (pumps and maize shellers (4.2.1(iii))). One way in which the latter constraint could be overcome would be through 'sensitising' these enterprises to market needs.

The purpose of this project is appraise what skills and resources would be required to establish a market research department in each of the four national enterprises.

The feasibility study will:

- confirm there is a role for a market research department attached to a manufacturing establishment (eg through market research to identify new products which could be manufactured within a factory's existing resources, monitoring the uptake of existing products and feeding back any modifications to the design department, and establish links with MOA's extension service and AIRIC);
- identify the personnel skills and facilities necessary for each of these units;
- draw up the curriculum for a training programme;
- conduct training-the-trainer programmes.

Inputs: market research specialist for:

- 4 weeks to conduct feasibility study and design training programme;
- 2 weeks to conduct training course (2 trainers);
- 1 week six months later to monitor progress.

Cost: Fees and daily allowance 9 weeks @ US\$ 400/day	25200
Travel	9000
Training materials + consumables	15800
Total US\$	50000

Institutions: attach to NMWC and work with four enterprises and Ethiopian Management Institute;

- liaise with IAR and MOA.

(iii) Project: A study to establish a foreign exchange credit line for use by small scale production

Restricted access to foreign exchange for purchasing production machinery, spare parts and raw materials is hindering the development of rural and small scale manufacturing sectors (section 7.2.1). For example, HASIDA has a backlog of projects totalling 25 m Birr which can not be implemented due to an inability to import equipment (4.2.2).

A feasibility study will:

- establish the criteria for selecting projects (eg production of agricultural tools and equipment, size of business, location, ability to repay loan, distribution effects, assessment of economic benefits (to producers and the agricultural sector));
- estimate the demand by projects satisfying the criteria;
- estimate the total call on the credit line;
- identify administering procedures for implementing and monitoring the project.

Inputs: an economist (rural/small scale production credit specialist) for 3 weeks

Cost: Fees + daily allowance: 3 weeks @ US\$ 400/day	8400
Travel	3000
Total US\$	11400

Institutions: attach to AID Ban! and work with HASIDA and Rural Technology Promotion Department

(iv) On-going Projects: Institutional support for agencies working with rural and small scale manufacturers: HASIDA (with UNIDO) and Rural Technology Promotion Department (with EEC)

It is essential that the informal manufacturing sector receives continuing assistance in terms of technical support, extension and training through support organisations. Extension links should exist between the industrial sector and the farming community.

9.4 Summary of Programmes and Costs

Programme	Total cost (US\$)
1. Agricultural Mechanisation Strategy Formulation	
(i) Training	38600
(ii) Centre and Coordination Committee	20800
2. Increasing Quality and Range of Hand Tools	
(i) Research on hand tools (on-going)	
3. Extending Range of Oxen Activities	
(i) Extending use of oxen power	20800
(ii) Research on animal-drawn equipment (on-going)	
4. Improving the use of tractors	
(i) Tractor certification (under 1 (ii))	
(ii) Tractor rehabilitation	47000
5. Developing Capabilities of Agricultural Manufacturing Industry	
(i) Increasing supply of scrap metal	19800
(ii) Establishing market research departments at national enterprises	50000
(iii) Establish a foreign exchange credit line by small scale producers	11400
(iv) Institutional support for agencies working with rural and small scale manufacturers (on-going)	

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and Sectoral Surveys Branch, Industrial Policy and
Perspectives Division

APPENDIX 1

List of Ministries, Corporations, Institutions and
other bodies visited during the Mission
29th January to 17th February, 1990

Ministries

Ministry of Industry
Ministry of Agriculture
Ministry of State Farms Development
Ministry of Coffee and Tea Development
Ministry of Foreign Trade
Office of the National Committee for Central Planning
Office of State Commission for Foreign Economic Relations

Corporations

National Metal Works Corporation
Agricultural Equipment and Technical Services Corporation
Agricultural Mechanisation Services Corporation
Ethiopian Domestic Trade Corporation
Agricultural Inputs Supply Corporation

Institutions

Ethiopian Chamber of Commerce
Rural Technology Promotion Department
HASIDA
AID Bank
Institute of Agricultural Research
Relief and Rehabilitation Commission

Industries

Akaki Pump Factory
Kaliti Metal Factory (Grain Mills)
Koteba Metal Tools Factory
Nazareth Tractor Assembly Plant

Others

RIES Engineering Ltd.
Wonji Melkahida Settlement Site, Shoa
RRC Shoa Regional Office

International Organisations

ECA
UNIDO
FAO
ILCA

Itinerary, Visits and Contacts

January 1990

Sun 28 Arrival in Addis Ababa
Visit to PTA Leather Exhibition

Mon 29 (a) Jørgen Brisson, JPO UNIDO, Floor 5
UNDP Office
PO Box 5580, AA
Tel: 51-42-45
Telex: 21596 UNDP ET

(b) Dr. Valery Bobrov, UNECA Industry Division
Industrial Development Officer PO Box 3001, AA
Tel: 51-72-00 X707

Tue 30 (a) Andre Hupin, FAO Programme Officer FAO

(b) Ato Yeheyese Aseffa National Metal Works Corpn.
Deputy-General Manager - for PO Box 2447, AA
development Tel: 51-72-35
Telex: 21515 METCORP ET
Fax: (01)150714 NMWC

(c) Tsegaye Tadesse Ministry of Agriculture
Regional Co-operative Expert

Wed 31 (a) Ato Worku, Head (?) Agricultural Development and Project Implementation
Extension Services Dept,
Ato Taffese, Head of Agronomy Ministry of Coffee and Tea
Ato Tessema, Head of Development,
Agricultural Engineering 9th Floor

