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D00284



United Nations Industrial Development Organization

Distr.
LIMITED

ID/WG.40/4
8 May 1969

ORIGINAL: ENGLISH

Expert Group Meeting on Agricultural
Machinery Industry in Developing Countries

Vienna, 18 - 22 August 1969

DEVELOPMENT OF THE SUPPLYING AUXILIARY INDUSTRIES FOR
AGRICULTURAL MACHINERY PRODUCTION
IN A DEVELOPING COUNTRY - INDIA^{1/}

by

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id.69-2219

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SCOPE

This paper is intended to present a brief picture of the development of industries which supply the various requirements of the agricultural machinery industries in India. As these auxiliary industries cover a very wide field and the space allotted for this purpose being limited, this paper will cover only the following important industries:-

1. Agricultural Implements.
2. Diesel Engines.
3. Gasolene Engines.
4. Pumps and Motors.

And

5. Ancillary Industries.

In other words, the object is to confine this paper to the development of such major industries which provide the necessary components in the manufacture of agricultural machinery which is required for the mechanisation of farming in India.

INTRODUCTION

Among the various items of machinery required for mechanisation of farming in India, wheeled agricultural tractors may be considered to be the most urgent requirement. The experience gained over many years has shown that wheeled tractors of horsepowers ranging from 14 to 50 HP are necessary for the varying conditions of soils

in the country. In view of this, the manufacture of wheeled tractors has been established with an annual capacity of 30,000 tractors of horsepowers ranging from 26 to 50 HP. Action is also underway for the establishment of capacities for tractors from 14-25 HP and above 50 HP. The recent trends indicate a very steep rise in the demand during the coming years. It is anticipated that the demand may rise to about 70,000 tractors per annum by 1973-74 from its present level of about 30,000 Nos.. The production of tractors in India has reached a level of about 15,500 Nos. in the year ending March, 1969. In order to cater to the demand which has been in excess of indigenous production, imports of tractors have been allowed, care being taken to import only those models of tractors which are likely to be taken up for indigenous production in the near future. The tractor industry has been delicensed to enable the existing units to expand and for new units to be set up so as to meet the anticipated demand. Side by side, for increasing the availability of tractors through production and imports, the matching implements are also being produced in the country.

2. The total population of wheeled tractors in use in India to-day is about 86,000 Nos., of these, nearly 40,000 Nos. had been produced in the country, and the rest imported. These include a wide variety of tractors of different makes, models and horsepowers. While those under manufacture are as detailed later,

tractors of makes such as Fordson, Massey Harris, International Harvester, Ferguson, Allischalmers, Cater-Pillar, Steyr, Byelarus, Lanz, Hanomag, Oliver, John Deer, David Brown etc. in varying quantities are in use, the largest of them being the Fordson, Massey Harris, Ferguson makes.

<u>Sl. No.</u>	<u>Name of indigenous manufacturer.</u> M/s	<u>Type & Model</u>	<u>Horsepower</u>	<u>Foreign collaboration</u> M/s
1.	International Tractor Co. of India Ltd., Bombay.	B-275 International Harvester.	35 HP 4-cylinder diesel.	International Harvesters, UK.
2.	Tractors & Farm Equipment Ltd., Madras.	MF-1035 Massey Ferguson	35 HP 3-cylinder diesel.	Massey Ferguson, UK.
3.	Sicher Tractors India Ltd., Faridabad.	Standard model.	26.5 HP 1-cylinder air-cooled.	Sichers, West Germany.
4.	Hindustan Tractors Ltd., Baroda.	Zetor-3011	35 HP 3-cylinder diesel.	Motokov Czechoslovakia
		Zetor-50 Super	50 HP 4-cylinder diesel.	-do-
5.	Escorts Ltd., Faridabad.	E-37	34.5 HP 3-cylinder diesel air-cooled.	Motoimport, Poland.
		E-47	49 HP 4-cylinder diesel water-cooled.	-do-

3. In India, unlike in the developed countries, the tractors continue to be used for long periods. Many of the tractors in use are 15 to 20 years old.

This could attribute to a slower rise in demand. Since many tractors are of models which have become obsolete in their countries of origin, difficulties are felt for their upkeep and maintenance due to scarcity of spare parts. Even the tractors under development need some imported spares which have still to be developed. While efforts are being made by the ancillary industries to produce some of the spares for tractors not being developed in India, continuing dependence on imports and expenditure of foreign exchange is inevitable. This aspect is borne in mind while planning the imports of tractors. As far as possible, makes of tractors and spares thereof planned for development in India are being imported. For the maintenance of these tractors, import of spares are allowed to the traditional distributors of these tractors and, recently, to the newly formed Agro Industries Corporations, also. Imports are also allowed to the trade to cater to the odd models of tractors in use in the country. The manufacturers and importers of tractors have their distribution and after-sales service net work all over the areas where the tractors are sold. They provide repair facilities as well. While much has been done in this regard, this aspect of the organisation has to be strengthened and made more effective through more intensive training and the provisioning of more servicing equipment. The Agro Industries Corporations, in addition to their various functions, are also expected to set up such repair facilities all over the country.

