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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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PROBLEMS OF MANUFACTURING AND MARKETING AGRICULTURAL MACHINES IN DEVELOPING COUNTRIES[1/]

by

H. Nichtern
Manager of Agricultural Engineering
Steyr-Daimler-Puch A.G.
Steyr, Austria

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1/ Introduction:

In the development of the world population there will be an increase from 3 1/2 millard to 7 millard people in a time of approximately one-third of a century. This fact leads to the conclusion that our task is "to feed a second world"[1] in the next years. In order to do this, it will be necessary that the developed and the developing countries work together in a real partnership. Only if both partners work on this task with full interest and with all the possibilities they have, we will be able to realize the sentence from a well-known writer "give the people a proper breakfast and you will have saved the peace in the world".

The main task is to feed the people. This can only be done by an increase in the agricultural production. It is known that the agricultural products should be produced in the same country where the demand for food is. This is an important fact for the economic policy, because the increase of agricultural production will also bring labour for the people and the labour will bring the money to buy other products. The circulation of economy is a basical prerequisite for a successful agriculture and a constant increase in the gross income of the population in developing countries.

First of all, the rais of the agricultural production is possible through the cultivation of the high yielding varieties. These varieties require more fertilizer and deeper cultivation

1) M. Hewitt: "Feeding the second world", Moline 1966

of the soil in order to provide better growing conditions. With the usual animal tractive power, it is not possible to reach the necessary working depth with the ploughs and other implements of the soil preparation.

Those above-mentioned points show that there are essential connections between the increase of agricultural production and the agricultural machine industry. At the same time, there are remarkable differences between the agriculture and the agricultural machinery in the agricultural - industrial - and serviceable societies.

As is known, the gross income per head will increase from the agricultural to the industrial society on the one hand, and from the industrial society to the serviceable society on the other. This is the reason why the Government of the developing countries are interested in setting up industries as soon as possible. On the way to the industrial society, the first step must be to maintain a successful agriculture with a high efficiency rating. For this development, agricultural machines are necessary. Consequently, the setting up of an industry producing agricultural machinery is one of the first steps on the way to an economy comprising an industrial infrastructure. At the same time, it should be regarded that a well-established ancillary industry will be important for the increase and the output of the farm machinery manufacture.

In the discussion about the "Problems of manufacture and marketing agricultural machinery in developing countries" the above-mentioned thoughts and

ideas connected with them have to be taken into consideration.

The notes in the following chapters are based on the experience of the famous Austrian tractor manufacturers, STEYR-DAIMLER-PUCH A.G. in several developing countries whereby the author has had the possibility to make special observations in Iran, Iraq and Lebanon in 1974 and in India and Thailand in 1975. So it is easily understandable that most of the observations and conclusions are referring to the tractors and their implements. Of course, there are other possibilities and conditions in regard to the marketing and production of other goods in developing countries, e.g. for processing agricultural products such as rice, sugar cane and other crops.

2/ Marketing and Manufacturing

2.1 Definitions:

First of all, it might be helpful for the further discussions to define what the main difference between the developed and the developing countries is. In appl. 1, the attempt has been made to show the increase of and the relationship between production and demand in both countries. While in developed countries the demand for economic products will be lower than the production, the situation in developing countries is vice versa. This general rule is true only for the total economy, for a special product a developing country may potentially produce more than the demand is in this country, without solution of the other problems, which are important for a developing country.

Marketing means to comprehend, as well as to open the market. Therefore, it is necessary for a successful economy that all branches of economy subordinate themselves to marketing and to support it. This holds good for the section of product - development as well as for the manufacture, service, distribution, sales and all the other departments.

2.2 Observations:

Someone might think, that marketing is only necessary for products in countries where there are rather satisfied markets, where it is essential that new ways of distribution and advertising are securing additional sales. Especially in developing countries, where the progress of a

century should take place in a few years, it is necessary that the whole economy is planned in general. Such a programme has to involve comprehension of the needs, estimation of the demand, possibilities of manufacturing as well as education of the people, training of the dealers, the further schooling of the workers, and the further development of economy on the whole and especially of the described products and branches.

