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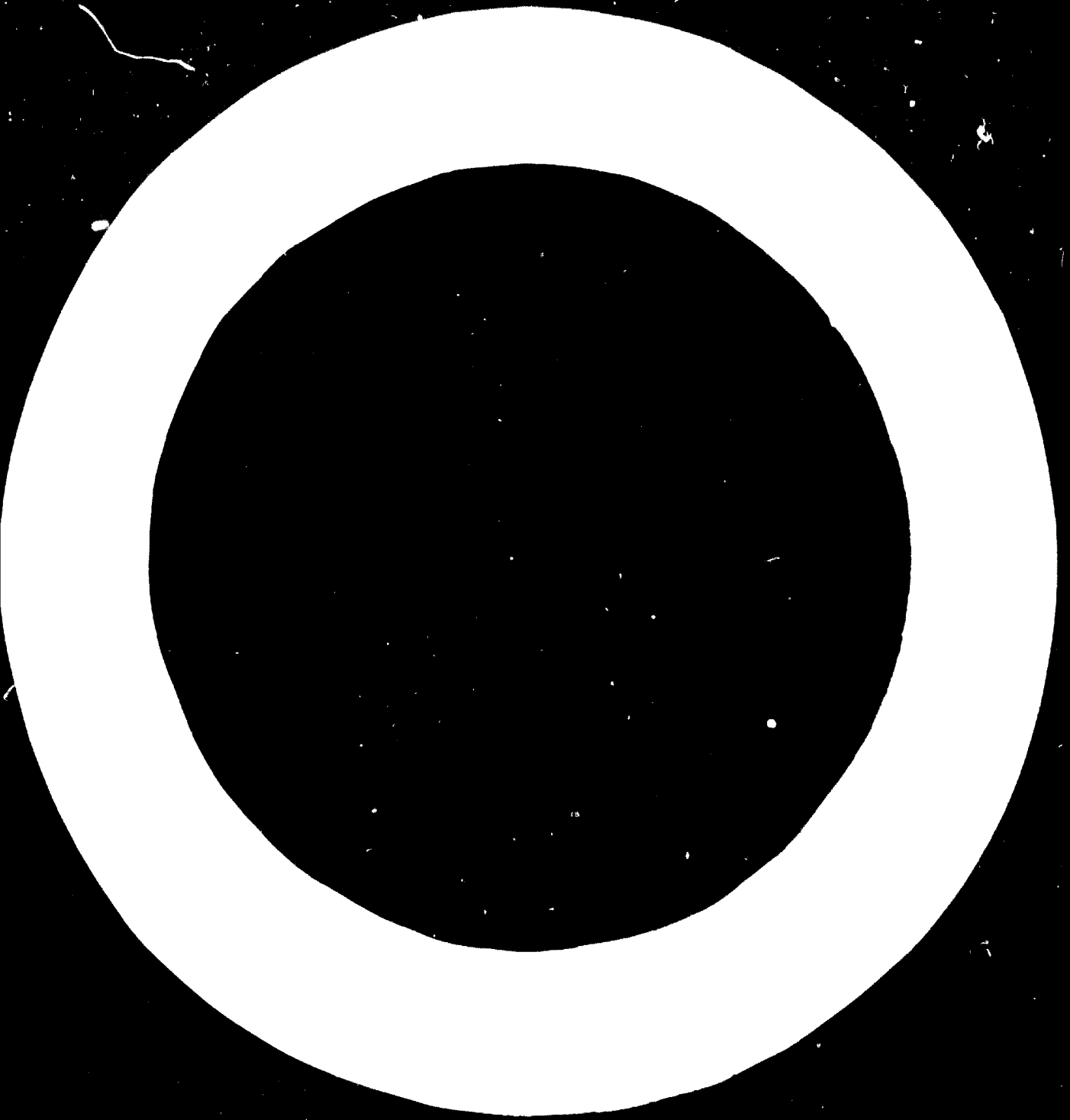
POSSIBLE AREAS OF AGRICULTURAL MACHINERY
AND IMPLEMENTS MANUFACTURE IN AFRICA^{1/}

compiled by the secretariat of UNIDO
from selected reports by
the United Nations Economic Commission for Africa

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I N D E X

Introduction

- SECTION I** **Future scope for agricultural machinery plants in Africa (based on 1980 demand projections)**
- SECTION II** **Recommended agricultural machinery plants (for 1980 demand)**
- SECTION III** **Recommended economic sizes of plants**
- SECTION IV** **Various supplies needed for selected agricultural machinery industries**
- APPENDIX A** **List of selected publications by the United Nations Economic Commission for Africa
Map of Africa**

I N T R O D U C T I O N

This outline is only a summary highlighting the agricultural and machinery aspects of six reports published by Economic Commission for Africa on Engineering Industries in Africa in general and subregions in particular. The general statistical data on agriculture, population and industrial indicators are not included in this outline. Main emphasis is given towards possible areas of agricultural machinery development by 1980, specific industrial plants that are recommended in individual countries and recommended economic sizes of plants.

This outline is exclusively prepared as the basic document towards UNIDO's future activities in Africa highlighting recommended agricultural machinery plants, areas of possible technical assistance and scope of co-operation among the countries of Africa, Regional Commission, UNIDO and other UN agencies.

1. General indicators, imports and production

Statistical data on areas, population, population density, GDP and c/o manufacturing sector, import figures on agricultural machinery other than tractors, tractors (average annual value 1957-1960), pumps, local production of agricultural machinery and tractors, pumps, transport equipment, and also production figures for steel, certain ancillary items are available. No data is available on small engines (1) # for agricultural usage.

The imports are not very significant and indigenous production is very limited as shown below:

PRODUCTION OF AGRICULTURAL MACHINERY

Value in 000 US Dollars

A. Agricultural Machinery

I.	<u>East Africa</u>	a) Tanzania	180	(1963 estimate)
		b) Rhodesia	2550	(1964)
II.	<u>North, West and Central</u>	a) Morocco	1870	(1963)
		b) UAR	6000	pieces (1970 estimated)

B. Tractors

I.	<u>East Africa</u>	Nil		
II.	<u>North, West & Central Africa</u>	a) UAR	1580	(1964)
			2000	pieces (1970 estimated)

* - Refer appendix A for list of publication

- Figures in bracket refer to publication serial number

C. MMPS

I. East Africa	Nil.		
II. North, West and Central Africa	a) Morocco	12	(1963)
	b) UAR	230	(1964)
			10,000 pieces (1970 estimated)

2. Economic sizes of plants (1)

Economic sizes of plants (minimum capacity, fixed capital, output, floor area etc.) based on average European conditions of 1965 has been recommended in table IV.2 (2) for

- a) hand tools and implements
- b) agricultural machinery for preparing and cultivating soil
- c) agricultural machinery for harvesting, threshing and sorting
- d) internal combustion engines
- e) pumps etc.