This is possible for each Corporation to do within its own State. These facilities will augment those already provided and to be provided by the manufacturers of tractors.

4. The modest achievement the tractor industry has made so far, in spite of the difficulties it had to surmount, is noteworthy. While the volume of production achieved is not impressive from the standards of developed countries, it is significant to note that the indigenous contents, by value, achieved by the units, average about 75%. Attaining complete indigenisation as quickly as possible, has been necessitated by the difficulty in not having adequate foreign exchange resources. This has also contributed to lower volumes of production in the case of those units which can produce more but are dogged by uncertainty, inadequacy and untimely availability of appropriate currency not only for the importation of components and raw materials but also for imported plant and machinery much needed to enlarge manufacturing capacities.

5. The tractor manufacturers in India have, ever since they commenced production, maintained the quality of workmanship. They have given importance to quality control at all stages in the manufacture and this is noteworthy.

6. In addition to 4-wheeled tractors, the need for 2-wheeled tractors (power tillers) has also been recognised, particularly, in rice growing and hilly areas. Action is underway for the manufacture of the same. A small beginning has already been made and more units are likely to go into production in the near future. The annual demand for these power tillers is expected to rise to about 80,000 Nos. by 1973-74 from its present level of 20,000 Nos..

7. On the basis of this assessment, a number of proposals for power tillers have so far been approved for manufacture, detailed as follows:-

<u>Name of power tiller</u>	<u>Horsepower</u>
Krishi (Akitu)	5-7 HP <u>Kerosene</u> Diesel
Mitsubishi CT-85	8 HP Diesel
SATOH LB-17	7.5 HP diesel
KUBOTA KMB-200	10 HP diesel

NB: All the above are with rotavators.

8. While all these schemes were under consideration of Government, the Tractor Training & Testing Station at Budni, India, developed a power tiller fitted with a 5 to 7 HP petrol/kerosene engine, without a rotavator. Of the schemes approved, the production of 'Krishi'

power tiller continued. 'Krishi' tillers are now fitted with a lopper cooled diesel engine of 6 HP and their sales have also shown an upward trend, the production rate having gone up to 50 to 60 Nos. per month. The 'Mitsubishi' power tiller is likely to be taken up for production during 1970 by which time the factory, plant and machinery, trained personnel etc. are expected to be in position. Assembly from imported subassemblies has just begun. A small production of 228 Nos. 'Krishi' tillers has been achieved during 1968. In rice growing areas of Bihar, Orissa, Bengal, Assam, Andhra, Madras, Mysore and Kerala, the power tillers are now in greater demand than before. This was made possible by Government in introducing a few thousands of the above-mentioned models, in those States for popularisation. With these hopeful signs developing, with the bumper crops during 1967 and 1968, and with all the measures adopted by Government as outlined later, the demand for power tillers is expected to grow substantially in the years that follow.

9. The most popular type of power tiller seems to be the one with a diesel engine, developing 8-10 HP at a speed of 1500 RPM. The basic impediment in the acceptance of the modern power tillers is their high cost. The conventional animal power cannot be dispensed with unless the power tiller can prove its reliability, performance, economy, cheapness and versatility. The more prosperous farmers can

afford to invest in power tillers in addition to retaining the bullocks. The power tillers imported from Japan cost ₹ 1100 to ₹ 1200 to the farmers. In spite of the various facilities for hire purchase etc. now available, this investment seems too large for the majority of the small farmers to afford, particularly when the bullocks cannot be dispensed with. While they appreciate that it is more difficult and costly to maintain the bullocks, their usefulness in transportation on uneven and unmetalled village tracks weighs heavily in favour of their retention. Where transportation of farm inputs and produce is concerned, the power tiller may not be the answer in most parts of India on account of the condition of the village roads and tracks. A concerted development programme of this line of communication will have to be undertaken to enable the power tillers to perform this very important function and thus become popular.

10. Power tillers are more economical and speedier in operation. They can be used as the source of power for irrigation, threshing and other farming operations during the idle periods. They are rugged in construction and are the most suitable for the tasks they have to perform in paddy growing areas. With suitable attachments, they can perform a number of other functions. Diesel oil which is required is now readily available anywhere in the country side. The villagers are already familiar with diesel engine

operated pumps, etc.. All the same, an efficient after-sales service to the farmers is a prerequisite to further popularisation and acceptance of the power tillers by the farmers in general.

11. Petrol/kerosene engine operated tillers have not made their mark in Indian agriculture in spite of their lower initial cost and weight. They would, however, be suitable for use in hilly areas where their lightness will be the main criterion. To cater to this category of demand, some schemes are under consideration of Government. The type of power tiller developed by the Tractor Testing Station, referred to earlier, may satisfy the requirement.

12. A 'Krishi' Diesel tiller made in India is being sold for about ₹ 700 while an imported tiller costs between ₹ 1100 and ₹ 1200. The 'Krishi' tiller, though originally of imported design, has over 90% indigenous content. The only components being imported are some bearings, roller chains, tyres and tubes, and tiller blades, which are being developed in India. Most of the raw materials required for production of the power tillers are available in India.