2.) Steps in building up a market:

From the point of view of manufacture and since the branch with the highest investments being a very important one, - we have to distinguish between the

steps before the production, sometimes it is called pre-investment phase;

steps of production, it means the manufacturing period;

steps after production, this phase is a prerequisite for a successful long-lasting production.

All these three steps are not accurately separated because there are many gradual transitions and one phase supports the other. Therefore it is necessary to study one phase after the other.

3/ Steps before the production

3.1 Market Research:

Every study of a market, especially of a developing country has to be seen for a long period, as a long term programme and as a section of the total economy. Moreover, it should be regarded that one has to look at the development during the time as well as of the position in the economy. What this means may be seen at the diagram app. 2 and 3. The diagram (app. 2) shows the curve of growth of economy, being different for the same branch under various societies. While in the one society, a branch might be on the increase, it is in a phase of decrease under different conditions. App. 1 gives an example of the usefulness and the accuracy of a long-term programme, namely the four Five-Year Programme for tractors in India.

3.2 The general pattern of Agriculture:

The general pattern of agriculture is the basis for further conclusions, for doing planning work with farm mechanisation. The basic figures are given as an example in app. 4 (General pattern in India 1968) and [illegible] (Statewise agricultural dates of India).

In the following paragraphs, the essential figures of agricultural statistics, which are necessary for fundamental planning are pointed out.

The examples (Table I are taken from two countries India and Thailand, which have been important for the international worldwide planning of farm mechanisation, which has been done by international organisations such as FAO and UNIDO on the

one hand and by banks (Asian Development Bank Worldbank etc.) and private manufacturers of agricultural machinery on the other.

Table I: General Pattern of Agriculture

	INDIA		THAILAND
A. Natural Distribution of Land:			
Total area	326.8	mill.ha	51.4
Cultivated area	158	"	9.5
Irrigated area	26.16	"	2.06
Percentage compared to total cultivated area	16.6	%	21.7
Forests	61.1	"	27.1
Net area sown	137.8	"	
Area sown more than once	20.2	"	
B. Distribution of Land according to the size of Holdings:			
Nos. of holdings	50.7	mill.	3.09
Average size	2.63	ha	3.35
Nos. of holdings ≥10 ha and more	2.293 1)	mill.	0.174
Percentage compared to total Nos.holdings more than 10 ha	4.7	%	5.8
Cultivated area belonging to the holdings over 10 ha	38.6	mill.ha	
Percentage compared to total cultivated area	28.7	%	

1/ India more than 10.117 ha
Thailand more than 9.5 ha

C. Land distribution according to crops (Major crops: 1965/66)

	1.000 ha	Percent. of cult. area (1158 mill/ha)	Aver. kg/ha	1.000 ha	Perc.of Cult.area	Average kg/ha
1. Grain:						
1.1 Cereals:						
Barley	2.551	1,6	895			
Bejra	11.428	7,3	315			
Jower	17.181	10,9	436			
Maize	4.683	3,0	989			
Ragi	2.198	1,4	594			
Rice	35.022	22,2	874	6.545	69,1	
Small millets	4.331	2,8	370			
Wheat	12.798	8,2	838			
Total cereals	90.192	57,2	690			

1.2 Other grains:

	INDIA			THAILAND		
	1.000 ha	Percent. of total cult.area	kg/ha	1.000 ha	Percen. of total cult.area	kg/ha
1.2 Pulses:						
Grain	7.849		566			
Tur	2.402		703			
Other pulses	11.199		347			
Total other grains	21.450	13.5	467			
Total grains	111.642	70.7	647	7.495	79	

