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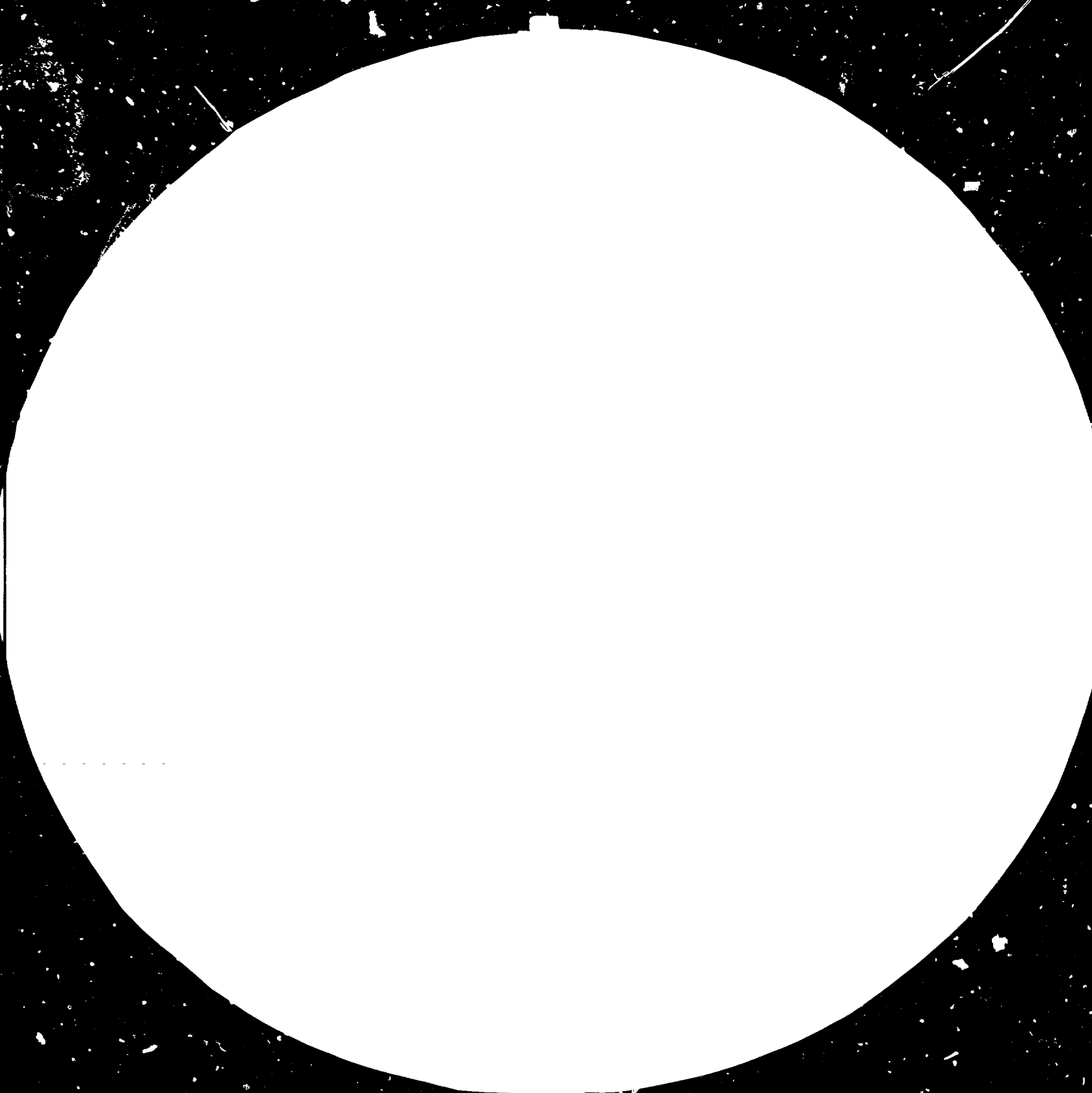

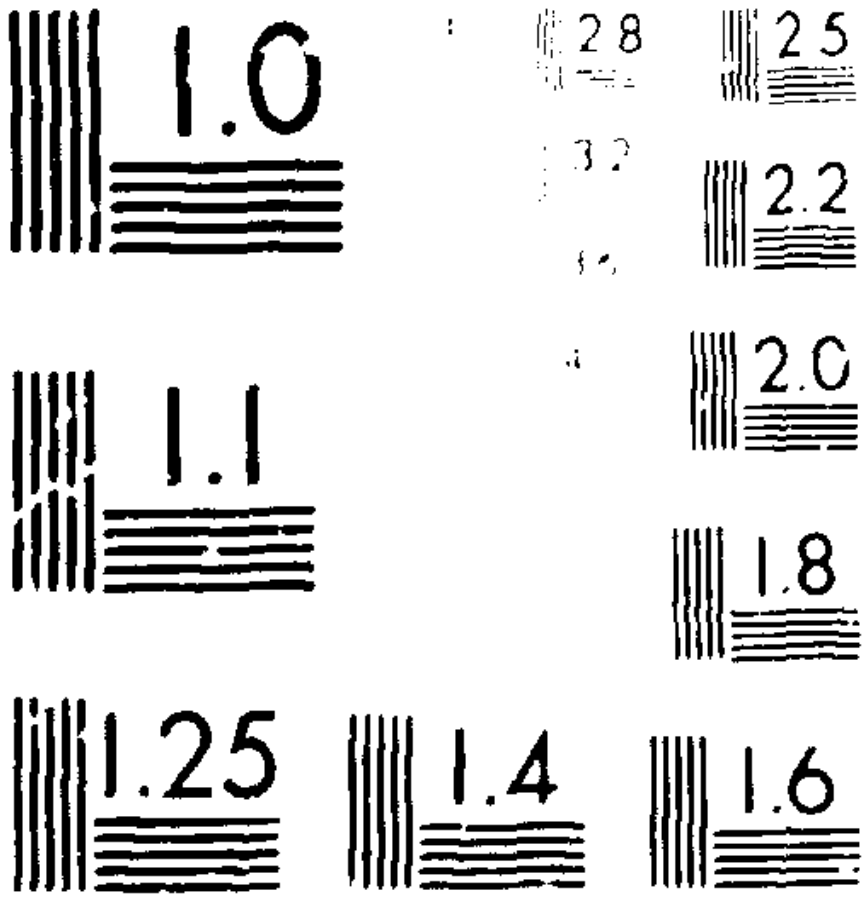

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United Nations Industrial Development Organization

Workshop on Design & Development
of Agricultural Equipment in
Africa, Cairo, October 1982

DESIGN & DEVELOPMENT OF AGRICULTURAL MACHINERY IN EGYPT

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Design and Development of Agricultural Machinery in Egypt

1.1. Agricultural Policy and Strategy in Egypt

Agriculture in Egypt is still one of the most important sectors of the economy. Agriculture occupies less than 6 million feddans which is about 2.6% of the total land area situated along the Nile Valley. A thin strip of green that winds north from the Sudan border and only branches out into the triangular shape Delta just north of Cairo. The Nile Valley is however one of the most fertile and heavily utilized pieces of agricultural land in the world.

Agriculture also provides employment to nearly half the labour force in Egypt and accounts for over 30% of the gross domestic product, 60% of direct exports and 25% of the indirect export through industry.

Over thousand of years agrieulture has historically supported Egypt without difficulty in the past and had given sufficient returns. The Government and people had therefore greatly depended upon the agriculture sector in the efforts towards industrialization. Unforturnately, in the past 10 years agriculture has been allocated less than industry, as far as capital investment is concerned. It was at one time only given a 10 per cent share of the country's total investment.

Egypt's agriculture sector is dominantly in private hands but closely monitered by the Ministry of Agriculture via a number of Committees. Government policy is executed through a network of about 5000 farm cooperative units covering every rural village in Egypt, and organized into a closely knit national grid since 1970. The Government controls to a large extent the areas to be planted with respect to cotton and other crops and in many cases sets the price and buys back the crop from the farmer, also providing him with fertilizers at subsidized prices and Agricultural Guidance.

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The major crops planted in Egypt are Cotton, Onions, rice, sugar cane, maize, wheat, sorghum, beans, citrus fruit, and vegetables, as well as medical plants

In spite of the fact that agricultural land is less than million feddans but by using double cropping per year, the actual cultivated area can be said to reach more than 10 million feddans.

The Egyptian Government announced a target to achieve an increase of approximately 40% in agricultural value over the next decade.