3. Present status of engineering industries (2,3,4,5)

The details of the present status of engineering industries with respect to agricultural machinery and implements is limited. No data is available on existing plant location, product mix, product specification, capacity, manufacturing reports etc. are available. The country case reports and regional case reports have limited data on the same.

4. Future scope for manufacturing engineering plants (2,3,4,5)

Summary of demand structure of engineering products (1964 and 1980) with respect to agriculture (in one group), both for capital form and for intermediate input in broad terms is available (3).

The following is the outline presented in the reports on manufacturing possibilities of various items: - (all proposals relate to demand projections for 1980).

1) Hand tools for agriculture

(a) West Africa

between 40 and 50 per cent will consist of hand tools used in agriculture and forestry, i.e., spades, forks, hoes, etc., and 50 - 60 per cent of other tools for use in the hand or with machines, i.e. hammers, pliers, pinners, spinners, metal cutting shears, etc. It will be assumed that about 80 per cent is produced in the sub-region and the rest, mainly tools for use with machines are imported.

The minimum economic capacity for such factories is about 600 tons per annum and the consumption would allow of factories with the following capacities:

Nigeria, 3,000 tons of agricultural hand tools per annum and 3,500 tons per annum capacity of other hand tools for local use and partly for export (Togo, Iahomey); Ghana 1,300 tons of agricultural hand tools and 2,000 tons of other tools for local use; Ivory Coast 1,300 tons of agricultural hand tools and 1,700 tons of other tools for own use, Sierra Leone 700 tons of agricultural tools and 900 tons of others for local use; Liberia 800 tons of agricultural tools and 1,200 of others for local use; Mali 800 tons of agricultural tools and 1,000 tons of other hand tools for local use and export (Senegal, Mauritania, Guinea, Gambia); Upper Volta or Niger 600 tons of agricultural tools and 800 tons of other tools for local use and export (Togo, Iahomey).

b) North Africa

The minimum economic capacity for such factories is about 600 tons per annum and consumption would allow of factories with the following capacities, taking into consideration the present production in the sub-region of about 1,540 tons - mainly in the UAR (1,300 tons):

UAR - 2,000 tons of agricultural hand tools per annum and 3,000 tons per annum capacity for other tools for local use and partly for export;

Sudan - 1,000 tons of agricultural hand tools;

Libya - 4,000 tons of other tools than agricultural for local use and partly for export;

Tunisia - 1,300 tons of agricultural hand tools;

Algeria - 3,000 tons of agricultural hand tools and 3,000 tons of other tools for local use and for export;

Morocco - 2,000 tons of agricultural hand tools.

c) East Africa

The estimated consumption of group 695 (tools for use in the hand or machines), in 1980 is about 40,000 tons, of which between 80 and 85 per cent will consist of hand tools used in agriculture and forestry, i.e., spades, forks, hoes, etc. It will be assumed that about half these requirements are imported. Consumption would allow of factories with the following capacity: Kenya, 5,000 tons per annum capacity for own use; Tanzania, 5,000 tons per annum capacity for own use and export; Zambia 5,000 tons per annum Rhodesia, 2,000 to 3,000 tons for own use; Ethiopia and Zambia, 2,000 tons per annum; Madagascar, 1,000 tons per annum. Such plants exist in Kenya, Uganda, Rhodesia and Burundi, and present capacity in these countries is probably adequate.

2. ENGINES

a) West Africa

The first group in the machinery division is the manufacture of power generating machinery (711) for which the demand in 1980 will amount to 60,000 tons. Of this, 60 per cent will consist of internal combustion engines and 20 to 25 per cent of steam generating boilers.

If it is assumed that about half the requirements for internal combustion engines can be met by local production, say up to units of 50 h.p., then there is room for two factories each with an output of about 10,000 tons per annum or 15,000 to 20,000 engines. The main markets for these engines will be Nigeria, Sierra Leone and Ghana, in order of importance, and the factories might be located in Nigeria and Sierra Leone, or alternatively four smaller factories producing from 8,000 to 10,000 units per annum could be located in Nigeria, Ghana, Sierra Leone and Senegal.

b) North Africa

The first group in the non-electrical machinery division is the manufacture of power generating machinery (711) for which the demand in 1980 will amount to 110,000 tons in the sub-region and about 53,000 tons in Maghreb countries.

Of this, 60 per cent will consist of internal combustion engines and 20 to 25 per cent of steam generating boilers.

If it is assumed that about half of requirements for internal combustion engines can be met by local production, say up to units of 50 H.P., then there is room for new capacities of about 30,000 tons per annum or 45,000 to 50,000 engines.

The main markets for these engines will be the UAR with 70 per cent of total consumption in the sub-region, which is also at present the only producer of internal combustion engines (about 2,000 tons per annum), and Algeria, which will consume almost 45 per cent of the demand of the Maghreb countries. Two factories each with an output of about 15,000 tons per annum or 22,000 to 25,000 engines might be located in Algeria (to cover the whole demand of Maghreb) and in the UAR.

c) East Africa

The first group in the machinery division is the manufacture of power generating machinery (711) for which the demand in 1980 will amount to 35,000 to 40,000 tons. Of this, 60 per cent will consist of internal combustion engines and 20 to 25 per cent of steam generating boilers.

If it is assumed that about half the requirements for internal combustion engines can be met by local production, say up to units of 50 H.P., then there is room for one large factory with an output of 10,000 tons per annum or 15,000 to 20,000 engines. The main markets for these engines will be /Zambia and Kenya, in order of importance, and the factory might be located in Zambia or, alternatively, two smaller factories producing from 8,000 to 10,000 units per annum could be located in Kenya and /Zambia.