	1.000 ha	Percent. of total cult.area	kg./ha	1.000 ha	Percent. of total cult.area	kg./ha
2. **Oil seed**						
Ground nut (in shell)	7.171		561			
Sesamum	2.456		166			
Mustard	2.891		439			
Limeseed	1.765		186			
Castor	356		200			
Total oil seed	14.639	9,3	416	435	4.6	
3. **Fibre**						
Cotton	7.827		108			
Jute	748		1.079			
Mesta	1.244		699			
Total Fibres	9.819	6,2		550	5.8	
4. **Miscellaneous**						
Sugar cane (gur)	2.749	1.7	4.304			
Potatoe	473		8.227			
Tobacco	345		792			
Rubber				70	0.7	
Fruit				540	5.7	
Garden crops				365	2.8	

	INDIA		THAILAND
D) Human population:			
Total population	511,115	mill.	31.5
Agricultural population		"	
Economically active population total	207.539	"	
Percentage total population	40.3	%	
Economically active population agriculture	145.319		
% of economically active population	70	%	78
Annual rate of population growth	+ 2.6	%	
Annual rate of agricultural growth	+ 3.5		
Relation of agricultural population growth compared to rate of population growth	+ 2.4	%	
Population density ha cultivated area	3.6	No./ha	
Number of active agricultural population per ha cult.area	1.0	No./ha	
E) Cattle population			
Total cattle population	363.0	mill.	6.69[1]
Cattle of every 100 ha cultivated area	230	No.s/100 ha	70[2]
Draft cattle	175.5	mill.	6.0
Buffaloes	51.2	"	
F) Farm labour			
Economically active agricultural population	130[3]	mill.	
Man latour capacity a year	3510[3]	mill.man/hrs.	
Percentage of cultivators	75	%	
Percentage of land labourers	25	%	
Wages for men	Rps. 2.5-2.75		Bath
Wages for women	Rps. 1.5-2.5		Bath

1) including water buffaloes
2) difference to point D
3) calculated by 2.700 man hours annually, 3.510 milliard = $3.51 \times 10^{}$

Besides those basic figures of general agricultural statistical dates further particulars such as usage of fertilizer, irrigation systems and so on are valuable items of information. All those statistical figures have to be seen not only as a snapshot, but as a background of the past and in the view of the future. This statement has an influence both on the agricultural pattern and on the farm mechanization dates. That is why official plans worked out by the Government experts for instance the Indian "Fourth-Five-Year Plan" have to be studied seriously by all who are engaged in planning works for developing countries.

One important point, which was shown by table I, is, that the classification of the statistical datas should be the same both for all developing countries and developed countries. When we come to this stage, it is possible to make comparable surveys of the agriculture and the farm mechanization in the developing countries. Furthermore, those prerequisites are necessary to get the full advantages out of the experience, which have been made in developed countries for the planning in developing countries. Therefore it is necessary that an "Agricultural Survey" published by UNIDO in 1969, will soon be accepted by the members.

3.1.2 The Pattern of Farm Mechanization:

The main points about the usage of statistic figures have been stated in the previous chapter. Here only the specific datas we need for further planning are enumerated.

In app. 6, the diagram shows the development of the total population of tractors in INDIA up to the end of 1968. The zonewise distribution of tractors is as essential for the general pattern of agriculture-especially for the distribution of crops - as it is for the statistical work

concerning farm mechanization. App. 7 shows, that the highest density in relation to the tractor population is in the states Punjap, Uttar Pradesh, Rajasthan and Gujarat. From the point of view of "Holdings per tractors" Punjap leads before Rajasthan, Uttar Pradesh and Mysore, in the classification "acre per tractor" Punjap is followed by Uttar Pradesh and Assam.

This short comparison shows the value of the statement of specific figures for the planning in marketing - especially for the distribution of the products, the selection of the dealers - and service network - and the manufacture.

The following table containing statistical datas of farm machinery is based on the 4-wheel riding tractor; its primary and secondary figures refer to the product - specific substitutes (draught animals, man labourers, power tillers etc.) The tertiary figures refer to the ranges of application. These latter are especially seen in the connection with the several tractor-trailed and tractormounted implements. The economic structure, the financial situation, the income of the future buyers (solvency, indebtedness) and the possibilities of credits are stated by the quarternary data.