13. The Government of India have taken various measures for the speedy development of agriculture and to achieve this, they have also provided various incentives to the farmers. A few of these are

enumerated as follows:

- a) extending credit facilities to farmers by commercial banks, Agro Industries Corporations, Cooperative Societies, Land Mortgage banks, and other financing institutions.
- b) Hire-purchase system by the Agro Industries Corporations etc..
- c) Foreign Exchange and Rupee loans to industries to augment their manufacturing capacities.
- d) Minor irrigation and lift irrigation schemes.
- e) Production of fertilizers and pesticides.
- f) Development of hybrid varieties of seeds and their distribution to farmers at subsidized rates.
- g) Procurement of food grains by Government and, thus, ensuring remunerative prices for farm produce.

14. These incentives coupled with to-day's higher purchasing power of the farmers, have created a suitable climate and the demand for agricultural machinery and, in particular, tractors, has risen appreciably.

15. The production of agricultural tractors, power tillers and other agricultural machinery is largely dependent on the various auxiliary industries. The succeeding paragraphs of this paper are, therefore, devoted to those major auxiliary industries which are essential for the growth of the main agricultural machinery industries. It may be mentioned, in this connection, that no attempt has been made to cover the industries which are auxiliary to the food processing industries.

AGRICULTURAL IMPLEMENTS

This section is confined to the agricultural implements industry related to tractors and power tillers and excludes the manually operated or animal drawn implements. The latter implements have been fully developed in India and have been and continue to be the mainstay in agriculture. Their place in the Indian agricultural economy will continue to rank high for many decades till mechanisation spreads into the remotest parts of India.

2. Ever since tractors were introduced in India, the need for tractor drawn implements and for their repair has existed. It is only in the post-independence (after 1947) period that the tractor population has grown. With this growth, the tractor drawn implements industry has taken shape and established itself particularly in areas where the tractors are popular and concentrated. In the Indo-Gangetic Plains of the

North and some areas in Madhya Pradesh, Rajasthan, Maharashtra and Gujarat, the tractor population has grown substantially. Likewise, the implements industries have also kept pace in those areas. It is significant to note that most of the implements industries are established without foreign collaboration. The most popular of these implements are the tine tillers, disc harrows, off-set disc harrows, disc ploughs and the mould board ploughs. While some of the tractor manufacturers manufacture matching implements, by and large, the largest production is from the many small units in the small scale sector. With the availability of steel and the necessary fabricating machinery indigenously, this industry has grown in size and has supplied the growing needs without recourse to imports. The springs, cutting edges, hardware and the discs are now available from indigenous production. Some special roller bearings are required to be imported at present for the production of disc ploughs etc.. The industry in the small scale sector has confined its activities to the production of these basic tractor drawn implements. The tractor manufacturers, on the other hand, are manufacturing a wider variety of tractor drawn implements. The same are listed as follows:-

1. Tine fillers with and without depth wheels.
2. Seeding attachments of tillers.
3. Subsoilers.
4. Low volume sprayers.

5. Mounted Offset Disc Harrows.
6. Trailing type of Disc Harrows.
7. Ridgers.
8. Furrow Mould Board Ploughs with or without bar point.
9. Furrow Disc Ploughs.
10. Paddy Puddlers.
11. Paddy Millers.
12. Multipurpose Blade Terracers.
13. Cultivators.
14. Cage wheels.
15. wheel weights.
16. Fertilizer Distributors.
17. Seed-cum-Fertilizer attachments.
18. Draw bars.

3. In recent years, the units in the small scale sector have also taken up the production of attachments to tillers for seeding and fertilizer distribution which are becoming necessary in modern farming operations. They have also initiated action in the development and production of tractor drawn reapers, harvesting machinery such as threshers, cleaners, driers etc..

4. Recently as part of the Crash programme, the Government of India, organised the imports of a wide variety of tractor mounted harvester combines, reaper binders, potato planters and diggers, rice transplanters, fertilizer spreaders, power threshers, forage harvesters etc.. The object is not only to popularise them in

agriculture but also to give an opportunity to the industries to examine the feasibility of their production in India. This is also with a view to providing the means for speedy harvesting of crops, a necessity that has arisen out of the introduction of high yielding seeds, intensive agricultural schemes and the use of fertilizers. The last two seasons have drawn attention to the need for mechanisation of harvesting operations particularly in large holdings due to the non-availability of adequate and suitable labour and the rising costs of such labour. A speedy harvest reduces damage to it from rodents, pests and inclement weather conditions which are responsible for the destruction of appreciable quantities of the grain produced with such toil. The introduction of these modern aids to farming are bound to increase the net return per acre and thus help in increasing the investment and endeavours of the farmers. Incidentally, the demand generated by this will create new opportunities to the industries to diversify their production. The results of this 'experiment' will be known during the coming years.