This will require a substantial increase in the growth rate achieved in the past several years. Major emphasis should be placed on yield improving technologies in the main field and increased foreign exchange should be allocated for the importation of materials and equipment.

Attention will be given to mechanization and the manufacture of farm implements.

Because of the fact that Egypt is one of the oldest agricultural countries in the world, traditional methods have prevailed to be developed after many years of stagnation in the agricultural sector development. An estimated picture of agricultural production can be presented based on the following three forms of powers:

30 % Human power
35 % Animal power
35 % Mechanical power

There is therefore, ample place for mechanization and the introduction of modern implements. Mechanization will lead to a lower cost of production, higher yields, better quality of products and more production of crops meat and milk, if used properly with the needed training.

No doubt mechanization is one of the effective means of developing the agricultural sector. Mechanization, however, menas different things to different people, and the depth and extent of mechanization is an essential decision.

Full mechnization is no way an absolute necessity but the gradual introduction is recommeded as first priority in projects to accelerate the growth of production and eventually save millions of Egyptian Pounds yearly to the economy of the country now lost by low productivity.

Although agricultural production has increased enormously since the 1952 revolution, population growth has also been rapid. However, the greatest impediment to real expanded economic development in Egypt has been the 20 years state of war.

Agriculture and Mechanization is still mainly traditional, that is in very small holdings and worked by hand with animal traction.

This fact results in more labour requirements and makes mechanization difficult. The whole problem is that agricultural production has ceased to rise at the needed rates during the last few years while the population has continued to grow. The net result is that food imports have risen rapidly and that main important food exports as sugar and rice for example are now insignificant. Decisions therefore, have been made at top level within the following choices:-

- To mechanize farming or not?
- To produce more cotton (for export) or more food (import substitution)?

The latter has been the policy over many years.1/

1/ See also. Stategy of Agricultural Development in the Eightier. By Dr. Yusef Waly. Minister of Agriculture and Food Security Egypt-US Business Council meeting. 1982.

With the former choice it is probable that mechanization would increase yield (vertical expansion of agriculture) but some argue that it might not. Full mechanization would free a large labour force from land, but the cities are already overcrowded and there are no industrial jobs available for people skilled only in farming.

With the second choice, cotton costs more in inputs (hand or mechanical) than most food crops, but usually generates more income for the farmers.

The proper decisions on the correct choices are obviously vital to the forecasting of agricultural machinery needs. A policy decision to proceed with mechanization or not, is in itself not sufficient, but the means and extent of execution and the details of the policy will have to be known in order to proceed.

In smaller land areas, semi mechanized equipment may be needed. The larger state owned areas may have complete mechanization. Whatever the solutions are the different options must be studied and the series of UNIDO meetings as the First Consultation Meeting on the Agricultural Machinery Industry. Addis Ababa 5-9 April 1982., and this meeting will no doubt shed light on possible solutions.

The extended discussions on agricultural machinery and implements ranging from hand tools to tractors will no doubt be very beneficial to all parties concerned.

Cross fertilization of ideas is expected and the experiences of the different African countries will be enlightening and useful.

2.0. THE AGRICULTURAL MACHINERY INDUSTRY

The use of agricultural machinery in Egypt is still relatively small, considering that the cultivated area of about 6 million feddans and the effective cropped area of more than 10 million feddans.

An attempt has been made here to present some of the local producers on the market. The major present producers of commonly used farm implements according to type of implement are:-

2.1. Main Types of Implements

a. Chisel Ploughs

Behera Company
Tanta Motor Company
Fahim Ragab Company
El-Mansoura Company
Small workshops throughout the Country, in the Delta, and in upper Egypt.

b. Drum Threshers +2 (25) which copied

Behera Company
Tanta Motor Company
El-Mansoura Company
Various small workshops throughout the Country

c. Irrigation Pumps

Helwan Diesel Company (+diesel engines)
Shubra Diesel Company
Tanta Motor Company
Misr Engineering and Tool Co. (MICAR)
Tractor and Engineering (assembly)

d. Tractors

Nasr Automotive Company (NASCO) } for completion
A new project with a Deutz license }

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e. Trailers

Nasr Automotive Company (NASCO)
Misr Engineering And Tool Co.(MICAR)
El-Sheity Company at Tanta
El Awadly
Behera Company
Tanta Motor Company
Sisman Company
Sallam Works at Dar El Salam

It is to be noted that Tanta Motor Company (a private firm) and the Behera Company (a public sector company) are the largest plants producing almost all types of farm implements needed. Other large plants tend to specialize in a single type of production as in the case of the many small shops which turn out varying numbers of hand made implements a year. Some of these also are important sources of locally fabricated components for larger firms.

2.2. Main Features of Larger Plants

Main features of the larger plants are described below:-

a. BEHERA COMPANY

Behera company is one hundred years old working in Alexandria.(founded in 1881). It is now a public sector company of the Ministry of Agriculture and Food Security. Its activities include the erection of structural steel work for industrial plants, construction, and assembly of steel cranes, building of dams, construction of pumping stations, land reclamation, earth excavations, road building, canal construction, production of pontoons, small ships and carpentry work. Farm implements production started in 1958 and constitutes one of the many divisions of

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the company. The companies work in the contracting and land reclamation area, however, far exceeds outputs in the farm implements. A great deal of contracting work is also done outside Egypt in neighbouring Arab Countries.

Plant Space and Facilities:

The area used by the Agricultural Implements Division comprises 4000 sq.mt. of which 1500 sq. mt. is the building area. The facilities include: small iron casting foundry, steel casting foundry, forge shop, welding , machining, wood working shop, moulding shop, assembly, painting and testing.

The plant has no heat treatment facility. It has no real sophisticated design department as such , but has the drafting capability of copying and modifying designs.

Employment.

The Agricultural Implements Division employs over 500 persons including 100 office staff, 20 technical and supervisory personnel and 380 shop workers. The average age of workers is 35. The average monthly basic wages for factory workers is reasonable. There is an incentive system in effect based on piece rate work and applied to either individual performance or group performance which results in an increase on the basic salary wage by over 50%. There are several fringe benefits including bonus, lunch, uniforms, safety equipment, health insurance and social benefits.

Types of Implements Manufactured:

The plant produces a variety of agricultural implements;significant among these are:-

- Chisel Ploughs/Cultivators, both trailed and tractor mounted by [illegible] of 7 and [illegible]. The tines are partly produced at [illegible] Forging Company at Helwan, and some still imported from Eastern Europe.

- Threshers, one type of belt drive [illegible] is manufactured as well as a thresher winnower with a built - in diesel engine. There is considerable competition from small threshers from small private sector firms such as Tan[illegible]gineering, Mamdouh, and from small workshops in Zagazig. The privately produced threshers are inferior in quality to that produced in Behera Company, but the workshops are more aggressive in their sales and are closer to the farmer, thus making considerable sales.

- Ditcher, ridger, and small mould board ploughs, these are assembled using imported ploughshares from the GDR.

- Landlevellers, these are made in 9ft., 6ft. 10Ft., or 14Ft. lifting mechanism which are automatically operated from the tractor hydraulic system.

- Heavy ploughs, subsoilers, and 4 tine chisel ploughs, for deep ploughing in land preparation for cotton and sugar cane, are assembled to a towbar for tractor trailing. Weight is about 1.25 Tons. The subsoiler is used in the Delta area to assist drainage by creating a trench 60cm or more below the ground level.

- 4 Wheel, 4 Ton Trailers, are produced , suitable for agricultural or road use, and are well known on the market.

Sources of materials

Steel sheet plates and other components are manufactured in Egypt. Hydraulic pumps and cylinders are usually imported. Purchased components (cultivator tines and chiesel ploughs) of good quality have unfortunately been cheaper to import in quantity than to have them produced in Egypt. The El Nasr Forging Company in Helwan, is also able to supply satisfactory forged iron. Wheel rims usually have to be imported as they are not produced in Egypt at acceptable quality, mainly, because of the limited demand not ensuring economic manufacturing.

Production Capacity:

The production capacity of the Behera plant is estimated as follows:

ITEM	UNIT/YEAR
Drum Threshers, belt driven	600
Mounted chisel ploughs, 7-9 tines	1200
Trailed chisel ploughs, 9-11 tines	1200
Subsoiler, trailed	240
Ditcher, trailed 200 x 45cm	240
Levellers, small, 6,10,12,14Ft.	280
Levellers, large, 6,12,14Ft.	360
Trailers, 4 Wheel, 4 tons	300

Additional investment in plant and equipment, and an increase in trained manpower is expected to meet more local demand.