3. AGRICULTURAL MACHINERY AND IMPLEMENTS

a) West Africa

The consumption of the next group, agricultural machinery, etc., (712) is estimated at about 110,000 tons in 1980. Important categories are agricultural tractors and accessories accounting for between 50 and 60 per cent of consumption, i.e., 55,000 tons per annum, and agricultural machinery, and appliances for preparing and cultivating the soil, for harvesting, etc., accounting for 20 per cent, or about 20,000 tons per annum. The total consumption of tractors is estimated at between 30,000 and 40,000 units and between 27,000 and 32,000 of up to about 50 h.p. should be produced and the remainder imported. In this case a sub-regional market is necessary and Nigeria and Ghana probably offer the cheapest location for new plants.

It would be desirable to have close co-operation and co-ordination between the producers of types and accessories for locally produced tractors. Perhaps the production of smaller units, say, up to 25 h.p. in Ghana with about 12,000 - 15,000 tractors per annum and production of units about 25 h.p. in Nigeria with about 15,000 - 17,000 tractors per annum would give a good result.

Of the market for agricultural machinery, about 6,000 to 8,000 tons per annum (about 6 to 7 per cent of the total consumption of the group 712), will consist of ploughs, both for use with tractors and with animals. The present capacities in Senegal and Niger accounting for about 600 to 700 tons will be sufficient to supply the domestic demand of these countries and the demands of Mauritania, Mali and Upper Volta. Important markets are Nigeria with a demand of about 3,500 to 4,000 tons per annum, and Ghana and Liberia, each with about 1,000 tons. One new plant in Nigeria with a capacity of 3,000 to 4,000 tons for local use, and two factories, each with a capacity of 1,500 to 2,000 tons per annum, in Ghana and Liberia are proposed.

The remaining agricultural machinery, i.e., harvesting, sowing, threshing, etc., equipment should be manufactured in two plants, each with a capacity of from 5,000 to 6,000 tons, located in Nigeria and Liberia.

b) North Africa

The consumption of the next group, agricultural machinery etc., (712) is estimated at about 124,000 tons of which almost 90 per cent (109,000 tons) will be in the Maghreb. However this estimate does not take account of agricultural consequences of the Aswan dam in the UAR.

Important categories are agricultural tractors and accessories accounting for between 50 and 60 per cent of consumption, i.e. 30,000 tons per annum, and agricultural machinery, and appliances for preparing and cultivating the soil, for harvesting, etc., accounting for 20 per cent, or about 25,000 tons per annum. The total consumption of tractors is estimated at between 30,000 and 40,000 units and between 2,000 and 30,000 units of up to about 100 h.p. should be produced and the remainder imported. In this case, a sub-regional market is necessary and Algeria probably offers the cheapest location for new plants. It could be desirable to have close co-operation and co-ordination with the producers in the UAR (present production about 2,000 tons per annum) and Morocco as far as the types and accessories for locally produced tractors are concerned.

Of the market for agricultural machinery, about 7,000 to 9,000 tons per annum (about 6 to 7 per cent of the total consumption of the group 712), will consist of ploughs, etc. for use with tractors and with animals. New capacities additional to existing could be established. In Morocco and Algeria each of about 4,000 tons per annum, Tunisia about 3,000 tons (covering also the demand of Libya), the UAR about 1,000 tons and Sudan about 500 tons.

The remaining agricultural machinery, i.e., harvesting, sewing, threshing, etc., equipment should be manufactured in two plants each with a capacity of 6,000 to 7,000 tons, located in Morocco and Tunisia.

c) East Africa

The consumption of the next group, agricultural machinery, etc., (712), is estimated at about 54,000 tons in 1980. Important categories are tractors and accessories accounting for between 50 and 60 per cent of consumption, i.e., 28,000 tons per annum, and agricultural machinery, i.e., cultivating and harvesting machines accounting for 20 per cent, or about 10,000 tons per annum.

The total consumption of tractors is estimated at between 18,000 and 20,000 units, and between 14,000 and 16,000 up to about 25 H.P. should be produced and the others imported. In this case, a sub-regional market is necessary and Tanzania (Dar-es-Salaam) probably offers the cheapest location.

Of the market for agricultural machinery, about 3,000 to 4,000 tons per annum will consist of ploughs, and six plants each with a capacity of 6 to 700 tons per annum are proposed. Important markets are Zambia, Kenya, Tanzania, Ethiopia and Madagascar.

The remaining agricultural machinery, i.e., harvesting, sowing, threshing etc. equipment, should be manufactured in a sub-regional plant with a capacity of from 7 to 8,000 tons, located in Kenya.

4. MILLS

a) West Africa

The market for machinery and appliances (719) is the largest machinery group with a demand expected to exceed 200,000 tons per annum in 1980 manufactures and will include the following main types of machines:

10 - 15 per cent	Pumps and centrifuges
5 per cent	Valves and similar appliances
20 per cent	Lifting and loading machinery
10 per cent	Weighing machines

It will be possible to construct plants for each of these types and to cover about a half of the total demand. For the manufacture of valves, cocks, etc., (from bronze and other copper alloys) a sub-regional plant is proposed with a capacity of 3,000 to 5,000 tons per annum and located in Mauritania. For light pumps and centrifuges two or three plants with 2,000 to 3,000 tons capacity and for medium pumps two or three of 3,000 - 4,000 tons. Two or three plants of 3,000 to 4,000 tons annual capacity would meet requirements for weighing machines, two of 4,000 to 5,000 tons could provide winches and hoisting equipment and four or six of 1,500 to 2,000 tons could produce belt and lath conveyors. These plants would be located in the principal consuming countries, i.e., Nigeria, Ghana, Ivory Coast, Liberia, Senegal, Sierra Leone.

b) North Africa

The market for machinery and appliances (719) is the largest machinery group with a demand expected to exceed 360,000 tons per annum in 1980 and will include the following main types of machines:

- 15-20 per cent pumps and centrifuges;
- 10-15 per cent valves, taps, cocks, and similar appliances;
- 20 per cent lifting and loading machinery;
- 10 per cent weighing machines.

The present production of these goods is about 15,000 tons of which about 13,000 tons is in the UAR - mainly weighing machines - and covers about 19 per cent of the present total demand in the sub-region.