5. While modernisation of farming in India has begun, efforts have also been made to establish industries for the manufacture of ~~XXXX~~ special types of implements and machinery. Power Harrows, Rotavators, Mounted Combine Harvesters, Seed Planters, Potato Diggers, to name a few, have already been approved

for manufacture. The manufacture of Discs for tractor drawn implements has also been established. The type of High Carbon Steel Sheets required for their production is also likely to be available from our steel plants by the end of 1969. Various Governmental workshops and institutions are constantly endeavouring to make improvements in the design of implements and to add to the existing range, new types of implements, machinery etc..

6. Statistical data is not available to indicate the year to year progress made by the implements industries but it may safely be assumed that at least 70 to 80 million worth of implements are being produced annually at present for supply to the tractor owners. The production of implements during 1967-68 was about 5000 Nos.. The demand for implements has a direct relation to the demand for tractors and an average increase of 20% each year can be safely assumed. Nearly half a tonne of steel for each implement is required. At least two implements are likely to be needed per tractor. In other words, steel to the extent of 30,000 tonnes would be required during the year 1969-70 for new supplies. In addition, there would be replacements to be catered for. The implements industry being largely steel oriented, its future requirements in the form of mild steel sections, castings, forgings and high carbon steel plates will rise steeply in the next four to five years. While

the steel, foundry and forging industries are well established and can meet this demand, the supplies from the steel plants are being organised so as to ensure a regular and adequate availability of steel raw-materials particularly High Carbon Steel Plates, to the implements industries.

7. The export performance of implements industry has been as under:-

<u>Year</u>	<u>Value of exports in \$ million.-----</u>
1965-66	0.079
1966-67	0.081
1967-68	0.079

8. The import of conventional implements like those produced by the indigenous industry is not being allowed. Special types of implements not yet developed in India are being allowed for purposes of development and for actual use. The total imports of such implements were as under:-

<u>Year</u>	<u>Value of imports in \$ million.-----</u>
1965-66	0.306
1966-67	1.120
1967-68	0.546

9. The implements industry is now in a position to export its products. Regional cooperation in this field will be beneficial to India and to other developing countries. Implements can be manufactured to suit the requirements. Joint ventures in the establishment of manufacturing units in the developing countries are also possible.

DIESEL ENGINES The subject "Diesel Engines" embraces a very wide field of the Indian economy such as lift irrigation, power generation, marine applications, mobile equipment, agricultural equipment such as tractors, earth moving machinery, locomotives for railways etc.. Particularly, in respect of the small scale sector, data on the production in that sector are not clearly known. The type of diesel engines produced in that sector are generally of the horsepower range up to 10 HP and include both vertical and horizontal engines. This paper is largely based on the present trend of production and demand and also takes into account the effect of recession that the industry had suffered and the possible break-through the industry would be making in the future years. The estimates included in this paper also take into account the requirements for exports. The estimates of requirements have been worked out in the various horsepower ranges that are likely to be required in the foreseeable future.

This does not, however, exclude the possibility of import of certain types and sizes of diesel engines which have not been planned for manufacture and which are required for replacement purposes for very special types of equipment imported into the country. In other words, this paper is confined to the diesel engines that are likely to be required in the various sectors of the economy, both for internal consumption and for export and for meeting the original equipment requirements of the various engineering industries which are dependent on the diesel engine industry.

2. The production of Diesel engines in the organised sector (excluding the small scale sector) from the year 1961 onwards, is furnished below. Figures in respect of the small scale sector are not available.

<u>Year</u>	<u>Production in Nos.</u>
1961	44,482
1962	42,835
1963	55,540
1964	69,172
1965	85,577
1966	107,153
1967	116,651
1968	116,358

(Note: The above figures are applicable to the organised sector only.)

3. The annual requirements of diesel engines and the tentative requirements by the year 1978-79, are shown below:

<u>Year</u>	<u>Requirements for</u>	
	<u>Industrial & Agricultural purposes.</u>	<u>Marine and other purposes.</u>
1969-70	249,250 Nos.	750 Nos.
1970-71	273,975 "	1,025 "
1971-72	294,800 "	1,200 "
1972-73	308,625 "	1,375 "
1973-74	327,450 "	1,550 "
Tentative requirements by 1978-79	442,900 "	2,100 "

(Note : The above data excludes the requirements of Diesel engines for motor vehicles.)

It may be mentioned in this connection that the bulk of the requirements have been assumed to be for lift irrigation for use with pump-sets and other agricultural requirements. The 3-10 HP range of engines are generally used for irrigation.

4. In so far as engines up to 350 HP are concerned, adequate capacities have already been established to take care of the existing demand in the country. Out

of the existing capacities, certain exports, particularly in the ranges up to 40 HP have already been established and it is hoped that in the future years both the quantum and the ranges of horsepowers would increase.

5. With regard to the range above 350 HP, capacity is also being established very shortly for the manufacture of high horsepower engines. In addition, engines suitable for diesel shunters and locomotives would also be available in adequate quantities from the railway production units. The requirements for marine engines, both for small crafts as well as for large ones, is also being catered for by the units.