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Production and Selling Prices:

During 1980, the plant produced the following implements at the indicated ex-factory prices:

TYPE	UNIT PRICE US$
Trailers	2.345.-
Chisel ploughs, 9 tines	770.-
Heavy ploughs, 9 tines	1,215.-
Mould board ploughs	N.A.
Levellers 14Ft.	1,270.-
Drum Threshers	1,000.-
Thresher Winnowers	N.A.

The selling prices include a 10 percent profit. No dealers are normally employed and the implements are sold to end users at the plant for cash. There is no service organization. In case of a breakdown the plant sends a technician for repair. This service is free during the guarantee period of six months only.

General Observations:

Although the plant is more or less adequate, it needs to be improved and modernized. The machines are almost all more than 10 years old. The shop for making moulds is rather primitive and requires new equipment. There is no continuous production line and the work is performed on a piece-rate basis by either single individuals or small work groups. Apparently, the size of the contracting firm overwhelms the agricultural implements production in size and volume. However, the company fills an important gap in local needs.

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b. Tanta Motors Company

This company is located in the city of Tanta in the Delta. It is a private sector enterprise with approximately 200 workers engaged in the engineering, manufacturing, and maintenance of various agricultural implements and water pumps. It also, imports tractors and power tillers and prepares them for sale.

Local Production And Assembly:

Among the implements being produced or assembled are:

- Chisel ploughs: 7 and 9 tines produced from new steel tips fabricated from used automobile leaf springs.
- Threshers: drums type, belt driven, similar to that made by Behera Company.
- Maize Mill: manufactured under the Tanta Company's brand name.
- Irrigation pumps: pump castings already machined are purchased from Damanhour plant 70 Km west of Tanta. The only part machined inplant is the coupling plate for the pump set. The set is equiped with either local diesel engines or imported from the GDR, UK, India, or Yugoslavia, or electric motors local (MF) or imported.
- Trailers: 2 wheel & 4 wheel types with all parts manufactured inplant except the wheel rims.

Imports

The Tanta Company has imported from Japan about 300 power tillers a year. These are made by Mitsubishi , 7 hp and 13 hp.

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The tractors imported by the Company are of three types:-

1. David Brown 990 and 995 imported complete cased and requiring only the wheels to be fitted and a few items bolted in place.
2. Mitsubishi 1300, with a 4 wheel drive. It is a 2 cylinder diesel tractor of 15 hp.
3. Mitsubishi 2 wheel tractor single cylinder 7 hp.

Production and Selling Prices

During 1980 the plant produced the following implements.

TYPE

Chisel ploughs 7 tines
Threshers
Maize Mill
Irrigation Pumps:-
Diesel 6.5 hp 5"/6"
Diesel 11 hp 6"/6"
Elect. 7 hp 5"/6"
Trailers:-
4 wheel , 4 ton
4 wheel , 6 ton
Tractors:-
David Brown

General Observations

The Tanta plant is in fact only an expanded workshop with very limited space for the variety and volume of its production. Raw materials, items in the process of produciton or assembly and finished items are scattered all over the place. The machine shop is rather primitive containing only about a dozen essential lathes and machines. The whole plant is too crowded for efficient safe operation.

c. Helwan and Shubra Diesel Companies: -

Though the two companies are at different location in Cairo, yet the two plants are under the same management and share technical expertise. In both plants, diesel engines are machined and assembled employing local materials. Pumping sets are sold for irrigation and other purposes The engines are also used in producing welding generator sets and in small power emergency sets. The sets are placed on trailers for mobility. Engines are not sold separately.

Helwan. At Helwan works, vertical diesel engines are produced, based on the original design by Proffessor LISZT of Austria (AVL). The engines manufactured are of two types with all cylinders having common dimensions:

1. 11 - 120 hp (1 - 6 cylinders)
2. 30 - 150 hp (2 - 6 cylinders)

Parts , forgings, castings, and crankcases are supplied from other local factories while fuel injection pumps and electrical equipment are imported. The engines are water cooled. Annual production amounts to about 6000 cylinders.

Shubra works. three Deutz licensed type diesel engines are produced with outputs of 6,10, and 16 hp. All components except the injection pump and electrical equipment are locally including crankshafts and camshafts. Machining, Heat treatment and assembly are all carried out within the plant, as is the manufacture of studs and other special fasteners. This plant also manufactures bearing shells under Glacier license. Production is about 2500 diesel engines.

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The total employment of both plants is about 1800 persons. The Helwan factory has a group of travelling service engineers. The irrigation pumps are sold mainly by the Tractor and Engineering Company and public sector trading company which provides services at several depots in rural areas. Both plants appear to be well run, despite their different locations and a common management structure, with the two factories producing pump sets for different markets.

d. Nasr Automotive and Manufacturing Company (NASCO):-

NASCO is a major public sector company at Helwan, South of Cairo. Established in 1959, it produces trucks , buses, passenger cars, trailers, and agricultural tractors. The toal area of the plant is about one million square meters, having only 300,000 square meters as covered area. The total working force is about 11000. This has achieved a high local manufacturing content in the truck , bus and trailer production which ranges between 70% to 75% including the production of the engine. Production target for 1982 has been set at 170 million L.E.

90% of local content

The tractors are assembled out of CKD or SKD sets with some components manufactured locally such as the battery, the tyres, silencers. platform, we' carriers, seat, tanks, and some sheet metal part NASCO imported 2400 SKD Massey Ferguson tractors through an AID financed contract in 1977. All of these tractors had been sold with difficulty because of the high selling prices compared with the cheaper Yugoslavian LMR and the Romanian UTB tractors assembled at the same factory. The production capacity for NASCO is estimated at about 3000 tractors per year on one shift basis. The trailers produced are 8 tons payload and matched to the trucks for road application.

CKD = Completely Knocked Down SKD = Semi Knocked Out

Production

During the 1980 the [illegible] ed the following tractors,

TYPE	
Massey Feguson Tractor	[illegible]
Yugoslavian LMR Tractor	[illegible]
Romanian UTB Tractor	[illegible]

Some of private and [illegible] sector companies act as distributors for tr[illegible] assembled at NASCO and have one or more [illegible]ps that can perform major overhauls.

The existing tract[illegible] area is about 2050 square meters. The [illegible]ngine of the Yugoslavian tractor is a[illegible]led and tested in an area of about 1000 s[illegible] tests.

General Observations

The plant is usual[illegible] efficiently and is equipped with very [illegible]-date machine tools. It has a very good [illegible] which is however not always full l[illegible]. The heat treatment shop serves both the gear [illegible] the tool room. The management of the co[illegible]ving to improve and modernize the work to [illegible] the productivity and the local content fo the p[illegible]. The company h[illegible] ambitious plans to branch [illegible] into four joint ventures with f[illegible] companies participating in the equity. [illegible] international [illegible] are now in fin[illegible] stages.

c. The Arab American Automobile Manufacturing Co.

It is a joint company of the Arab Industrialization Authority and American Motors. The so-called JEEP project because of the Jeeps that are manufactured is situated 5 km along the Suez Road. The Egyptian side has the majority 51% in the shares. First studies were made in 1977 and the plant errection started 1978 with the first produced car in December 1978. Area of the plant is around 10,000 square meters employing 400 and with fixed assets of 12 million $.

Production capacity is 10 to 12,000 cars annually with one shift, though this capacity has not been reached. The company has signed with NASCO to assemble RITMO cars to make use of utilized capacity. No doubt some of the CJ-7, CJ-6, and Wagoneers will be used in the agricultural sector as a strong workhorse.

2.3. Features of Smaller Plants

a. Bedros Light Engineering

Working since 1929 this enterprise produces light metal engineering products including water filters and rims (steel) for automobiles and trailers. His efforts on the agricultural field is limited to Hydro engineering and rims for agricultural trailers.

b. The Arabian Company for Assembly and Manufacturing Construction Equipment - produces a variety of products of interest to the agricultural sector including the Pivot irrigation systems. Most of the Mobile Pivot structures, spans, are locally made. Pumping, drives, and control equipment are imported.

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c. El Salam Works

El Salam Works is a workshop owned and managed by the private sector. The workshop engages in the production of a variety of metal work including such agricultural implements as chisel ploughs, drum threshers, and trailers.

All work is done on contract and no stock of finished items is usually kept.

The shop is equipped with lathes, grinders, saws, presses, electric and acetelene welding, milling machiens, cutters, blacksmith facilities, and other essential equipment needed for the production of relatively simple agricultural implements.