It will be possible to construct plants for each of the types mentioned above and to cover about a half of the total demand. The rest, consisting of heavy, specialized high pressure pumps and appliances will have to be imported.

For the manufacture of valves, cocks etc. (mainly used in the construction and petroleum industries) two sub-regional plants are proposed, each with a capacity of about 9,000-10,000 tons per annum located in the UAR and Algeria.

There will be room for new capacities of about 30,000-35,000 tons in pumps and centrifuges of which about 15,000-20,000 will be of light size and the rest of medium size.

For the light pumps and centrifuges three plants each with a capacity of about 3,000 tons could be established and located in Morocco, Tunisia and the Sudan; for the medium pumps and centrifuges two new capacities each with about 10,000-12,000 tons per annum, which would include also the rest of the light pumps. could be located in the UAR and Algeria.

c) East Africa

The market for machinery and appliances (719) will also exceed 100,000 tons per annum, and will include the following main types of machines:

- | | |
|-------------|-------------------------------|
| 10 per cent | Air conditioning machinery |
| 35 per cent | Pumps and centrifuges |
| 5 per cent | Valves and similar appliances |
| 20 per cent | Lifting and loading machinery |
| 10 per cent | Weighing machines |

It will be possible to construct plants for each of these types. For the manufacture of valves, etc. (from bronze and other copper alloys), a sub-regional plant is proposed with a capacity of 3,000 to 5,000 tons per annum, and located in Zambia. For light pumps, four or five plants with 2,000 to 3,000 tons capacity and for medium pumps four or five of 3-4,000 tons. Two or three plants of 3,000 to 4,000 tons annual capacity would meet requirements for weighing machines, and three or four of 4,000 to 5,000 tons could provide winches and hoisting equipment. These plants would be located in the principal consuming countries, i.e., Kenya, , Zambia. Air conditioning machinery could be installed by constructional engineers in most countries.

5. AGRICULTURAL TRAILERS

a) West Africa

With regard to trailers, the whole quantity of trailers for agricultural use could be produced in the sub-region and five factories are proposed, each producing some 15,000 - 20,000 units per annum and located in Nigeria, Ivory Coast, Ghana, Upper Volta and Senegal.

b) North Africa

With regard to trailers, the whole quantity of trailers for agricultural use could be produced in the sub-region and the following new capacities are proposed: in the UAR about 6,000 tons per annum, Morocco 4,000 tons and Algeria 3,000 tons.

c) East Africa

With regard to trailers only one factory catering for the whole sub-region and producing some 15-20,000 units per annum is justified and should be located in Tanzania.

6. FOUNDRY PRODUCTS (All requirement)

a) West Africa

The total production of the mechanical engineering factories proposed above would amount to 700,000 to 800,000 tons per annum, or about 50 - 60 per cent of the total consumption of mechanical engineering goods. Consumption of iron castings for this production would be about 120,000 tons per annum, of steel castings about 40,000 tons and of forgings and pressings (other than motor car bodies) 80,000 to 90,000 tons. About 80 per cent of these castings and forgings will be produced in the engineering factories themselves, and some 20 per cent will come from specialized foundries. In addition, foundries will be required for the electrical machinery industry and for certain building components and household equipment, e.g., manhole covers, siphons, cisterns, baths, pots, stoves and laundry irons, and for general repair work.

Every country should have at least one foundry, using local scrap and operating initially as part of the general engineering shop engaged primarily on repair work. A general foundry of this kind is required in Nigeria and existing facilities in Ghana, Senegal and Ivory Coast could be improved.

b) North Africa

The total production of the engineering factories proposed above would amount to 1,300,000 tons. Consumption of iron castings for this production would be about 200,000 tons per annum, of steel castings about 60,000 to 70,000 tons and of forgings and pressings (other than motor car bodies) about 120,000 tons. About 80 per cent of these castings and forgings will be produced in the engineering factories themselves, and some 20 per cent will come from specialized foundries. In addition, foundries will be required for certain building components and household equipment, e.g., manhole covers, siphons, cisterns, baths, pots, stoves and laundry irons, and for general repair work.

The total demand for iron castings of all kinds may be estimated on the basis of information available in developed countries at about 20 per cent of the demand for finished steel or at about 1,000,000 tons per annum of which about one quarter will be engineering castings and about one-third building and domestic castings (the balance consisting of castings for railways, ingot moulds, for motors and tractors and abrasives and repairs). This figure includes, of course, castings imported directly and indirectly in the form of machines. Because of the high weight of castings in relation to value most foundries making building and domestic goods will operate on a national scale. Exceptions will be the spinning of cast iron pressure pipes which could be undertaken in big scale factories for more countries of the sub-region and the production of small castings in mechanized foundries.

c) East Africa

The total production of the mechanical engineering factories proposed above would amount to 800,000 to 900,000 tons per annum, or about 60 per cent of the total consumption of mechanical engineering goods. Consumption of iron castings for this production would be about 140,000 tons per annum, of steel castings about 40,000 tons and of forgings and pressings (other than motor car bodies) 80,000 to 100,000 tons. About 80 per cent of these castings and forgings will be produced in the engineering factories themselves, and some 20 per cent will come from specialized foundries. In addition, foundries will be required for the electrical machinery industry and for certain building components and household equipment, e.g., manhole covers, siphons, cisterns, baths, pots, stoves and laundry irons, and for general repair work.

There are a number of foundries in Rhodesia where the market is also sufficiently large to give rise to some degree of specialization. In Zambia a large iron and steel foundry makes grinding materials and equipment for the copper mines and obtains scrap from the same source. At the other extreme a small foundry employing about a dozen persons and covering a wide range of ferrous and non-ferrous castings operates in Somalia (Mogadiscio). Every country should have at least one foundry, using local scrap and operating initially as part of the general engineering shop engaged primarily on repair work. A general foundry of this kind is required in Malawi and existing facilities in Kenya, Tanzania and Madagascar could be improved.

Recommendations

The reports of ECA on Engineering industries of Africa is very interesting and informative. However, there is a need to expand the data available with respect to agricultural machinery industry. Based upon the existing material it is recommended that an UNIDO/ECA Fact Finding and technical assistance investigation mission in the field of agricultural machinery is instituted at an early date in order to pin point areas of technical assistance and formulate a five-year assistance programme.