6. With regard to the gaps between the demand and production, it may be stated that such gaps are only related to those in other sectors e.g. there would be a growing requirement of diesel engines of high horsepower for earth-moving equipment, construction machinery and drilling rigs. Such items of drilling, earth-moving and construction machinery have to be manufactured in India for which there may be gaps at present, which have to be filled up. In so far as diesel engine industry is concerned, it is felt that this industry is now in a position to diversify its production to match the requirements of the other engineering industries.

7. The main requirements of raw materials for the manufacture of diesel engines are:

- a) Pig iron.
- b) Forging steel.
- c) alloy steel.
- d) Special steels.
- e) Ancillary components.

Efforts are being made to meet the growing requirements of the Diesel engine industry both for meeting the internal demand and for exports. Sizeable exports of engines for irrigation have already been established. The industry is capable of expanding its production, to cater to the needs of the other developing countries in the ESCAPE region.

GASOLINE ENGINES

Gasoline engine industry relating to applications other than automobiles has been in existence for the past 10 or 12 years. The production in this field has been confined to engines of horsepowers from 1-7 HP. Engines, of both 4-stroke and 2-stroke varieties and in air-cooled versions, are now being produced. The rate of growth of this industry has not been phenomenal like that of the diesel engine industry. The farmers' preference for diesel engines has indirectly affected the off-take from this industry. In certain areas gasoline engines

are still in use in India for driving pump-sets in agriculture, but, this is limited. but, the use of 1-2 HP Gasolene engines on insecticide and pesticide spraying equipment is becoming increasingly popular with the more prosperous of the farming community. The Gasolene engines also have a potential demand for use on power tillers where light weight is the criterion, particularly, for use in hilly areas. With the popularisation of power tillers in this agricultural sphere, the demand for these engines would grow. Some of the power tiller manufacturers may develop their own engines if it is economical to do so. The following data give an idea of the production achieved and the likely demand during the next few years for Gasolene engines of above 2 HP and those of 1-2 HP, the latter required for powering knapsack sprayers:-

<u>Year</u>	<u>Production</u>	
	<u>Above 2 HP</u>	<u>1-2 HP</u>
1961	917	-
1962	736	-
1963	2297	-
1964	8383	-
1965	10832	-
1966	7421	3359
1967	12328	16356
1968	10627	12843

Estimated demand

Year.	above 2 HP	1-2 HP
1969-70	18,000 lbs.	30,000 lbs.
1970-71	26,000 "	40,000 "
1971-72	35,000 "	50,000 "
1972-73	45,000 "	60,000 "
1973-74	50,000 "	60,000 "

2. The engines of 12 HP, 2-stroke air-cooled variety have also been developed. Efforts are being made to cover the gap between 7-12 HP also with air-cooled engines. Outboard gasoline motors are also likely to be taken up for production in the near future as the demand for these is also developing. Special importance is being given to enlarging the production of 1-2 HP engines for sprayers for which the demand is expected to grow substantially during the next few years. One of the manufacturing units of these engines is already capable of producing 2,000 engines per month and can step it up further, depending on the demand. Additional capacity in this field may also be created in the near future. This industry also has attained a very high degree of indigenisation, the only items required to be imported being the magneto and the carburettor. Even these items are being developed by the engine manufacturers themselves or by other ancillary units.

3. These Gasolene engines have a wide variety of applications, apart from those in agriculture. In course of time it is expected that they would be used in various portable machinery such as portable saws, portable pneumatic drills etc.. They would also be required in increasing numbers for portable generating sets particularly for use in remote areas.

4. This industry will continue to cater to the needs of the agricultural machinery industry as the use of such Gasolene engines in agricultural applications cannot be ruled out altogether.

PUMPS & MOTORS

Power Driven Pumps constitute one of the most important items of machinery required by almost all the industries and particularly in the field of agriculture for irrigation purposes. A large range of Power Driven pumps such as centrifugal, rotary, reciprocating, turbine, axial flow, propeller, submersible etc. are being produced in India. While the major portion of the total production in the country is from the organised sector, a sizeable production of some 100,000 pumps is estimated from the small scale sector. Unlike in other engineering industries, the growth of the pump industry has been quite rapid during the last few years. The estimates included in this paper also take into account the requirements for exports. No attempt has been made to indicate the requirements in terms of sizes of pumps

or their exact types, but, the requirements have been broken down on the basis of the end use.

2. While the bulk of the production relates to pumps required for irrigation, handling water and sewage, a small percentage is required for other special purposes. Even for special purposes, efforts are being made to diversify the production and meet much of the internal demand as is possible with existing resources. In so far as irrigation/water handling pumps are concerned, high capacity pumps delivering upto 3,60,000 litres per minute have been planned for production. If there is any gap to be filled, it will be only in respect of the very special types of pumps for handling corrosive liquids with varying conditions of temperature, concentration, viscosity etc..