Table II: Pattern of Farm Mechanization

3.1.2.1 Primary figures, Product "4 wheel-Riding-Tractor"

		INDIA		AIDC-UNIDO FACT FINDING TEAM FIGURES 1)
a) General figures:				
Tractor population	1968	80.000	units	168.000
Annual sales (present potential)	1968	19.000	"	32.000
Indigenous production assembled		14.000	"	22.000
Import		5.000	"	7.500
Importrate		26.3	%	
Annual growth for --- years			%	2) 5
Estimated demand	1970			55.000
	1975			115.000
production	1970			
	1975			60.000
Uncovered demand	1970			
	1975			55.000

b) Specific figures

	Units and percentage (%) 1) of actual saes			Estimated demand
1) Distribution of Horse Power classes				
	1965	1968	1970	1975
24 - HP and below				
25 - 34 HP				
35 - 50 HP			40.000(72.8)	
50 - 59 HP				
60 - 69 HP			15.000(27.2)	
70 - 89 HP				
90 -109 HP				
110 HP and more				
total:			55.000	115.000

Footnotes:

1) including 12, 1968/1969 visited Asiatic countries

as: Taiwan (Cluta), South-Korea, Philippines, Indonesia, Singapore, Malaysia, Ceylon, Thailand, Iran, Pakistan, India, Napal

2) Annual increase of tractors in Thailand 5 - 10% during 5 years.

b_2) Distribution of tractors referring to the cultivated area:

This relative figure (app.7) is our check point for the density of the tractor population and for the necessity of the foundation of new dealing centres. For the better purpose, the zonewise distribution has to be specified. Sometimes it is helpful to specify the product-units to other basic figures such as ha of arable land (ploughs), irrigated land (pumps), grassland (mowers), cereals (combines) or tons of crops (processing machines) etc.

b_3) Distribution of tractors referring to holdings:

As is shown in App. 7, it is helpful for further recommendations that in the phase of market research also the population of tractors related to Nos. of holdings is figured out for the total area as well as for several regions. In addition to these figures, also the population of tractors and its development in relation to the sizes of holdings is of interest. But those figures are usually not available in developing countries

3.1.2.2 Secondary figures "Substitute for the Product"

For marketing and manufacturing 4-wheel-riding-tractors it is necessary to compare the market situation with the substitute for labour (see phase 3.1.1 General Pattern of Agriculture). The figures of Human Population "(Actual working population, Man labour hours) and "Cattle Population" (Nos. of Draught animals) have also been collected and classified like the general and specific datas of agriculture (heavy tillage work) crawlers and power tillers (doing cultivating and plant-protection work). The same system as has been pointed out in Table II (General and specific figures) is available also for this substitute for tractors as they are crawlers and power tillers. For being able to recognise the connection between the ancillary industry (manufacturing of engines) it is necessary to know how the market for diesel engines has developed in the different horse-power classes.

3.1.2.3 Tertiary figures: "Range of Application"

The implements of agricultural and light industrial usage are of interest for the tractors in connection with the range of their application. The agricultural equipments in developing countries usually are in the first place one- and two- axle trailers, tractor trailed implements, ploughs, harrows, cultivators, seed distributors, fertilizer spreaders, sprayers and dusters as well as tractor-mounted implements.

For the product planning as a whole, the percentage of the working period, during which the tractor is used stationary as a substitute of stationary diesel engines on the one hand and as an automotive product on the other, is of great interest. For this reason the figures of stationary engines are also needed as mentioned under the secondary datas.

For all those groups of implements the market research has to figure out the amount of population, distribution, sales, (indigenous production, the assembly and the import) and the demand for the next years and for a period of 5 or 10 years. When estimating these figures, the expected development of agriculture, forestry, but also the development of the trade-exchange with foreign countries, important for the production, have to be regarded as a whole.

3.1.2.4 Quarternary figures: "Economic figures"

In order to estimate the real expectations of tractor sales, it is not only necessary to know the demand for the product, the possible substitutes, the sizes of the markets (now and in the future, national and international) but also to explore the economic figures of the product and of the buyers.