SECTION II

Recommended agricultural machinery manufacturing plants by ECA. (For 1980 demand and taking into account some aspects of regional demand).

NOTE: Items marked * are suggestions by UNIDO on subjects not covered by ECA report. The following recommended plants provide scope for assistance by UNIDO.

Recommended agricultural machinery plants and other activities
(based on ECA reports)

ALGERIA

- 1) Assistance in establishment of a tractor manufacturing plant (up to 100 Hp estimated demand in North Africa around 40,000 by 1980. Tractor specifications and capacity needed to be investigated).
2. Assistance in establishment of agricultural tillage implement factory - both for tractor and animal drawn (capacity around 3000 tons/year)
3. Assistance in establishment of a plant for centrifugal irrigation medium pumps (capacity around 12,000 tons/year by 1980) taking into account some regional demand in North Africa.
4. Assistance in establishment of agricultural trailer plant (capacity 3000 tons/year by 1980).
5. Establishment of hand tool factory with a capacity of 6000 tons/year by 1980 of which 3000 tons for agricultural hand implements and 3000 tons for other hand tools.
- 6.* ECA report recommends engine factory up to 50 Hp 25,000 units/year by 1980 to cover regional demand of North Africa. Demand for small engines for agriculture to be investigated.
- 7.* Establishment of maintenance and repair centre.
- 8.* Establishment of design and development centre - agricultural machinery

Recommended agricultural machinery plants and other activities

(based on ECA reports)

ETHIOPIA

1. Assistance in establishment of agricultural tillage implement plant
- both animal and tractor drawn - with a capacity of 700 tons/year
2. Establishment of agricultural hand implement factory (capacity 2000 tons/
year by 1980)
- 3.* Establishment of repair and maintenance centre.

Recommended agricultural machinery plants and other activities

(based on ECA reports)

IVORY COAST

1. Assistance in establishment of a plant for centrifugal irrigation pumps (capacity around 4000 tons/year by 1980 taking into account some regional demand) in West Africa.
2. Assistance in establishment of an agricultural trailer plant (capacity 20,000 units by 1980)
3. Assistance in establishment of a hand tools factory with a capacity of 3000 tons/year by 198P of which 1300 tons are agricultural hand implements and 1700 tons other types of hand tools

Recommended agricultural machinery plants and other activities
(based on ECA reports)

GHANA

- 1.. Assistance in feasibility study and establishment of a tractor manufacturing plant (capacity around 15,000 by 1980 for each of two HP ranges 50 and 25) taking into account the regional market in West Africa.
2. Assistance in establishment of agricultural tillage implement plant - both animal and tractor drawn (capacity around 2000 tons/year by 1980)
3. Assistance in establishment of a plant for centrifugal irrigation pumps (capacity around 4000 tons/year by 1980 taking into account some regional demand in West Africa)
4. Assistance in establishment of an agricultural trailer plant (capacity 20,000 by 1980)
5. Assistance in establishment of an agricultural hand tools factory with capacity of 3,300 tons/year by 1980 of which 1,300 tons are agricultural hand implements and balance other types of hand tools
- 6.* ECA report recommends engine factory up to 50 Hp 10,000 units/year by 1980. Demand for small engines to be investigated
- 7.* Establishment of design and development centre - agricultural machinery
- 8.* Establishment of repair and maintenance centre

- 17 -

Recommended agricultural machinery plants and other activities

(based on ECA reports)

KENYA

1. Assistance in establishment of agricultural tillage implement plant (both for tractor and animal drawn) capacity around 700 tons/year
2. Assistance in establishment of agricultural equipment plant (seed drills, fertilizer distributors, threshers, harvesters etc.) with a capacity of 8000 tons/year taking into account the regional demand of East Africa
3. Assistance in establishment of plants for centrifugal irrigation light pumps (about 3000 tons capacity by 1980) and medium pumps (4000 tons capacity by 1980)
4. Establishment of agricultural hand implements factory (capacity 4000 tons/year by 1980)
- 5.* ECA report recommends engine factory up to 50 Hp 10,000 units/year by 1980). Demand for small agricultural engines to be investigated.
- 6.* Establishment of design and development centre - agricultural machinery
- 7.* Establishment of repair and maintenance centre

Recommended agricultural machinery plants and other activities
(based on ECA reports)

LIBERIA

1. Assistance in establishment of agricultural tillage implement plant - both tractor and animal drawn (capacity around 2000 tons/year)
2. Assistance in establishment of agricultural equipment plant (seed drills, fertilizer distributors, threshers and harvesters) with a capacity around 6000 tons/year
3. Assistance in establishment of a plant for agricultural irrigation pumps (capacity around 4000 tons/year by 1980 taking into account some regional demand in West Africa)
4. Assistance in establishment of a hand tools factory with a capacity of 2000 tons/year by 1980 out of which 800 tons for agricultural hand implements and 1200 tons for other types of hand tools

Recommended agricultural machinery plants and other activities
(based on ECA reports)

LIBYA

1. Establishment of hand tool factory with a capacity of 4000 tons/year by 1980 for domestic and export purposes.

Recommended agricultural machinery plants and other activities
(based on ECA reports)

MADAGASCAR

- 1 . Assistance in establishment of agricultural tillage implement plant - both animal and tractor drawn, with a capacity of 700 tons/year
2. Assistance in establishment of plants for centrifugal irrigation light pumps (about 2000 tons capacity by 1980) and medium pumps (3000 tons capacity by 1980)
3. Assistance in establishment of agricultural hand implement factory (capacity 1000 tons/year by 1980)

Recommended agricultural machinery plants and other activities

(based on ECA reports)

M A L I

1. Assistance in establishment of a hand tools factory with a capacity of 1800 tons/year by 1980 out of which 800 tons for agricultural hand implements and 1000 tons for other types of hand tools, taking into account regional requirement of Senegal, Mauritania, Guinea and Gambia

Recommended agricultural machinery plants and other activities

(based on ECA reports)

MOROCCO

1. Assistance in establishing a tractor manufacturing plant (HP up to 100 estimated demand in North Africa around 40,000 by 1980. Tractor specification and capacity needed to be investigated)
2. Assistance in establishment of agricultural tillage implement factory - both tractor and animal drawn (capacity around 3000 tons/year)
3. Assistance in establishment of agricultural equipment plant (seed drills, fertilizer distributors, threshers, harvesters) with a capacity of 6000 tons/year
4. Assistance in establishment of a plant for centrifugal irrigation light pumps (capacity around 3000 tons/year by 1980) taking into account some regional demand in North Africa
5. Assistance in establishment of agricultural trailer plant (capacity 4000 tons/year by 1980)
6. Establishment of agricultural hand implement factory (capacity 2000 tons/year by 1980)
- 7.* Establishment of repair and maintenance centre.