3. A statement showing the production of pumps from the year 1961 is shown below:

<u>Year</u>	<u>Production (in Nos.)</u>
1961	1,24,674
1962	1,28,883
1963	1,61,592
1964	1,73,434
1965	2,18,507
1966	2,93,304
1967	3,42,056
1968	3,31,119

(N.B. The above figures do not include the figures of production in respect of the small scale sector.)

4. The following figures indicate the import of Power Driven Pumps during the three financial years viz. 1964-65, 1965-66 and 1966-67:

<u>Year</u>	<u>Quantity (in Nos.)</u>	<u>Value in \$ million</u>
1964-65	5,187	2.61
1965-66	6,313	3.56
1966-67	4,453	3.14

5. A statement showing the estimated requirements of pumps during the next ten years broken down into various end uses, is also furnished as follows:-

<u>Year</u>	<u>Water handling for irrigation etc.</u>	<u>Other special pumps.</u>	<u>Total</u>
1969-70	395,000	5,000	400,000
1970-71	420,000	10,000	430,000
1971-72	455,000	10,000	465,000
1972-73	485,000	15,000	500,000
1973-74	520,000	15,000	535,000
By 1978-79	600,000	16,000	616,000

6. From the foregoing data, it may be seen that the bulk of the requirements fall in the category of irrigation/water handling pumps. It has been estimated that the demand for pumpsets for irrigation alone may be of the order of 0.3 million numbers during 1969-70 and it is likely to increase progressively during the

subsequent years. The figures of requirements indicated in the statement, on pre-page, also include those which are likely to be exported. Sizeable exports have already been established particularly in the range of irrigation pumps, both centrifugal as well as turbine and a substantial increase in the exports is visualised during the fourth Plan.

7. As regards the requirement of turbine/submersible pumps for irrigation purposes, it is estimated that about 5500 State (deep) tubewells would be constructed during the Fourth Plan. Some turbine/submersible pumps of 10" diameter and above would be required for installation of these tubewells. In addition, the Fourth Plan envisages installation of 0.3 million lbs. private (shallow) tubewells. The cultivators generally go in for centrifugal pumps (volute type) for installation for these tubewells. However, it is expected that during the Fourth Plan a large number of private tubewells may be constructed in various regions where the groundwater table is very deep and, hence, installation of turbine/submersible pumps may be preferable. It is, therefore, estimated that about 10 to 15% of the total number of private tubewells may be installed with turbine/submersible pumps during the Fourth Plan.

8. Some State Governments have now been evincing interest in construction of high capacity tubewells yielding 3 to 5 cusecs. A sizeable demand, therefore,

is likely to develop for high capacity turbine/ submersible pumps during the Fourth Plan. Quite a large number of high capacity pumps of various types would also be required during the Fourth Plan for lift irrigation from rivers, streams, lakes etc.. These requirements, however, can be met from the existing capacity by suitable adjustments in the manufacturing programmes.

9. The basic facilities for the production of pumps are available in the country, but, it may be necessary to import the know-how for the production of pumps made of special types of alloys and castings required for handling corrosive fluids.

10. Separately, the Diesel engine industry has already commented upon in this paper. Regarding Electric Motors required for Pumps, these are abundantly available in horsepower ranges required for irrigation and deep-well pumping. Monobloc pump-sets are very popular in the lower ranges in irrigation and their production is being increased rapidly.

11. Sizeable quantities of pump-sets, electrical and diesel engine driven, are available for exports to the neighbouring countries of the SAARC region. The pump, electric motor and diesel engine industries are well developed in India and are capable of being expanded rapidly to cater to the internal

demand and for serving the needs of agriculture in other developing countries. Establishment of joint ventures for the production of these essential items in agriculture would also be possible.

ANCILLARY INDUSTRIES The ancillary industries supply the essential components and spares to the automotive, agricultural tractor and internal combustion engine industries. The ancillary industries are the backbone of the automobile, tractors, power tillers, engines, earth-moving equipment, and implement industries. The establishment of these industries in India dates back to the early fifties when the automobile industry began to take shape. A beginning was made with the establishment of the piston-ring-pin and fuel injection equipment industries to cater to the requirements of the automobile industry on the one hand and the engine industry on the other. The diesel engine industry which had already been in existence for some time in meeting the needs of agriculture in a limited way, had to be expanded. In the automotive field, the era of dieselisation had begun and a rapid change-over from petrol to diesel engine driven commercial vehicles was taking place. Besides, the needs of the petrol engine fitted equipment such as cars, trucks, scooters, three-wheeled vehicles, motorcycles, material handling equipment etc. had to be catered

for. The industrialisation particularly in these fields was taken up almost simultaneously and to sustain them and to assist their growth, the ancillary industries had also to be established. Initially, there was a cautious approach to investing in this new and untried field but it did not take long to realise the benefits and the future that these industries could guarantee. From the year 1956, these industries covering a wide range of products involving varied technology and processes were established in spite of the difficult foreign exchange position which came into focus then. The Government's liberal licensing of these industries and foresight, coupled with foreign assistance and collaboration, was responsible for the rapid establishment of these industries. To-day, it may be stated with satisfaction that this industry has come into its own and is in a position to cater to the varying needs of the agricultural machinery industries. To give an idea of the growth, the following data on the value of the production and exports, yearwise, is furnished in respect of some of the ancillary industries which directly cater to the automotive industry:

<u>Year</u>		<u>Value of production</u>
1965	..	\$ 60 million
1966	..	\$ 80 "
1967	..	\$ 110 "
1968	..	\$ 120 "

<u>Year</u>		<u>Value of exports</u>
1963	..	\$ 0.16 million
1964	..	\$ 0.22 "
1965	..	\$ 0.65 "
1966	..	\$ 0.82 "
1967	..	\$ 1.30 "
1968	..	\$ 1.60 "

2. The following is a brief outline of the products the automobile ancillary industries have developed and supplied to the tractor, engine and implement industries:-

1. Pistons, Pins, Rings.
2. Cylinder Liners.
3. Gaskets.
4. engine Valves.
5. Fuel Injection Equipment.
6. Filters and Filter Elements for fuel, oil and air.
7. Fuel and oil liners, hoses.
8. Roller Chains.
9. Flywheel Ring Gears.
10. Water Pumps and Parts.
11. Lubricating Oil Pumps and Parts.
12. Radiators.
13. Bimetal Bearings and Sintered Bearings.
14. Fan Belts.

15. Starter motors, Dynamos/Alternators, Voltage regulators.
16. Ignition Coils, Spark Plugs, Breaker Points.
17. Clutch Assemblies and Driven Plates.
18. Clutch facings and Brake Linings.
19. Brake Equipment and parts.
20. Ball joints, steering linkages, and steering wheels.
21. Axle shafts.
22. Ball and roller Bearings.
23. Oil Seals, King Pins.
24. Valve Springs, Laminated Springs and Miscellaneous springs.
25. Wheels and rims.
26. Head, Tail, Plough lights, Electric Horns, switches.
27. Panel Instruments.
28. Sheet metal parts.
29. High tensile Hardware.
30. Jacks, servicing equipment and tools.
31. Special Automotive castings and forgings.
32. High carbon Discs for agricultural implements.
33. Batteries.
34. Tyres & Tubes.
35. Cables and wires.
36. Grey Iron & S.G. and Malleable castings.
37. Forgings.
38. Steering wheels and gears.

3. In most of the ancillary industries, well-known foreign collaborations have been sought and these have helped in establishing the industries expeditiously and in attaining high standards in quality and performance. The high quality of the tractors made in India is largely attributable to the quality of the components and parts supplied by the ancillary industries, as well.

4. The ancillary industries need, for their sustenance and growth, a large variety of steel raw materials, copper and copper products, long staple asbestos, alloy steels, nickel shots, chromium and other alloying metals, special steels, tin, lead, special steel rolled sections and cold rolled sheets, etc.. Most of these are to be imported though some may be available in limited quantities from indigenous production. The tractor and power tiller industries are bound to draw heavily from the ancillary industries in the years to come. In developed countries, the ancillary industries supply most of the needs of the equipment manufacturers. In India, though, initially, some of the equipment manufacturers had to manufacture some of the ancillary items under their own roofs due to the nonexistence of certain industries, the present trend is to off-load those items to the ancillary industries.

5. The ancillary industries would have to expand particularly in the following fields to cater to the rising demand:

1. Pistons, Pins, Rings and Cylinder Liners.
2. Fuel Injection Equipment and parts.
3. Electrical equipment such as Starters, Dynamos etc.
4. Clutch assemblies and Driven Plates, and parts thereof.
5. Ball and Roller bearings.
6. Engine Valves, Springs etc.
7. Wheels and Rims.
8. Gaskets.
9. High Tensile Hardware.
10. Automotive castings.
11. Automotive forgings and their heat treatment and machining.
12. Gears and Shafts.
13. Steering Gears.
14. Hydraulic equipment.

6. High production and special purpose machines, Heat-treatment plant and improved machines for the foundries have already been taken up for production by the indigenous industries. The machine shops in the tractor and engine industries will have to be modernised and augmented. High frequency induction hardening machines, crankshaft and camshaft grinders, gear shavers, spiral bevel gear generators, spline

grinding machines, broaching machines, jig borers, are some of the important machines needed to increase capacities. The machine tool industry can and has to play a vital role in the development and growth of the agro based industries.

7. The importance of the adequate and timely availability of steel raw materials to these industries needs no emphasis. The steel mills in India are already endeavouring to supply the needs of these industries. The needs of the tractor, implement and engine industries are comparatively small in respect of special and alloy steels. The ancillary industries, on the other hand, would require special steel raw materials in increasing quantities.

8. In addition to the industries covered earlier, a mention has to be made of other industries which contribute to the growth of agriculture in India. The manufacture of Drilling rigs required for drilling of tube wells for irrigation, has also been undertaken. This industry is making rapid progress. Side by side, the manufacture of steel pipes and core drills, has also been established.

9. Sprinkler irrigation is yet another field in which production of sprinkler heads, light weight pipes, fittings and control valves has also been undertaken. This is at present popular in tea gardens and coffee estates. Many of the progressive

farmers with large holdings are beginning to take to this mode of irrigation to conserve water resources. The pumpsets required for the purpose are easily available.