In order to get the economic figures of tractors, we have to regard the usual number of annual working hours, the period of using them in years, the costs of running the tractors (per hour, per year) in relation to the horse-power of the tractors. Besides the prices of the competitor and the suitable market price, the market research has to solve the problems of conditions and customs of sales. These problems comprise also the possibilities of credits on the market in general and specially for those products. The financial capacity of the presumptive buyer and of the chosen dealer as well as of the dealer and the workshop which is to be selected, is of great interest.

3.2 Product Research

The market research is the basical prerogative for the product research. While the market research, which has to procure all needed statistical figures, sees the demand of the product (in figures) it is the task of the product research to look for the n e e d s of

the product. Product research has to analyse the product, its demanded specifications, its applications and to compare the product or products with their possible substitutes. In order to comprehend all aspects of the subject, that have been seen so far, they have to be closely considered. It means that at the beginning of a product research, the problems have to be analysed and the solution of the problems have to be stated.

3.2.1 <u>Problem Analysis:</u>

It seems to be strange that somebody is asking for the problems in the developing countries, while everybody who has ever been in such countries, knows, that they are full of problems. To be sure it is necessary for all technical development to analyse the typical problems and to find their possible solutions under the various conditions and circumstances. If we know various solutions, we have to criticise them and to find the best or at least one of the best of them. Let us visualize at an example:

Is it really the task of the farming industry in developed countries to sell or produce tractors in developing countries? The author thinks, that "The feeding of the people" should be the problem number one. It is mentioned with interest that "feeding of the people" and not the production of crops is the basical problem, which is to be solved. In the latter case it is particularly an agricultural question. In the former one, the social side of this question, the problem of the policy of population is as important as the agricultural problem.

Therefore the task of "family planning" is really the most important one in the whole plan of the growth of

of the economy in developing countries. The building of the Nagerjun Sagar Dam of the Great Indian Irrigation Project in Andhra Pradesh, took about 11 years. With this irrigation system it is now possible to irrigate up to 4 million acres yearly, that means that there is the possibility of feeding 4 million people. In the same period of time, i.e. in eleven years, the increase of the population in India was approximately 60 million people. Surely, there have taken place also other projects of land reclamations, nevertheless, it is obvious that it is not possible to solve the problem of "feeding the second world" only by solving the agricultural problem alone. It can only be done hand in hand with "family planning". Obviously this is not a question of farming machine industry, but it should be stated here, that the decrease of the birth rate is the primary prerequisite for an improvient of an economy

In Table III the attempt is made, to give a rough survey of the problems, their influences, their solutions and the scope of applications for the products.

Table III: Problems of Farm Mechanisation (scheme of decisions)

(Example for Fieldwork in Agriculture)

Main-Problems	Detail-Problems	Sort of Products for drafting	Sort of Products for working implement	Applicat. of Products for				Influences for the selection of the products
Feeding the people	Land reclamation	crawler 4-wheel driven tractors industrial tractors spade lug	grading pitching levelling draining irrigating	x	x	x x x (x)	x x x (x)	sort of soil soil conditions surface of soil working depth water content of soil slope datas of climate size of fields sort of crops and fruits varieties of cultivations size of hollings seasonal working area time and duration of the working the use of machines (individual-community or co-operativ possession, hire work, leasing) distances of fields distances to the market (distance and time of transportation) quality of the roads density and quality of sales- and service-network lifecycle of the product
	soil cultivation	draft animals (cattles, buffal.	ploughs (moulboard-, discpl.	x		x	(x)	
	soil preparation	2-wheel-tractors (power tiller	harrows disc harrows cultivators rotary hoes	x x (x) x x x		x x x x	x	
	irrigation	4-wheel tractors (riding tyie, 2-wheel driven	pumps		x	x	x x	
	distribution of seeds, fertilizers and manure	4-wheel-driven tr. (riding type)	drillmachines fertilizer distributor manure spreader	x x x x x		x x x	x	
	plant protection work		sprayers duster	x x		x		
	harvesting		mowers rakes combines tractor-trailed tractor-mounted	x x x x x x x x		x x x	x	