Recommended agricultural machinery plants and other activities

(based on ECA reports)

NIGERIA

1. Assistance in feasibility study and establishment of a tractor assembly plant (capacity about 15,000 by 1980 for each of two Hp ranges 50 and 25) taking into account the regional market for West Africa.
2. Assistance in establishment of agricultural tillage implement plant - both tractor and animal drawn (capacity around 4000 tons per year)
3. Assistance in establishment of agricultural equipment plant (seed drills, fertilizer distributors, threshers, and harvesters) with a capacity around 6000 tons/year
4. Assistance in establishment of an agricultural trailer plant (capacity 20,000 by 1980)
5. Assistance in establishment of agricultural hand tools factory with capacity of 6,500 tons/year of which 3000 tons are agricultural hand implements/year by 1980 and balance other type of hand tools with partial export to Togo and Dahomey
- 6.* ECA report recommends engine factory up to 50 Hp 10,000 unit/year by 1980. Demand for small engines to be investigated
- 7.* Establishment of design and development centre - agricultural machinery

Recommended agricultural machinery plants and other activities
(based on ECA reports)

SENEGAL

1. Assistance in establishment of agricultural trailer plant (capacity 20,000 units by 1980)
- ' 2.* ECA report recommends engine factory up to 50 Hp 10,000 units/year by 1980. Demand for small agricultural engines to be investigated

Recommended agricultural machinery plants and other activities

(based on ECA reports)

SIERRA LEONE

1. Assistance in establishment of a hand tools factory with a capacity of 1600 tons capacity by 1980 of which 900 tons are agricultural hand implements and 900 tons other types of hand tools

- 2.* ECA report recommends engine factory up to 50 Hp 10,000 units capacity by 1980. Demand for small agricultural engines for to be investigated.

Recommended agricultural machinery plants and other activities
(based on ECA reports)

SUDAN

1. Assistance in establishment of agricultural tillage implement plant - both animal and tractor drawn with a capacity of 700 tons/year
2. Assistance in establishment of a plant for centrifugal irrigation light pumps (capacity around 3000 tons/year by 1980), taking into account some regional demand in North Africa.
3. Assistance in establishment of agricultural hand implement factory with a capacity of 1000 tons/year by 1980

Recommended agricultural machinery plants and other activities
(based on ECA reports)

TUNISIA

1. Assistance in establishment of agricultural tillage implement plant - both animal and tractor drawn (capacity around 2,000 tons/year) taking into account the requirement of Libya also.
2. Assistance in establishment of agricultural equipment plant (seed drills, fertilizer distributors, threshers, harvesters) with a capacity of 6000 tons/year
3. Assistance in establishment of a plant for centrifugal irrigation light pumps (capacity around 3000 tons/year by 1980) taking into account some regional demand in North Africa
4. Establishment of agricultural hand implement factory with a capacity of 1300 tons/year by 1980

Recommended agricultural machinery plants and other activities
(based on ECA reports)

TANZANIA

1. Assistance in establishment of tractor manufacturing plant (25 HP. Total demand in East Africa 20,000 by 1980, specification and capacity needed to be investigated)
2. Assistance in establishment of agricultural tillage implement factory - both for tractor and animal drawn (capacity around 700 tons/year)
3. Assistance in establishment of plants for centrifugal irrigation light pumps (about 3000 tons capacity by 1980) and medium pumps (4000 tons capacity by 1980)
4. Assistance in establishment of agricultural trailer plant (capacity 20,000 units by 1980) taking into account regional demand of East Africa
5. Establishment of agricultural hand implement factory (capacity 4000 tons/year by 1980) for domestic and regional demand
- 6.* Establishment of design and development centre - agricultural machinery
- 7.* Establishment of repair and maintenance centre

Recommended agricultural machinery plants and other activities

(based on ECA reports)

U A R

1. Assistance in expansion of the capacity of existing tractor plant
(Hp up to 100, estimated demand in North Africa around 40,000 by 1980.
Tractor specification and capacity needed to be investigated)
2. Assistance in expanding the capacity of agricultural implement production
3. Assistance in establishment of a plant for centrifugal irrigation medium pumps (capacity around 12,000 tons by 1980) taking into account some regional demand in North Africa
4. Assistance in establishment of agricultural trailer plant (capacity 6000 tons per year by 1980)
5. Assistance in establishment of a hand tools factory with a capacity of 5000 tons/year by 1980 out of which 2000 tons for agricultural hand implements and 3000 tons for other hand tools
- 6.* ECA report recommends engine factory up to 50 Hp 25,000 units/year for 1980 to cover regional demand of North Africa. Demand for small agricultural engines to be investigated.

Recommended agricultural machinery plants and other activities

(based on ECA reports)

UPPER VOLTA

1. Assistance in establishment of a plant for agricultural trailer (capacity 20,000 units by 1980)
2. Assistance in establishment of a hand tools factory with a capacity of 1400 tons per year by 1980 of which 600 tons for agricultural hand implements and 800 tons for other types of hand tools taking into account regional requirement by Niger, Togo and Dahomey

Recommended agricultural machinery plants and other activities

(based on ECA reports)

ZAMBIA

1. Assistance in establishment of agricultural tillage implement plant - both animal and tractor drawn, with a capacity of 700 tons/year
2. Assistance in establishment of plants for centrifugal irrigation light pumps (about 3,000 tons capacity by 1980) and medium pumps (4,000 tons capacity by 1980)
3. Establishment of agricultural hand tool factory with capacity of 2000 tons/year by 1980
- 4.* ECA report recommends engine factory up to 50 Hp 10,000 units/year by 1980.
Demand for small agricultural engines to be investigated
- 5.* Establishment of design and development centre - agricultural machinery