10. Numerous industries are supplying the rubber hoses (suction and delivery) required for pumping where portability is a necessity. The plastic substitutes for rubber hoses are also gaining in popularity.

11. For the transportation of agricultural inputs and produce, the trailers required for use in conjunction with tractors, are available abundantly. The necessary wheels, bearings, axles, tyres, brake equipment etc. are available from the ancillary industries. Trailers upto 3 ton capacity are the most popular for use with tractors of upto 35 HP. 5-ton capacity trailers are used with 50 HP tractors. Trailers are available in 2-wheeled and 4-wheeled versions with tipping arrangements. Tipping gears are also being made in India.

12. A special mention must be made regarding the foundry and forging industries in India. Every machinery contains certain portion of castings and forgings. Basically, they are either to be of iron & steel or non-ferrous metals. In the case of stationary machinery,

generally, various types of cast iron are being used as the base, but, in the case of moving items, other types of Malleable castings, Spheroidal Graphite Iron & steel castings are increasingly used. Why a certain type of casting is used instead of the other, is mainly dependent on the economies of production and functions etc.. Therefore, by and large, with modern techniques, the steel castings, wherever they are used, can be replaced by malleable castings and wherever malleable iron castings are used, can be replaced by spheroidal graphite iron castings which are popularly known as S.G. castings.

13. India has a very well developed and organised foundry industry. By and large, every conceivable type of cast iron based castings up to 50 tonnes can be cast in the country. In the case of steel castings, sufficient capacity has been planned to cover the requirements of mild steel and low alloy steel castings. A few small foundries have specialised in the manufacture of heat resistant, stainless steel and other medium and in some cases low carbon content alloy castings. For making steel castings, the capacity already installed is about 200,000 tonnes per annum. This capacity, indicated above, is mainly for sale to public. A word of explanation here may clear what is meant by sale to public, i.e. these steel casting units which are expected to sell

their products to various consuming industries. There are quite a few major units which are having their own captive casting facilities, which is not reflected in the figures given earlier.

14. Whether it is ferrous or a non-ferrous casting, the techniques of moulding used in India are as given below:-

- a) Sand casting.
- b) Permanent mould casting.
- c) Shell moulding.
- d) Gravity Die casting.
- e) Precision casting by various processes.
- f) Investment casting.

15. In ancient India, very highly intricate and accurate castings were being made, mainly, in non-ferrous alloys by what is known as the wax process. The modern counterpart of this technique is called the investment casting. All the above types of casting techniques are fairly well developed in the country and the units in the country are geared up for almost all types of casting jobs needed in the building of plant and machinery.

16. As in every developing country, in India also, steel forgings by drop forging method was the order of the day. Therefore, to begin with, there was hardly any capacity for the manufacture of sophisticated types of heat treated die forgings to meet the exacting requirements of the automotive industry, diesel engine industry, earth-moving equipment, machine tools and other machine building industries. For the past few years, about 10 units of medium sized capacities capable of handling closed die forgings and ferrous alloy steels have been established. The die making capacity to feed the recurring requirements of the forging units, has also been created to a major extent. The pattern of development of these die-shops is that they are an adjunct to the main forging units though they are also catering to the general requirements of various other units. Since the gestation period for a sophisticated forging unit of medium capacity is about 4-5 years, sufficient capacity for the steel forging is planned to meet the requirements of the industry in general.

17. Non-ferrous forgings are also needed in the manufacture of internal combustion engines, tractors and other machinery. A small, but good, beginning has been made in this direction and some of the smaller sized non-ferrous forgings are being

manufactured at present in the country.

18. Against the total capacity of 120-130 thousand tonnes of steel forgings per annum installed in the country, the quality forgings are about 30-35 thousand tonnes per annum. Even though India is not fortunate in having sufficient production by way of non-ferrous metals with the exception of aluminium, by and large, all the raw materials that are required for ferrous iron & steel castings are available in the country. Similarly, most of the plant and machinery required for the above industries, excepting a few items like heavy forging equipment, are being manufactured in the country, progressively. The equipment required for mechanisation of foundries is also becoming available.

19. The capacity to manufacture various types of aluminium based alloy and copper based and other non-ferrous based alloys is well developed in the country. In addition to this, capacities have also been established for the production of various non-ferrous sections, including rods, wires, tubes, pipes and flat sections. In the case of aluminium, even aluminium foils are being manufactured, including the foil stock required for its manufacture.

20. India is now at a stage where it can give expertise in the manufacture and establishment of various types of iron & steel foundries for

malleable and spheroidal graphite iron castings
and steel castings in other developing countries.
India is also in a position to export, substantially,
various types of castings, rolled products & steel
forgings required for the machinery industries.



THE VIEWS EXPRESSED IN THIS PAPER
ARE MY OWN AND NOT NECESSARILY
OF THE GOVERNMENT OF INDIA.

K. S. PRABHAKAR

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