Feeding the people	harvesting		combines, self propelled	x	x					motives for buying the products prices of the products and their substitutes condition of credits
			threshing machines		x		x			
			baters	x	x					
			forage harvesters and other harvesters for other special	x	x				x	
			loading equipment (self loading trailer)	x	x				x	
	transportation		1- or 2-axle [illegible]	x		x			x	
			frontloaders		x			x		
	processing		milling-machines		x		x	x		

These are surely other decision-schemes possible too. This example should only show how the multiple views and multilateral connections could be brought together to guarantee, that all points of importance are taken into account for the final decision of the further analysis of the product, the sales, the production and the service.

3.2.2 Product Analysis

After defining the detailed problem and selecting the special product, the selection and specification of the product is to be made while paying attention to the possibilities and techniques of the application. Following this trend of thoughts the fixing of the main criteria of the products will include also the technical comparison to competitors of the same and different kind. competitors of the same kind mean products of the same sort, but products of other producers. Competitors of a different kind are different products like a heliocopter-duster in comparison to a tractor mounted implement. Another example of competitors of a different kind may be the steam plough (Dampfpflug) compared with the tractor-mounted plough. For the selection of a product, the following reasons are decisive:

3.2.2.1 Methods of Application:

If, for instance, the depth of the soil that must be worked for the cultivation of high yielding varieties makes a change of the kind of soil cultivation and the application of more horsepowers necessary it is not useful to substitute tractors of 25 HP or less for water buffaloes. This deeper reaching soil cultivation, especially that of heavy soil but also under paddy conditions, requires greater capacity of work than that being used on an average until now. Especially the modern successful p.t.o. driven implements have a demand on a performance of 30/35 hp on the p.t.o.

3.2.2.2 The Evaluation of the Products

Besides the technical comparison as mentioned at the beginning of this chapter (3.2.2. Product Analysis) and the durability under several conditions - being proved in separate tests - the evaluation of a product is of greatest importance for the selection of the type. With immediate connection to the sales price the individual price, that is the price per HP tells by its relative co-efficient price/HP the particulars about the evaluation of a product in comparison to other similar products (Please see app. 8)

3.2.2.3 Further technical development:

As it has been pointed out before, it is essential for product planning, especially in developing countries, that plans are not only including a few years. They always have to comprise a long period. In a long term programme it seems sometimes to be reasonable that a stronger or a smaller type of a tractor or of another vehicle might be interesting for the market. From the point of view of the production and the service, it is correct to start from the beginning with a stronger type. If it is expected to produce more than one model, this type might be preferred which in a system of manufacture of standardized units gives the possibility to use a lot of components for both types. Also it is of interest that most of the power equipment of the factory may be used for manufacturing both models.

The product analysis has also to include the life cycle of a product in regard to the different economic structures. As it has been shown in app. 2 "Curve of growth in the economy", the life time and cycle of a product might be different in the agricultural society than under industrial conditions.

3.2.2.4 Tests of the products

The approval of the product decision is obtained if a sufficient test under the local conditions is passed positively. This test has to include the labatory test as well as the field test. As the regulatives for the labatory test are the same all over the world it is possible to save time and money to make this test wherever it is possible to give the figures of the test report. Those are the criterie, for instance, for a tractor report:

performance of engine and power-take-off
oil consumption
drawbar pull in the different gears
lift capacity of the hydraulic
and the testing of the technical datas of
the leaflet and operator's handbook

The testing rules of OECD defines exactly all these datas of the test report and it is therefore not necessary to check the same figures once more. There are conditions to be fulfilled for the practical test with farming equipment. The special conditions in developing countries makes it necessary for both, the producer as well as the consumer and, acting for him, the authorities of the Government. This practical test is particularly useful for tractors which are using indigenous produced implements. Those implements have been developed for the special local conditions but they are not always suited for the high speed work with tractors. It is also possible that new methods and implements have to be tested. These are some reasons why those tests are to be welcomed. But it is not necessary that a limited time has to pass until the general licence is given, because it is reasonable to test these specified implements in different regions and therefore quite a number of tractors are necessary. Usually it is not possible

for official testing stations to do such testing work by their own. Therefore the programme of the field test has to take place in a sort of team work between the manufacturer being a private Company and the official testing station.
After the tests same parts of the product and some additional equipment have to be changed in order to be successfully applied under the special conditions in developing countries. At this stage the product research, that is to say product analysis, is finished.