(b) Ato Mengesha Workeneh Ethiopian Chamber of Commerce
Secretary General PO Box 517, AA
Tel: 51-40-05

(c) Comrade Getachew T. Medhi Office of National Committee
Head, Agricultural Department for Central Planning
3rd Floor, Room 080

February 1990

Thur 1 (a) Comrade Kebede Tiku and UN Dept
Comrade Bekele Desta Office of State
Commission for Foreign
Economic Relations
4th Floor, Room 417

(b) Ato Mulushewa Metekia Ethiopian Peasants' Central
Head of Public Relations Council
PO Box 100067, AA
Tel: 15-75-65

- (c) Ato Hailu Desta, Sales and Service Manager - Agriculture RIES Engineering Sh. Co.
PO Box 1116, AA
Tel: 65-11-33
Telex: 21082
Cable: RESCO ET
- Fri 2 (a) General Manager and Technical Manager Akaki Pump Factor
- (b) Ato Masresha, General Manager Kaliti Metal Factory (Grain Mills)
PO Box 5751, Kaliti
Tel: 34-01-10
Telex: 21081 Addis Ababa
- (c) Ato Taha, General Manager Kotebe Metal Tools Factory
PO Box 296, AA
Tel: 18-56-82
- NB. Accompanied by Ato Zewdu, Economist NMWC
- Mon 5 (a) Head of Planning Ministry of Agriculture
- (b) Ato Sitotaw Berhanu Head of Socio-Economics MoA
- (c) Comrade Menke W/Kiros Head Rural Technology Promotion Dept, MoA,
Rural Infrastructure Main Dept.
Tel: 15-37-53
Telex: 21390
- (d) Ato Guta, Head of Rural Small Scale Industry Division MoA
- Tues 6 (a) Ato Getachew Asamenew Agricultural Economist International Livestock Centre for Africa
PO Box 5689, AA
Tel: 18-32-15/19
Cable: ILCAF ADDIS ABABA
Telex: 21207 ILCA ADDIS
- (b) Miss Eftiha Ministries of Domestic and Foreign Trade, 7th Floor and Documentation Room, 5th Floor
- (c) Ato Girma Unde, Head Industrial Promotion Dept HASIDA
5th Floor
- Ato Tadessa Brihan, Expert in Project Preparation and Planning Dept.
- Ato Gutelak, UNIDO Liaison Officer

	(d) Prof. John Whittaker	University of Alberta Edmonton, Canada T6G 2G8 Tel: 492-4443
Wed 7	(a) Ato Belete Tilahun	Relief and Rehabilitation Commission Tel: 51-97-29
	(b) Abo Negussie Aberra, Head Planning and Programming Dept	Ministry of Industry PO Box 704, AA Tel: 51-80-25/71
	(c) Ato Solomon, Head of Projects	Ministry of Industry
	(d) Ato Guta	Rural Technology Promotion Dept, MoLA
Thur 8	(a) Ato Haila Sebsibe General Manager and Ato Taye Afrasa, Acting Head, Central Equipment Maintenance Branch	Agricultural Equipment and Technical Services Corpn. PO Box 5575, AA Tel: 16-23-63 Telex: Agroeng Addis 21326 Cable: AGROENG
Fri 9	(a) Ato Girma Unde Visit to ex-Maresha Producers Co-op, Merkato and Pilot Industrial Co-op	HASIDA
	(b) Ato Wolansu Rebu Team Leader Co-operatives Management Team	MoA
Sat 10	(a) Ato Teferi, Early Warning and Planning Services	RRC Tel: 15-24-96
	(b) Library	Ministry of Foreign Trade
Mon 12	(a) Ato Bele Mariam Ayenu Engineering Dept	Ministry of State Farms Development Room 406 Tel: 15-40-68
Tue 13	(a) Comrade Menke	Rural Technology Promotion Dept. MoA
	(b) Ato Tecle Mariam Berhane Head of Operations	Agricultural Mechanisation Service Corpn. PO Box 82306, AA Tel: 15-92-41 Telex: 21582
	(c) Ato Yeshitilia, Head of Agricultural Co-operatives Division	AID Bank 2nd Floor Tel: 15-15-25

- (d) Ato Ahmed Said Ali
Head of Industrial Section
AID Bank
3rd Floor
Tel: 15-27-61
- Wed 14 (a) Ato Alemayehu Bekele
Head of Sales and Purchasing
Dept.
Agricultural Inputs Supply
Corpn.
Tel: 15-14-40
- (b) Comrade Nesebho Yifru
Deputy General Manager
Ethiopian Domestic
Distribution Corpn.
PO Box 1897, AA
Tel: 11-70-53
Telex: 021041
- Thur 15 (a) Ato Demana Merkonon
Manager
and Petros Ghirmisso
Agricultural Section Head
RRC Shoa Regional Office
PO Box 62259, AA
Tel: 15-56-24
- Fri 16 (a) Ato Firen Kelemu, Team
Leader AIRIC
Institute of Agricultural
Research,
Nazareth
02-11-21-86
- (b) Ato Mohammed, RRC Officer
Wonji Melkahida Settlement
Site, Shoa
- (c) General Manager and Technical
Expert
Nazareth Tractor Assembly
Plant
- NB. Accompanied by Ato Petros
Ghirmisso, RRC Shoa Regional
Office
- Sat 17 (a) Ato Taha
General Manager
Kouebe Metal Tools Factory
- Sun 18 Return to UK