The firm lacks good distribution channels and the trailers produced are all sold through some private distributors.

d. Sisman Company

Sisman is a private owned trailer manufacturer that produces trailers for a great variety of purposes.

Monthly production rate is about 50 units of various types. Among trailers produced for agricultural users are:-

- 1.1 Ton, 2 wheel trailer
- 4 Ton, 4 wheel trailer
- 5 Ton, 4 wheel trailer
- 8 Ton, 4 wheel trailer

The trailer components are all manufactured locally except some items which are imported such as axle bearings, hub assemblies and fifth wheel assembly. Product design was made at EIDDC for the first trailers. Larger ones were made as joint projects.

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e. Mabruk Workshop for Trailers and Agricultural Equipment (Tanta)

The company started operation in 1972 and produces trailers, water tanks, threshers, and ploughs. A special loader shovel has also been developed. Trailers are 4, 6, 8 Ton 4-wheel trailers. Originally, water wheels were made (SAGIA). Nos. of workers around 15.

f. Misr Co. for Metal Manufacturing (Alexandria)

Started in 1956 to manufacture chemical spraying equipment for agriculture. Produces totally sprayers (mobile) with tank. Is a main supplier to the Ministry of Agriculture. Has a small effective foundry for aluminium.

2.4. Sub-Suppliers to the Agricultural Machinery Industries

The following is a list of the most important possible sub-suppliers to the agricultural machinery industries:-

a. Plants Supplying Iron and steel Castings:

1. Helwan Iron Foundries MF9 (Helwan, Cairo)
2. El Nasr Foundry (Alexandria)
3. Delta Steel Company (Cairo)
4. El Mansoura Company (Cairo)

all over country) where are the foundries

b. Plants Supplying Finished Components:-

1. Military Factory 99 (Cairo)
   Pistons, rings, liners, pins...
2. Helwan Company for Diesel and Military Industries
   Water pumps, bearing shells, connecting rods...

3. Military Factory 54 (Maadi, Cairo)
   Radiators, Cutting Tools
4. Abou Youssef Engineering Co. (Cairo)
   Filters, Exhaust systems & stampings
5. Machine tools MF 999, (Helwan, Cairo)
   Machine tools and gears, semi-autom. bakeries
6. Military Factory 135 (Helwan, Cairo)
   Engine parts valves, gears, nozzles, injectors, and accessories for brake systems
7. Military Factory 36 (Helwan, Cairo)
   Stampings, exhaust systems and filters
8. Military Factory 45 (Helwan, Cairo)
   Ball bearings, standard parts and gauges
9. El Hayat Company (Cairo)
   Leaf and coil springs, brake and clutch lining
10. Military Factory 909 (Helwan, Cairo)
    Bearings and standard parts
11. Misr Engineering and Car Co. (MICAR) (Cairo)
    Wheels
12. El Nasr Company for steel pipes (Helwan, Cairo)
    Pipes and maleable castings

c. Plants Supplying Electrical Components:-

1. General Company for Batteries (Cairo)
   Batteries
2. National Plastic Company (Cairo)
   Batteries and plastic parts
3. Egytian plastic Industries Co. (Alex.)
   Batteries, Vinyl cloth, plastic products
4. Military Factory 27 (Shoubra, Cairo)
   Electric motors
5. Kamal Mounir Khella (Cairo)
   Horns, terminals, facing of lights, brushes

6. Egyptian Company for Electric Cables (Cairo)
   Wires, cables
7. Canal Electron Company (Ismailia)
   Lamps, and bulbs

d. Plants Supplying Miscellaneous Component Industries:-

1. Transport and Engineering Company (Alex.)
   Tyres of different sizes, inner and outside tyre
2. Abou Qir Company for Engineering Industries (Alex.
   Moulded plastics, gaskets, and stampings
3. El NAsr Company for Rubber Products (Cairo)
   Rubber parts, and hoses
4. TAKI Company (Cairo)
   Seat Foam and coil springs
5. Paints and chemical Industries (Cairo)
   Paints, udnercoatings
6. M.F.I 81 (Cairo)
   Paints, Varnishes, and rubber products
7. Medical Packaging Company (Cairo)
   PVC products and hoses, containers, plastic moulds
8. El Nasr Company for Glass (Alex.)
   Glass and fibre glass
9. El Sherif Company for Plastics (Cairo)
   Plastic parts and hoses
10. SABI Company (Cairo)
    Spark plugs, hardware fittings, locks,...etc.
11. ITALEX Company (Cairo)
    Marks and sign s
12. Egyptian Copper Company (Alex.)
    Copper alloys, pipes, alum. products and profiles

e. Plants Supplying Forgings:-

1. El Nasr Forging Company (Helwan, Cairo)
2. El Maadi Company (Maadi, Cairo)
3. Small private sector forges

f. Plants Supplying Aluminium Castings:-

1. The General Metal Company (Helwan)
2. Sigal Company (Cairo)
3. Military Factory 63 (Helwan)

g. Plants providing heat treatment facilities:-

1. Helwan iron foundries (Helwan, Cairo)
2. El Maadi Company (MF 54) (Cairo)
3. Helwan Engineering Industries (MF99) (Helwan, Cairo
4. Helwan Iron Foundries (MF 9) (Helwan, Cairo)
5. El Nasr Forging Company (Helwan, Cairo)
6. Nasr Automotive Manufacturing Co. (Helwan, Cairo)
7. Engineering and Industrial Design Development Centre (EIDDC) (Dar El Salam, and also in Pyramids) 50% westonly
8. Alexandria Arsenal (Alexandria)

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2.5. Basic Sub-Supplier Industries

The following is a brief description on some selected plants from the basic industries mentioned above:-

a. Maadi Company for Civil and Military Production MF54

This factory produces sewing machines and parts, including scissors, surgical instruments, and vessels, in stainless and carbon steel. It has light drop forging, comprehensive heat treatment facilities and accurate machining capacity for miscellaneous parts. It also produces auto radiators. Tractor line, hand operated, in which the radiator matrix tools are supplied by Bigwood, Wolverhampton U.K. A Dualform press with tooling cast in a low melting point alloy is used for deep drawn header tanks in brass. The matrix plates can be adjusted to produce radiators upto 36" X 36" X 5" with a variation in fine spacing at one mm intervals. Tube forming is done by an assembly of simple rolls and the machine incorporates a solder dip on both sides of the brass strip and lock seaming. Fluxing and soldering of matrix to header and base tanks is done in baths, temperature controlled by thermostats and electrically heated. Final sweating and sealing of the assembly is in force draft ovens at about 350°C and the assembly concludes with pressure testing and painting.

Production of radiators of whatever size is at rate of 100 finished radiators per shift but there is capacity for 200 per shift of the matrix. Labour working in this field consists of 60 workers per shift including 4 foremen.

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Brass strip in various widths for the different tube sizes 0.15mm thick is imported usually from Austria. Top and bottom tank tubes are of brass. In the lighter radiator these are fabricated from brass strip on site, for the larger radiators they are cast and bought locally from the Helwan Foundry.

b. Helwan Engineering Industries (MF99)

This factory produces stainless steel decorative ware, scales for weighing, pistons rings, liners, and gudgeon pins for engines. The factory has been in production for 15 years and is fed with cast iron and cast steel components from the military foundry 9.

Pistons are cast in aluminium silicon alloys on the site and are machined, inspected and packed in matched sets.

Pistons rings of cast iron are supplied from the military foundry and machined, split and finished fitted to the pistons made or sold separately in sets.

Cylinder liners of iron are also brought-in machined and finished.

Gudgeon pins and circlips are formed, heat treated and machined in plant in a full range.

The shop runs two shifts at present and production capacity is about 200,000 pieces per annum of pistons, matched components cylinders and liners.

Original technology and know how were developed in association with Associated Engineers (AE) of U.K. over a ten year period but the arrangement has now expired. Inspection facilites are extensive, standards are carefully maintained and monitored.

The total staff is 700 at present working two shifts, of which 500 are operators, and labourers. A few machines representing bottle necks are run in a third shift.

This factory is quite capable , in terms of capacity and qualit , and can supply easily the necessary pistons... etc. for local production of agricultural tractors.

c. Helwan Iron Foundries (MF 9)

The factory site consists of two foundries:- Old Foundry, melting iron and scrap in 2 four ton cupolas and in 3 three ton mains frequency electric industion furnaces. Production is about 4000 tons p.a.

Steel (all scrap, with minor alloy adjustments occasionally) is melted in a Krupp 5 ton electric arc. 4 melts daily. Production is about 3000 tons p.a.