3.3 Sales Analysis

The main problems of the sales and service are to be treated as stages after the production. But there are a few questions which have to be decided before the production is made. On the basis of market or product research decisions have to be made on the following items:

- annual and total figures of sales, classified in the various types
- statement of the monthly delivery in the different zones of the market
- desirable share in market.
- calculation of the product price in regard to the price structure under the various stages of production (different shares of indigenous and imported products) distribution (different costs of transportation) service and advertisement
- ascertainment of the motives for buying
- selection of dealers in regard to the distribution and service programme

The other items concerning sales are discussed under 5.1 Distribution of the Products.

3.4 Production Analysis:

Most of the facts which are needed for this point are treated in the sections Market Research, Product Research and Sales Analysis. If the sales programme

(total figure, annual and monthly demand) is fixed, the effective programme of production is easily made. Besides the estimated sales production figures respectively, the part of indigenous components and the share of products, which are manufactured by the supporting ~~(founding, forge)~~ and the ancillary industry are of importance.

For all other items, please see section 4,"Steps of produdtion". Under this heading only those questions are mentioned, which already belong to the pre-investment stage, that means the pre-production phase.

3.5 Service Analysis

Just as in sales and production, a series of considerations have been made in the scope of service before starting the production and making investments for manufacturing. Therefore, a few remarks are made here as to this subject, it has to be pointed out, that during the testing time of the tractors and implements it is possible to choose the first dealers and workshops for setting up a service network, therefore it is necessary to send a serviceman with excellent agricultural background to the new market. This programme is based on the figures of the sales and production analysis.

Along with the service analysis the training programme for customers, dealers and workshops could be planned.

4. Steps of Production

4.1 1st Stage: Collecting Experiences

In order to get experience with the qualification of a product on a new market, the product has to be tested under various conditions and in the total range of its application. In the case of tractors, they have to work with various implements of the same specification as are intended for the later delivery. To save time, internationally certified test reports should also be approved by the

Governments in developing countries. Usually there is an agriculturally skilled service engineer present at the practical test.

4.2 2nd stage: Setting up a service network

It is the task of the service engineer to put up a widespread service network for the future sales organization. In doing so, primarily already existing establishments are to be improved and intensified. The task of the service engineer will also be to train the future salesmen and their staff at the dealers' shop and the mechanics in the workshop. A detailed plan of workshops and service stations is to be set up to make sure, that the product including the necessary implements is being taken care of by the service.

4.3 3rd stage: Setting up a Factory

The local Company which is to be founded for the purpose of setting up a factory, has to establish a factory that can produce the estimated annual numbers

4.3.1 Phases of the Manufacturing Programme

Since it is impossible that full output of the factory is obtained immediately, a time table with steadily increasing figures of production is to be made. This plan has to consider the share of indigenous components as well as the share delivered by the ancillary and supporting industry. The particular phases are:

- the planning of the factory;
- the setting up the buildings;
- the installation of an assembly line;
- the purchase of machines, tools and jigs;
- the technical installation of the mentioned apparatus;
- the procurment of the available indigenous raw materials;
- import of the raw materials and units which are not available at the time;
- inquiry and adaptation of brought out finished (B.O.F.) which are available in the native country and their procurment;

The phasewise progress of the production will be introduced by the assembly of semi-knock-down components. During this time, the assembly line will be established and will be

the first step of manufacturing. Next in the programme the products could be assembled with the help of complete-knock-down components and it could be completed with an increased share of indigenous products.