SECTION III

RECOMMENDED ECONOMIC SIZE OF PLANTS

Table 3.1
Economic size of plants for various agricultural machinery and implements products (1)
 (based on average European conditions of 1965)

Item	Hand tools and agr. hand implements	I.C. Engines (up to 50 Hp)	Agr. machinery for soil preparation	Agr. machinery for threshing and harvesting	Agr. centrifugal pumps
1 Min. economic capacity (1000 tpa)	A 1 - 1.5	3 6 - 10	C 16 - 20	D 4 - 6	E 2 - 3
2 Max. wt of piece to be lifted (kgs)	30	150	-	-	2000
3 Fixed capital per unity of production \$ per ton	160	140	45	42	180
4 Fixed capital buildings as % of total (Percent)	28	40	44	47	31
5 Working hours total/unity of production (hours/ton)	220	110	23	57	150
6 Working hours/max hours % of total (percent)	80	63	65	72	50
7 Output p.a. per prodn. workman (tons/wkr)	8.5	17	82	33	13

	A	B	C	D	E
8 Output p.a per m ² of prod. area tons/m ²	0.95	1.0	3.0	2.2	1.0
9 Total floor area per worker (sqm)	24	40	66	33	30
10 prod. workman as % of total workman (percent)	93	75	75	80	80
11 Prod. workman as % of total employees (percent)	88	65	66	76	72
12 Energy consumed per unit of prodn (kWh/ton)	400	280	230	250	320

Table 3.2

Data related to agricultural machinery industries with possibilities for developing countries (1)

(based on USA conditions 1959/60 one shift operation)

		Farm Hand Tools	Pumps	Agr. Implements	Plows	10 Hp utility tractor
1	capacity	Annual	(820 pump -1.5-10 inch (1900 valves 4-16 inch)	1800 units	12,500 unit	10,000 units
2	capital requirement 1000 US \$	Fixed capital	618	260	92	234
		Working capital	120	46	50	232
		Total capital	738	306	142	466
		Foreign currency	576	206	66	238
		Local currency	162	100	76	228
3	Employment (Nos)	Direct labour	33	31	27	38
		Indirect labour	5	5	6	4
		Total	38	36	29	42
4	Investment	Fixed investment per employee \$	16300	7200	3200	51
5	Sales	Total Annual gross sales (1000 US\$)	667	336	350	1450

			Farm Hand Tools	Pumps	Agr. Implements	Flows	10 Hp utility tractor
6	Cost	Total annual costs (1000 US \$)	522	510	268	278	1252
7	Gross annual profit	Total (1000 \$)	59	157	68	72	198
		As % of total capital	33	21	22	51	42
		As % of gross sales	22	24	20	21	14
8	Foreign currency	Annual needs (1000 \$)	93	219	107	83	977
		Annual savings (1000 \$)	318	448	242	267	473
		Valve added (1000 \$)	324	464	242	233	444
9	Capital output	As % of gross sales	79	70	72	67	31
		Capital output ratio	0.83	1.59	1.27	0.61	1.05

136

Table 3.3
 Data related to agricultural machinery industries with possibilities
 for developing countries (1)
 (based on African conditions in 1965 - one shift operation)

				Parm Hand Tools	Pumps	Agri. Implements	Plows	10 Hp utility tractor
1	Capacity	Annual	520 pumps-1.5-1" inch 1900 valve 4-16 inch	250,000 units		1800 units	12,500 units	10,000 units
2	Capital requirement 1000 US \$			255	770	320	110	285
				95	130	80	90	335
				350	900	400	200	620
					760	290	115	480
					140	110	65	140
3	Employment (Nos)			50	55	60	50	90
				20	10	10	13	15
				70	65	70	62	105
4	Investment	Fixed investment per employee \$	11800	17.0	4700	1800	2700	
5	Sales	Total annual gross sales (1000 US \$)	410	660	330	350	1450	

		Farm Hand Tools	Pumps	Agrl. Implements	Flows	10 Hp utility tractor
6	Cost					
	Total annual costs (1000 US\$)	240	440	220	230	1220
7	Gross profit					
	Total 1000 \$	170	220	110	120	230
	As % of total capital	49	24	23	60	37
	As % of gross sales	41	33	33	34	16
8	Foreign currency					
	Annual needs (1000 \$)	70	225	120	100	1145
	Annual savings (1000 \$)	340	435	210	250	305
9	Value added					
	per annum (1000 \$)	315	465	220	220	300
	As % of gross sales	77	70	67	63	21
10	Capital output					
	Capital output ratio	1.10	1.95	1.80	0.91	2.05

- 41 -

SECTION IV

Various supplies needed for selected agricultural machinery industries (1)

Based on table 3.2 and 3.3, for agricultural machinery plants having possibilities for developing countries is expected to need the following major items annually.

1. Agricultural hand tools

- | | | |
|-------------------|---|--------------|
| A. Direct labour | a) steel | 325 tons |
| | b) lumber | \$2500 worth |
| | c) lacquer | \$4500 worth |
| B. Supplies | Normal plus dies worth \$4000 | |
| C. Electric power | 300,000 K.w.nrs. | |
| D. Fuels | 1 700 gallons for production and other purposes | |
| E. Water | 1.2 million gallon | |

2. Centrifugal pump and values

- | | | |
|--------------------|------------------------------|--------------|
| A. Direct material | grey iron castings | 380 tons |
| | bronze fittings | 30 tons |
| | steel rods | 76 tons |
| | bolts, nuts and washers | \$3000 worth |
| | paint | \$3000 worth |
| | skids and crating material | \$6000 worth |
| B. Supplies | Normal plus petrol for truck | |
| C. Electric power | Connected load about 190 Hp | |
| D. Fuel | Heating only if any | |
| E. Water | Normal | |

3. Agricultural implements

A. Direct material

- a) tubes, shaftings, sheet plate, spring, stock, strip and castings 255 tons
- b) grey iron castings 75 tons
- c) bearing material \$600 worth
- d) ball bearings \$1000 worth
- e) paint etc. \$300 worth