Adjacant to the main old foundry in a newer installation is an iron foundry for cylinder liners (centrifugal casting machines) and piston rings (sand cast in stack fed boxes, four rings to a box). It has a separate melting furnace 5 off 500kg med-frequency induction and a workforce about 100. Production is about 200 liners per shift, plus rings.
New Foundry, this was opened 4 years ago and works $1\frac{1}{2}$ shifts , but is still well under full capacity production. It is an iron foundry and capacity is about 15000 tons p.a.

Melting is by 4 six ton (Czech.) mains frequency induction furnaces. The foundry is largely East European equipped. There are two large Retropress (sand) Moulding lines, two large

12 station rotary core moulding machines and ten Shalco/Acme (USA) hot box moulding press machines, a sand slinger moulding line capable of running up to 5 patterns at once.

The old foundry runs two shifts. Total capacity with the new foundry is now about 20,000 tons of finished iron castings plus 3000 tons of steel castings. Total workforce is about 2500 of which only 500 are in the new foundry.

The old foundry produces ingot moulds, cast-in green sand, small engineering castings e.g. sewing machine bodies, wheels pulleys,...etc.

The steel foundry produces value castings wheels and railway axles, general engineering up to 5 tons in weight and ingots for the Delta Company to be rolled to reinforcing bars.

The new foundry also produces cast value parts in iron and all parts which are too complicated to be produced in the old foundry by floor moulding, are made here by machine moulding, as especially by the hot box method which is capable of great accuracy. Included in this latter category is the cylinder blocks and gear box housing for the truck, bus and passenger car engines nowadays produced in Nasr Automotive Company.

Only imported iron is used as the locally produced pig iron from Helwan Iron and Steel Company is too high in phosphorous for most engineering castings. For the steel castings.

For the steel casting exclusively and for some of the iron casting, scrap is used, most of which is found in Egyptian sources but a growing proportion is now being imported to meet the foundry demand.

Present capacity would not permit the production of the complete demand expected for the big plans for automotive and agricultural industry and some expansion would be needed for equipment, building and investments.

d. Nasr Forging Company

Nasr Forging Company is also a public sector company located in Helwan started in 1964. The establishment has an area of about 120 feddans. The production facilities includes different types of hammers:-

- air lift gravity drop hammers up to 10mt. ton
- power drop steam hammers up to 10mt. ton
- counter blow hammers
- open die forging hammer
- hot upsetting forge machine
- ring rolling machine

The company has complete workshops for die making , mechanical machining and an electrodischarge machine. The company has also a design department for forged workpieces and for the dies.

The heat treatment facilities include:-

- single place blacksmith forge furnace
- flame furnaces for heating billets before closed die forgings.
- continious furnaces fuel oil, fired for normalizing, water or oil hardening, and tempering

- electric chamber furnace
- flame and induction hardening
- hydrogen electro flame hardening
- salt bathes

The production capacity of hammers is about 15000 tons/year shift.

The product characteristics are:-

- length up to 1200 mm
- diameter up to 400 mm
- weight up to 150 kg, also 500 kg free forging
- drop angles min 7^{o}
- burr and die shalt max. 2mm
- tolerence , according to customer request is as per Russian Cost
- surface treatment , pickling

Non-Ferrous Metals

- Aluminium Supply is assured now by the new Naga Hammady Smelter working with the Aswan High Dam Hydroelectricity. Production now is 100,000 tons p.a. with a max. extended capacity of 160,000 tons
- Aluminium Die Castings are provided by the General Metal Company located in Helwan. The Company produces all aluminium parts for the engines such as the cylinder heads, oil sumps, rotor and stator for air cooling fan and also fuel filter bodies. The total employment of this company is about 1000 persons.
- Aluminium Extrusion are produced in MF63 which is located in Helwan. It also produces copper and aluminium semifabrication. This factory has an enormous and wide capacity metal

semifabrication which serves the Egyptian industry. Aluminium sheets are also produced and possibly alloys for manufacture of bushings (copper alloy).

2.6. Repair & Maintenance Facilities

Most tractors are assembled in Egypt. Nasr Automotive Company (NASCO) a public sector plant has alone assembled over 30,000 tractors. Spare parts for these tractors are imported by NASCO. NASCO sells these tractors through one of several distributors or directly to farmers. Some of the major distributors are:-

2.6.1. Main Distributors

- Tractor Engineering Company (public sector)
- General Company (public sector)
- Saad Aguizy (private sector)

The warranty is provided by the importing agent representing the manufacturer through a contract with NASCO. The distributor received approximately 1% of tractor selling prices for warranty service and pre-delivery checks. The parent company provides needed spare parts and the distributor or local agency furnishes labour, travel and related items.

Other companies both in the public and private sector also import tractors and act as dealers, some of the same companies also act as distributors for NASCO and have one or more workshops that can perform major overhauls. Some also have stations outlying areas that represent the importer, carry a limited supply of spare parts and can repair or make arrangements for repair with local private repair shops.

2.6.2. Repair Workshops

Most of the agents have one or more major workshops that are reasonably well-equipped. Tractor Engineering Company for example imports I.H. tractors and acts as both distributor and dealer. It has large workshops able to repair tractors in both Cairo and Alexandria. It also has about 20 branches that have limited supply of spare parts. The General Company for Engineering has a substantial workshop in Cairo to serve Eastern Bloc tractors. Survey results reported that approximately 10% of the tractors owned by cooperatives and private individuals are out of operation. Presale checkups, operations, care and maintenance information and after sale service are either provided by importer-dealers or not at all.

2.6.3. Spare Parts

Local manufacturers of agricultural implements do not maintain a spare parts inventory. Implements are relatively simple in construction and spare parts are manufactured in small workshops as needed. Some parts, such as chiesel points which wear and require replacing on a regular basis are manufactured in some larger plants and local shops but usually on a demand basis. When repairs are needed, either a local repair shop or the original manufacturer is contacted. Much of the repair work is done by private mechanics who have learned by trial and error rather than through formaliz ed training by equipment manufacturers. Many of those mechanics are quite able but are limited in their ability to handle specialized problems, workshop facilities, test

In general it may be said that lack of local repair facilites and a chronic shortage of spare parts take a heavy roll of Egypt's farm tractor stock potential. Many of the inoperable tractor units are at least 10 years old. By Egyptian standards the fact that a tractor is old does not necessarily imply it is ready for the junk yard. This is indicated by the fact that roughly one fourth of the machines reported to be in good or fair condition also were over 10 years of age. In fact, a surprising number of private owned older units are in their 20's or 30's and are still going strong.

Another dimension of the repair/service/spare parts problem is seen in the large number of tractors tractors reported as only in "fair" condition. That so many younger machines are in this category have poor maintenance. This no doubt reflects in part the owner's lack of appreciation of the importance of preventive maintenance. Lack of convenient access to service facilities and the difficulty of finding even such simple items as the right oil filter contribute to the problem.

With respect to other farm machinery , the repair/spare parts situation apparently is not nearly so critical as it is for tractors. Except for a comparatively few diesel and electric powered pump sets and some sprayers, tractors are the only motorized machines currently found on Egyption farms. Farmers know how to repair these implements themselves. Village blacksmiths

can make parts or even entire pieces of equipment and if necessary the manufacturer can be effected in a few days. At worst, complete replacement of these types of farm machinery, if they become totally inoperable does not require big investment.

While the spare parts/service problem today relates mainly to tractors, it will grow in both volume and complexity as farm mechanization in Egypt becomes increasingly sophisticated. Water lifting will become more motorized. Self-powered thresher-winnovers will replace tractors powered drum threshers and release tractors for field work. New type threshers will require more attention by skilled mechanics than do the drum thresher and hand-turned winnowers now in use. These and other technological advances will increase the farmer's dependence upon repair, service and spare parts supply facilities outside their own villages.

2.6.4. Mobile Teams

Discouraging as the repair/spare parts picture is today, there are some bright spots. Plans have been developed in several quarters for coping with the problem. Bringing repair, maintainance and dealer services much closer to local communities than they are today is a central concern of Egyptian Planning. In this area the Ministry of Agriculture plan, still in the incubation stage, visualizes a network of privately owned and operated service-dealer facilities with Ministry monitoring to assure

that farmers get dependable service and can find spare parts when they need them. NASCO has for some time operated a system of small mobile teams to work their own dealers in providing after sales service during the tractor warranty period. They also maintain stock of spare parts for the types of tractors they assemble, Massey Ferguson has tried the mobile van repair servcie approach on a limited scale and has evolved a plan much like the Ministry's for area dealer-service centers. It is important to say that only through private initiative Egypt will develop an efficient network of farm machinery repair and maintenance facilities.