B. Supplies - normal

C. Electric power - connected load 100 Hp

D. Fuel 600 gallons furnace fuel

E. Water 500,000 gallons for production, sanitation and fire protection

§. Plows

A. Direct labour

- a) castings (pig iron, scrap, coke) 625 tons
- b) paint \$6500 worth
- c) steel brace \$3000 worth
- d) bolts, nuts, washers \$1500 worth
- e) lumber \$37,000 worth

B. Supplies casting supplies \$4000 worth

C. Electric power connected load 50 Hp

D. Fuel apart from coke as direct material 10,000 gallons for coke oven

E. Water 1,5 million gallons

5. 10 Hp utility tractor

a) Direct material

a) Hp engines	10,000 units
b) Sheet steel etc.	500 tons
c) H.R. rounds and flats	250 tons
d) Differential gears	10,000 assembly
e) General hardware	\$60,000 worth
f) Tyres and tubes (pneumatic)	20,000 each
g) Tyres (solid)	20,000
h) Packaging	\$3,000 worth

b) Supplies

cuttings tools, solvents, paints	\$15,000 worth
finishes	\$12,000 worth
welding supplies	\$1,500 worth

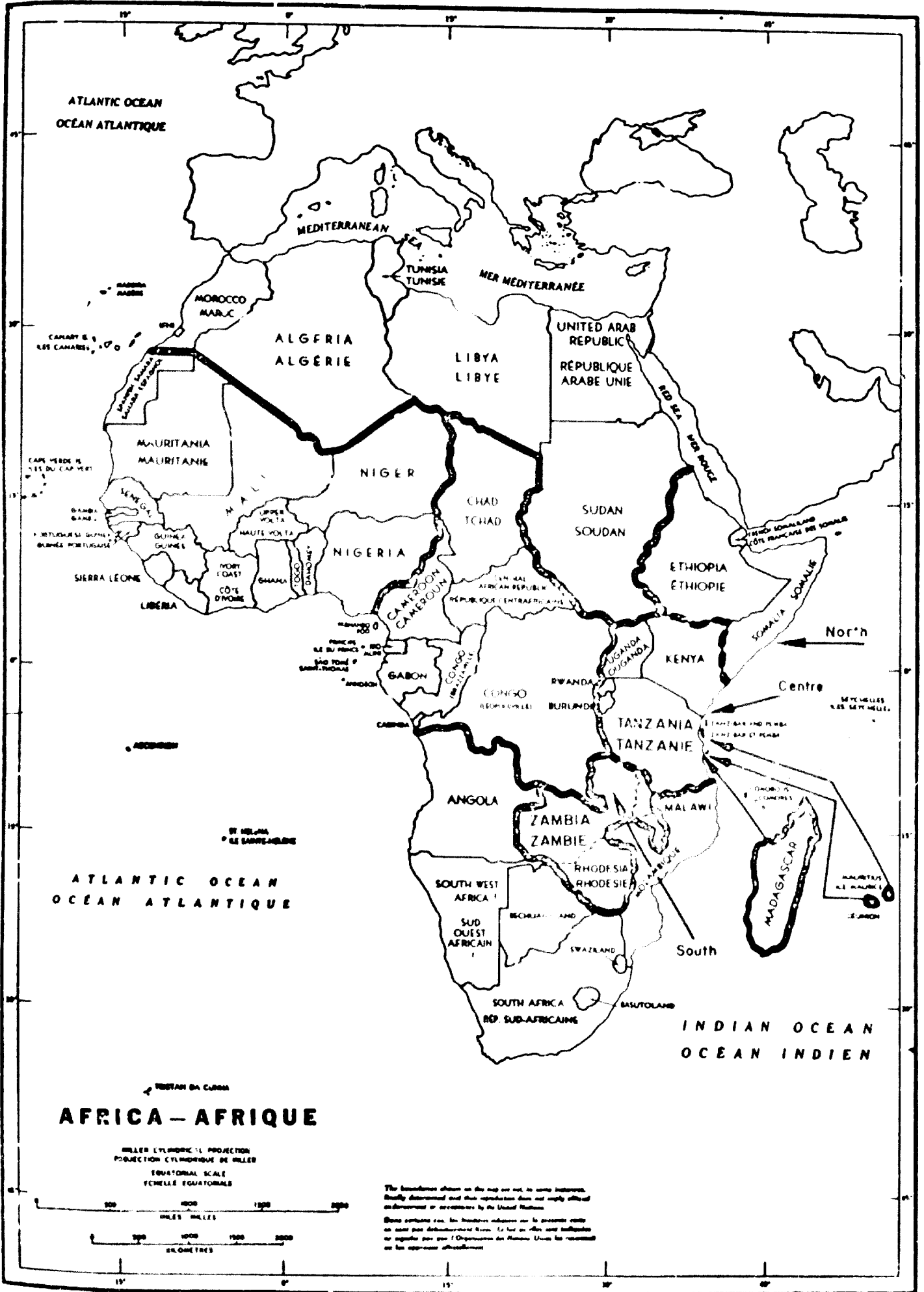
c) Electric power	1,350,000 k.w.hrs.
d) Fuel	200,000 gallons bunker oil
e) Water	25 million gallons

A P P E N D I X - A

List of ECA publications reviewed.

<u>No.</u>	<u>Code No.</u>	<u>Title</u>
1	E/CN 14/INR/AS/II/2.1	Engineering industries in Africa part II. Regional symposium on industrial development - 16 Aug 1965
2	E/CN/4/INR/152	The development of the engineering industries in North Africa. - 11 March 1969
3	E/CN/14/INR/89	Electrotechnical Engineering Industries in East African sub-region part II. Conference on the harmonization of industrial development program in East Africa, Lusaka, 17 Sep - 9 Oct 1965
4	E/CN 14/INR/90	The Development of the Engineering Industries in East Africa - Mechanical Engineering. Conference on the harmonization of Industrial Development Program in East Africa, Lusaka, 27 Sept - 9 Oct 65
5	E/CN 14/INR/89	Electrotechnical Engineering Industries in the East African sub-region. Conference on the harmonization of industrial development program in East Africa, Lusaka 27 Sep - 9 Oct 65
6	E/CN 14/INR/126	The Development of the Engineering industries in West Africa. Sub-regional meeting on economic co-operation in West Africa, Niamey, 10 - 22 Oct 1966

28.7.1969
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