2.6.5 Network of Area Centres

Recommendation of a consulting office to assist in the development of the above-mentioned situation included the following:-

A. Create a Incentive Loan Fund to encourage private and semiprivate enterprises to develop a network of competent service centers throughout Egypt. This fund would cover:-
   a. financing required for establishing 20 area centers (scattered all over Egypt) by building new facilities or upgrading existing ones.
   b. assist about 50 local repair shops to upgrade their facilties to acceptable standards.

B. Provision of expert assistance in getting the presently inoperable tractors back into use.

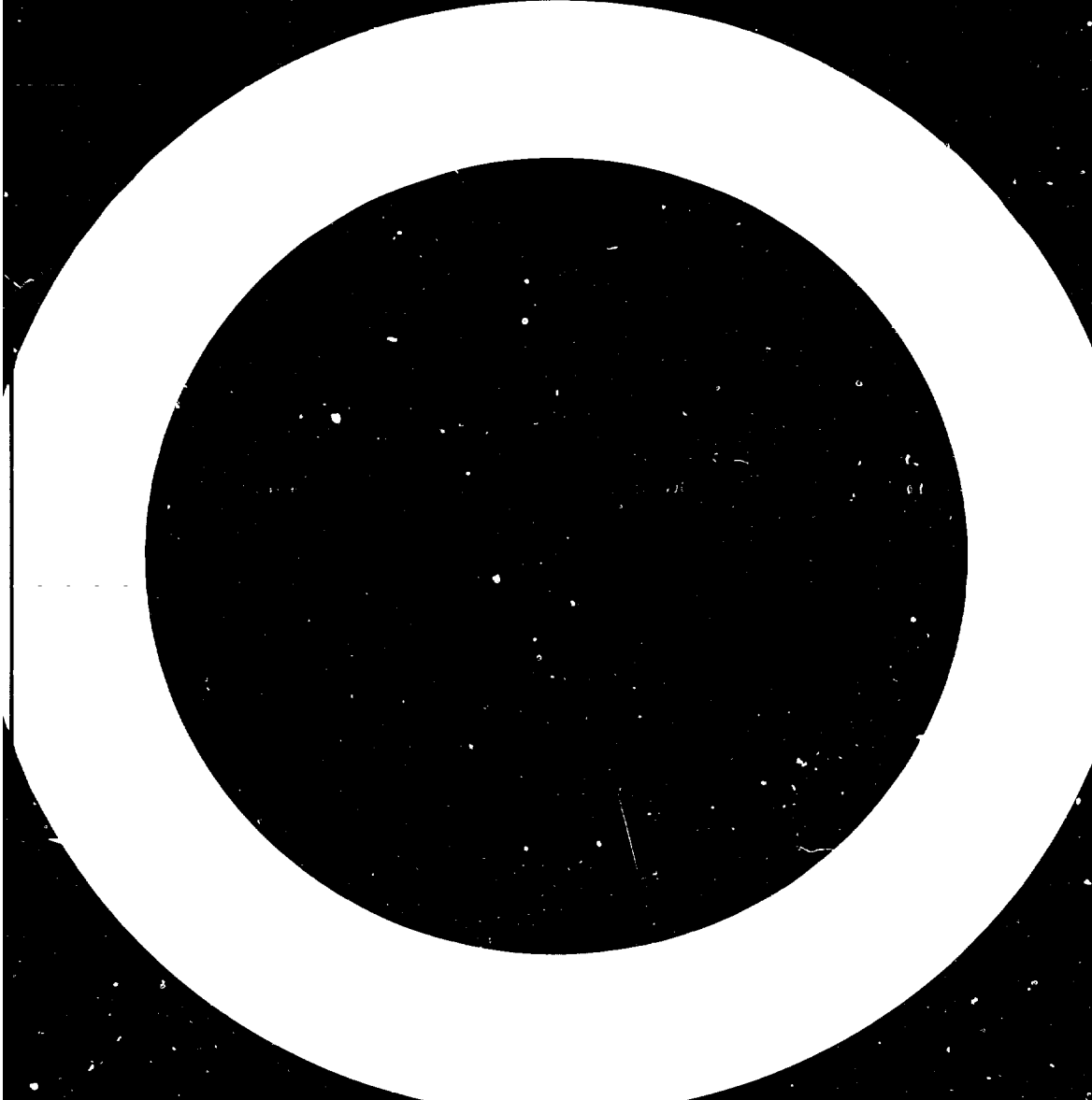
C. Assist the Ministry of Agriculture to develop:-

a. Performance standards for farm machinery service facilites/dealerships to insure farmer-users of reliable repair services and easy access to spare parts.

b. The Ministry's capability to monitore the the performance of service/dealer facilities without intervening in the operation of the facilities themselves.

It is anticipated that the 20 area centers would :-

1. Provide services directly to farmers, co-operatives and others in their immediate vicinities.
2. Be available to more distant machinery operators in their respective territories who require repairs more sophisticated than local shops can service.
3. Stock spare parts for sale to local shops or others as needed.,
4. Function as equipment dealers to their entire territories. In addition each area center would have specific "satellite" arrangements with a number of local shops strategically located throughout its area.



On the basis of reasonable growth assumption of intensity of mechanization to reach 0.45H.P./HA by 1985, the projection of the tractor park is 37000 units. This will lead to a total demand of about 55000 units per year in year 1985. Therefore, the most optimistic figure is around 6000 units which casuses problems when full production is considered versus assembly.

With respect to the agricultural implements, it is is not easy to analyse the trends. However, market studies have estimated the Egyptian requirements for recommended new types of equipment during the next several years.

3.2. Factors influencing use of Agricultural Machinery:-

In Egypt today farm mechanization is limited largely to tractorization of primary tillage and the threshing of wheat and rice. Eighty percent of all farmers still depend upon animal powered Saqias or man powered Tambours for lifting irrigation Water. Although about 70 percent of all farmers use custom-hire tractors for some ploughing, there are only enough operable tractors available to cover 40 percent of the total area ploughed each year.

The Egyptian market is very price sensitive and a substantial increase in the cost of tractors or implements would reduce overall demand because of the limited capacity to pay by farmers.

The small farmers cannot afford to buy a machine, because it has no down payment, they find it too hard to get a credit and the cost of loans are too high.

The spread and popularity of custom tractor services enabled some operators to become tractor owners. As their own small acreages require only a fraction of tractor's time, custom work has almost become a separate occupation for farmers.

The service/repair facilites that typically support use of agricultural machinery are presently incapable of meeting the needs of the present number of machines.

As seen from statistics 95% of land owners have less than 5 Feddans. The small size of land affected obviously the usage of agricultural machinery and lead to the spread of custom tractor services.

Shortage of loanable funds at any level is a bad effect on the purchase of required machinery. Thus, the Central Bank would make certain adequate funds to be available at time to provincial, district, and village banks serving farmers and custom operators. To enable the Agricultural credit Bank to meet enlarged credit management responsibilities ways would have been found to transfer to some other appropriate entity the responsibities for in-kind production input loans which village banks recently acquired from cooperatives. Additionally, either the agricultural credit system or other institutions such as Nasser Social Bank and/or commercial credit institutions would have broadened their traditional roles to meet the credit needs of small implement manufacturers, machinery dealers and others. These ancillary elements would function at high capacity to make it possible for Egyptian farmers to obtain their technical efficiency.

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3.2. Main Needs of Agricutural Machinery

The common handtools used by the Egyptian farmers are made locally by blacksmiths producing with simple equipment:-

a. The Egyptian hoe is an excellent digging, weeding and general purpose tool. It is mainly used for cultivation, ridging and weeding.

b. The shovel is also used efficiently for shifting earth, cleaning drains, and ditches.

c. Sickles are used extensively for harvesting and mowing operations. The short handle sickles are made locally by artisans. The major problem is in the in the quality of the metal used. Whatever the efficiency of handtools, at best they place heavy demand on human energy, increase work hours and are often responsible for low levels of production.

e. Saqia (Egyptian Water Wheel) are used to lift water from canals to the level of the surrounding fields. These are drawn by animals, either cows or buffaloes.

f. Tambours. In addition farmers utilize man-powered tambours to lift irrigation water. An estimated 70% of all farms use either saqias or tambours. A relatively small proportion have access to power pumps wither electric or diesel. If saqias work could be mechanized there would be a saving of the milk and meat now lost. Replacement of saqias, with pumps is one of the most significant opportunities available for mechanization to increase Egyptian production. Mechanizing water lifting can cut irrigation costs in half. Notwithstanding this evident economic advantage, however, the changeover from saqias to motor driven pumps is proceeding slowly. Saqias are not portable. However, this imposes

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no additional constraint upon their technical feasibility as they are limited by capacity to watering about 15 feddans, and existing irrigation areas are designed around that capacity.

g. The Chisel Plough is the commonest tillage equipment, the reasons for this are the similarity to the traditional animal drawn wooden plough and the simplicity of adjustment with relatively low mechanical aptitude and absence of moving parts. The 5,7, or 9-tine tractor drawn plough can plough in one operation more deeply than repeated animal ploughing.

h. Pest control spraying of cotton is mandatory Very many farmers used knapsack type sprayer motorized or hand. Spraying is done nowadays by government sponsored aircraft.

i. Threshing The non-mechanized techniques are threshing by animal drawn "sled" and winnowing by tossing in baskets. The loss of cereals is considerable. Machine threshing by the simplest machine will increase crop yield by 10%, the amount lost by animal sled and hand winnowing.

j. Tractors . The effective output of tractors and related equipment now on Egyptian farms could be increased by at least 20% through efficient machinery management. Roughly 40% of all tractor hours are spent on threshing,another 7-8% on lifting irrigation water. Using 65 H.P. tractors to power a drum thresher when a 10 H.P. stationary

engine and improved type of threshing equipment could do an even better job, is scarcely making efficient use of farm machinery. The same is true of tractor powering a saqia for water lifting when a 5-6 H.P. motor pump would deliver more water and faster. Today use of tractors and related equipment in field is limited to seedbed preparation. Substituting a disc harrow and a spike tooth harrow for the board drag now used for smoothing the seedbed after ploughing would eliminate one ploughing and produce a much better seedbed with no more tractor hours

k. Combine Harvesters are in common use only on state farms. This is suitable only for large scale farming.

l. Seed drills and planting machines are not often used in Egypt.

3.3. Farmers Needs for Agricultural Machinery

For mechanization to make an optimal contribution toward increasing the productivity of Egyptian agriculture, it is essential that improved technology be progressively applied. Some new types of equipment which offer particularly promising opportunities are:-

- A tractor mounted disc and spike - tooth harrow combination to improve the quality of seedbed preparation and reduce tractor time requirements for seedbed preparation.
- Tractor mounted row crop planter to provide better seed placement hence germination, and facilities mechanical cultivation of raw crops.

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- Self propelled mower - binders to permit more timely planting of crops following small grains.
- Thresher - winnowers to reduce grain losses and help relieve the peak season power and labour constraints upon timely performance of other cropping operations.

4.0. THE ROLE OF EIDDC

4.1. The Development of the Centre

The Engineering and Industrial Design Development Centre (EIDDC) was established in Cairo in 1968, as a joint project between the Government of A.R.E. and UNIDO. The second phase started in 1973, after the first phase was successfully completed.

The long range objectives of the Centre were to develop industrial products, strengthen the design capabilities within the country, and to assist in the development of a capacity for manufacture of capital goods equipment and tools.

In short the Centre was established to develop the national capabilities of the industry, to innovate and develop new products, processes and manufacturing plants i.e. development of the local ability to develop local technologies and products which were appropriate to the environment. Appropriate from the point of view of consumer customs and appropriate from the manufacturing process and local availability of raw materials. This would not stop the transfer of technology if this was appropriate and could not be developed locally.

The Centre , which is located on two sites in Cairo (Al Ahram Road), and Dar El Salam, has about 400 employees (sixty engineers, forty draftsmen, as well as 100 technicians, and skilled workers, as well as the administrative and supporting staff).

United Nations experts (UNIDO) and from time to time other bilateral aid consultants and short term experts.

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The Centre is headed by an Egyptian President. The centre was originally working mainly with the public sector companies, but lately has increased its activities with other joint venture establishments and with the private sector. Although the centre is still a national one, some work has already been done for other neighbouring states and still more requests are coming. At the end of 1973, the centre introduced a new system, i.e. all work is on a contract basis and against a nominal payment. The reason for the nominal payment system is to ensure additional inputs and to give the work a more businesslike character. These additional inputs are used now as incentives and for further development of the working conditions in the Centre. In the future, this payment system will be again developed to enable the Centre to retain skilled personnel and not loose them to higher paid companies.

In December 1973, the Centre also introduced the first specialized training courses; the first one was a course of tool room practice. Later on, the Centre continued to hold training courses in very specialized practical subjects, chosen according to the problems which the participants have faced in their everyday industrial practice. Due to their very practical orientation, these courses have proved highly successful. Therefore, the programme for the year 1982, included 32 training courses, apart from special requests.

The training courses are designed for about twenty-five participants, last for between one to two weeks, and are in very high demand. The participants come from various Egyptian factories, lately also from other Arab States and African States. Participation is against a nominal payment. The courses are prepared and held by Centre's staff and engineers. The languages used are Arabic and English.

The Centre also accepts engineers and designers for training on the job in various specialized fields. The duration of the training varies from two months to one year. The main fields of specialization are in the industrial engineering field. The centre has more than 1200 trainees per year at the moment.

The centre has acquired increased recognition from the companies and Government authorities due to the fact that the project has been well-formulated and the institutional framework is excellent. All personnel are working as a team in a very friendly atmosphere. The Centre has full understanding and support from the Government authorities as well as from the UNDP and UNIDO as well as different aid doners.

Due to the results reached by the Centre and increased demand for further development of it, the Government had decided to attach the previous institute for Small Scale Industries to the Centre. Therefore, as from 1st of January 1977, the Centre has had the two locations:

1. Dar El Salam Centre on the old road of Meady, a Cairo suberb (5 feddans)
2. Pyramids Institute, on the Pyramids Road (25 feddans)

Both sides are full staffed and well-equipped.. Further development of this centre is in progress for the development of the Egytian industry.

It has been mentioned in the Introduction that the Engineering and Industrial Design Development Centre:(EIDDC) was established in 1968 as a project between the Government of A.R.E. and United Nations. The second phase of EIDDC's project started in 1973. The UNDP/UNIDO input for the two phases was just under three million dollars.

The institute for Small Scale Industries (ISSI) which has been attached to EIDDC was also a joint project between the Government of A.R Egypt and UNDP, executed by International Labour Office (ILO). The ISSI's proejct started in 1963 and second phase in 1963; the ILO project was terminated by the end of 1969. The institute was then taken over by EIDDC.

The first phase of EIDDC's project had its main purpose to train designers in product development. Phase II of the EIDDC's project had as its main objectives : to develop industrial products design capabilities, to assist in development of manufacturing capacities and tool , and above all to assist in the development of capabilities for manufacture of processing or capital goods equipment. In phase one concentration was mainly on the engineering industries; in phase two, the network has expanded to other groups of industries. The work of EIDDC is following the main objectives although there are large demands for complementary activities in the field of industrial consultancy. The work plan

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has been continiously adjusted to be as close as possible to the changes in the Egyptian industry, and the growing demands. To fulfill the requirements and the main objectives, some new activities have been introduced: Plant layout studies. Heat treatment, and material tests, specialized short-term training courses, lectures, as well as technical documentation and information. Also, from time to time , some requirements from other developing countries in the form of specific assignments or training activities are accepted. The system of nominal payment for the work done by EIDDC is working satisfactorily. Presently, EIDDC has the following technical divisions:

4.2. EIDDC's Technical Division

1. Industrial Design Section
2. Product Design And Development Division
3. Processing (or Capital Goods) Equipment Design Division
4. Engineering (or Production Technology and Tool Design)
5. Plant Layout and Factory Planning Division
6. Workshop Division for Manufacture of Prototypes and Special Tools
7. Heat treatment and Material Division
8. Training Division
9. Documentation and Information Division
10. Small Scale Industries Development Program

Every division is strictly working in the field of its specialization . The Training Division has the task of organizing all training activities technically prepared and conducted by the specialized sections. Phase one and two of the project of the Institute for Small Scale Industry had as their main objectives to render services in the field of applied technical and economical research, development and implementation of industrial techniques, industrial consultation and management, as well as training and extension work. Concentration was on the Small Scale Industries and the Government, cooperatives and private sector. But since termination of UNDO, ILO assistance , the activity of the previous ISSI had concentrated on very limited training in the form of various training courses, mainly conducted for foremen, workers, and draftsmen. Therefore, the Government Authorities considered the better utilization of the previous investments and accordingly had decided to attach the ISSI to the EIDDC. Presently, the previous is working as a part of EIDDC having certain technical divisions and the management located at its premises. The World Bank/ILO project for "Industrial Guidance" is being implemented.

The work of EIDDC is progressing satisfactorily as is briefly reviewed in the following information:-

1. Industrial Design Division

Most of the consumer oriented products as washing machines, kerosene cookers, water heaters (electric), metal furniture, wood products, and furniture are designed here. All these products have found their way to the market Model making has been a new activity.

2. Product Design & Development Division

Through phase one and two, the main objectives were to develop the industrial products design capabilities within the country. Although it was a new activity in the country, results have been achieved and a well-established Product Design & Development Division exists. Similar design offices have been initiated in several factories. When phase two of the project was completed the design division continued to work without further assistance. Concentration in the future should be in addition to the existing type of design work, to help the industry in the proper transfer and implementation of documentations for sophisticated licensed products or main components. All engineering products in the transportation sector as trailers and in the building as brick making machines are developed here, as well as agricultural implements.

3. Processing or Capital Goods Equipment Design Division

This division has been established and a work plan initiated. Several studies and design work have been undertaken with appreciated results. At the present stage, there are still difficulties due to the fact that the needs of industry are mainly for complete projects (flow study , design and manufacture as well as in some instances technical supervision of erection and putting into operation). EIDDC is with its present objectives and capacities and activities limited to make the design and development. Extension of objectives and activities for development have included conveyor lines, silos and now a brick making plant.

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4. Engineering (orProduction Technology and Tool Design) Division

During phase one a good Engineering Division was established concentrating on process planning and tool design. Through phase two these activities have been continued and expanded to more complicated products and tools. Certain help was also given to companies to initiate the establishment of similar engineering offices. When phase two of the project was completed, the engineering division continued its activities without further assistance. Concentration in the future further involvement in design of more sophisticated production systems. This division has also specialized in developing designs for maintenance and service workshops.

5. Plant Layout and Factory Planning

Over the years a number of factories have been planned and now the techniques of production flow, technology choice, machine and tool specifications have been well-understood. The division has been able to design numerous projects which have been implemented. The latest factory has been one for the manufacture of water heaters (electric) for a private industry.

6. Workshop Division

A well-equipped prototype manufacturing workshop was established during phase one and more equipment and machinery added during phase two. The Government has also purchased a number

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of sophisticated pieces of machinery. An optical grinder and a spark errosion machine were the latest additions. The main task of the workshop is to produce prototypes of products as well as special tools. Several prototypes , special tools and special components parts have been manufactured and this type of work will continue. Concentration in the future should continue on manufacturing new prototypes and more complicated and sophisticated special tools. The latest prototypes included an agricultural thresher, a brick making machine, and a woodworking lathe. Many industrial companies now rely totaly on this workshop for their tools as a substitute to imports.

7. Heat Treatment & Materials Testing Division

This division has been extended recently after receiving the remaining required equipment. The laboratories are operating and the heat treatment workshop is extending its work. The main aim is to introduce proper heat treatment and material testing technology in practical work operations for manufacture of sophisticated component parts (for prototypes, tools, etc..)

8. Training Division

During phase two specialized short term engineering oriented training courses had been introduced in addition to training on-the-job of factories personnel. These activities are continuing with the aim to fulfill the demands

of factories. At first there were no special external inputs to these activities, except the participation of the existing experts and two courses financed through UNIDO Voluntary Contribution (Quality Control/Regional and In-Plant-Group Training Courses)for participants from East African and Arab Countries) as well as one bilateral (Management of Maintenance). The Centre had also conducted two training courses in Iraq, one regional on Industrial Product Design and one national on Tools and Dies Design and Manufacture. The previous Institute for Small Scale Industries also contributed with training activities. Taking into consideration the industrial development plan of A.R.Egypt and its aims , as well as the specific requests of neighbouring countries, further extension of training activities was very important. It was for this reason that a new project was started. The Industrial Training Advisory Services (ITAS). This project contributed effectively to the expansion of the training programme and in 1981 over one thousand engineers and technicians were trained. UNIDO provided experts, fellowships, and sophisticated training equipment.

ITAS II has now started in thecountry programme, and more equipment, training films and fellowships will further strengthen the training. some specialized experts will be called in.

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EIDDC is now to run the fifth UNIDO In-Plant-Training Programme for Industrial Design and Engineering starting 11. October 1982. Young engineers from all over the world will attend.

Only a small Information and Documentation Unit has been initated during phase two of the project without any direct inputs from UNDP. A well-organized and equipped Information and Documentation Unit is needed to meet the present and future requirements. Strengthening and expansion of these activities are part of future development schemes. U.S. AID will provide inputs under ITAP (Industrial Technology Application Program)

The two units at Dar El Salam and the Pyramids are being continiously strengthened, and ITAP will give considerable inputs.

The present stage of development of the industry in the A.R.Egypt further requires more sophisticated technical and managerial work aiming to achieve an acceptable economy of production. This work has to be done through:

a. Promotion of transfer and use of appropriate up-to-date technology.
b. Better utilization of capacities
c. Introduction of new products and/or production methods
d. Planning and/or replanning and organizing the plants
e. Introduction of up-to-date industrial management methods and systems

During the past period, EIDDC has been receiving requests in these fields, but due to the objectives, present capacities, it was not always possible to accept them. Only very few and more simple requests have been accepted. These assignments were left either to very expensive foreign consulting firms or for the future , on account of keeping the existing situation of production.

The industrial development policy of A.R. Egypt underlines the great importance of the rationalization of production as well as introduction of few production and industrial management methods and techniques. Therefore, the future development scheme of EIDDC has to have as its main task to fill the exis gap in the requirements of the industries and industrial development with introduction of industrial consulting and at a later stage, contracting services in the field of mechanical engineering for various industries.

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4.3. Some Design & Development Work

Although EIDDC was not originally geared towards design of Agricultural equipment and implements it has always considered this area to be of top priority and has exerted all efforts to contribute. Here are some examples:

a. Direct design and prototype building contribution. A number of products have been designed; notable examples are the IRI Thresher which was redesigned to suit local raw materials and of which a prototype was built. The building experience was quite instructive and many problems were met including the balancing of the drums. An IRI type motorized Archimides wheel was also produced. Here difficulties were encountered in impeller clearances.
Earlier brick making machine for making concrete bricks to be used in villages instead of Nile mud had been designed and built.

b. Indirect Engineering Support. The centre has been continuously supporting enterprises especially the smaller one by making tools, providing heat treatment services etc.

4.4. Indirect Support

a. The SSI extension program, now known as Industrial Guidance has been assisting private sector agricultural machinery producers to produce better products and raise the technological ability and productivity of their establishments. This WORLD BANK/ILO/EIDDC program has been very effective. Many new products have been encouraged.

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b. Training has been given to public sector feeding companies and also to the producers. No doubt some contribution has been made by this manpower development effort. UNIDO's ITAS Project has been of great help.

AXIAL FLOW THRESHER

A prototype of the axial flow thresher was produced locally in the EIDDC Engineering Workshop. The initial production model have been tested and evaluated in the farms. Experimental modifications are currently under test at EIDDC. The machine is developed for medium size farmers and for contract threshing operations. It can thresh paddy wheat, soya beams, and other small grain crops. Features of this machine are throw-in-feeding-axial movement of material, low power input, high separation , and cleaning efficiency. The machine is equipped with knives for making wheat bhoosa while threshing.

Features:

High output: One ton per hour when threshing paddy

Low horsepower requirements: 7.5 electric motor or engine

Low Labour Requirements: Three men to feed, thresh, and bag grain

Ease of operation: Simplicity of design reduces operation & maintenance problems

Threshing and Winnowing combined: Throw-in Threshing combined with the air and screen cleaning mechanisms.

Highly Mobile Can be moved behind small hand tractor , jeep or truck

Machine Specifications

Power: 7.5 hp electric motor

Weight: 500 kg

Length: 3 meters

Width: 2 meters

Height: 1.75 meters

Capacity: 1 t/h rough rice
0.5 t/h wheat

Separation recovery: 98% by weight

Threshing Drum: 700 rpm wheat
950 rpm rice
Fan: 1050 rpm for both wheat and rice
Adjustment: Angle of air deflector and engine speed
Labour requirements: 3 men
Prototype cost: 1000 L.E. for materials
375 L.E. ffor machining