4.3.2 Ways of Manufacturing Industrial Products

Basically there are three different kinds of manufacturing are possible:

4.3.2.1 Manufacturing the Products by Way of Assembly Line

This way, the stage of production will be reached soon, the required capital is not very high and the organization of production is not too difficult either. This kind of industrialisation has a further advantage for the developing countries namely that they always have the latest standard of world-wide technical development. There is no need of running a production any longer than there is demand for it on the market, and the product is competent. Considerations of calculation of using installed machine tools and jigs have not been decisive for the decisions to manufacture the product. The difficulties in promoting this system of manufacture are that in some of the developing countries there are not enough hard currencies available for an unlimited trade. This has to be improved if some progress is to be made, in this request. Perhaps it would be more profitable for the economy of those countries to develop other branches of their economy in order to get hard currencies to buy the needed farming equipment. The manufacturing system namely the assembly line, is the best for countries with an limited annual market and where from the point of view of the production figures it is not essential to investigate a lot of money for buildings, machine tools and jigs. But this system is also used in the first stages of the manufacturing programmes in several other countries, where a product, designed and developed abroad, is to be taken up by the manufacturing programme.

4.3.2.2 Manufacturing Products in Small-Scaled Industries

From the point of view of investments, the next step would be to manufacture the product in small-scaled industries. This is possible only for simple farming implements. To do this with complicated products, a tractor, there would have to be an excellent teamwork between the associated manufacturers. For the beginning this co-operation of small-scaled industries seem to be the most suitable form of industrialisation in developing countries. They are spread all over the country and therefore provide agricultural people with money. This is of special interest for the industry of farming machinery because it needs a population of farmers with a reasonable income to buy farming machines. But there are two main difficulties in this kind of manufacturing. The one is the quality and the other the quantity of the delivered products. It is known, that in industries where the standard of the skilled workers is not very high, the quality of the produced goods is not as good as it is to be expected. So the control has to be strict. But anyhow the risk that the intended programme cannot be fulfilled is rather high, even higher than it is in the large-scaled industry where the responsibility is laid in one hand.

Caused by the above-mentioned facts, the second difficulty is that the total production figures and the temporal condition cannot be determined accurately. That this is really a great problem, App. 9 "Tractor licence and -production in INDIA 1969" shows. Even tractor manufacturers that are known all over the world are not able to produce the total number of tractors in the licenced capacity in places where there would still be an increasing demand for agricultural tractors. The main problems that of the lack of quality and quantity may explain parts of the arguments, that show why there is such a gap between demand and delivery.

4.3.2.3 **Manufacturing Products in Large-Scaled Industries**

This is the most comprehensive stage of manufacture. It is valuable from the technical point of production and installation as well as from the view of investment. The advantages and disadvantages of the other two stages (Assembly line and manufacturing in small-scaled industries) become obvious by the characteristics of the manufacture in large-scaled industries. Because this system of production is the most complicated one and since it is the last phase in the development of the manufacture, it has been chosen as the basis for the further descriptions and investigations.

4.3.3 Manufacturing Facilities

In the following chapter, the facilities which are needed to set up a factory and to manufacture more complicated farming machines, for instance, a tractor in the form of large scaled industry are described. The items are pointed out without declaration of value, because this would depend on a lot of facts, which cannot possibly be discussed in the frame of this paper.

The particular items of the manufacturing facilities are:

4.3.3.1 Land: Size of area and value

4.3.3.2 Buildings: Size and value of factory buildings such as machine shop
press shop
hardening shop
painting shop
assembly and finish
tool room
checking laboratory

Size and value of ancilliary buildings such as:
transport shop
material shop
office furniture and machines

canteens, locker rooms, fire protection
first-aid post etc.

4.3.3.3 Machines, vehicles etc.

Machines
technical installations
technical and commercial equipment
vehicles

The sort, numbers and values, they are divided into two groups:
locally produced and imported ones.

4.3.3.4 Tools and jigs:
The sort, numbers and values, they are divided into two groups:
locally produced and imported ones

4.3.3.5 Supply of Water and Energy: Demand and costs

4.3.4 Demand of material for Manufacturing the projects:

For planning and calculating the production, the knowledge of the demand is essential. In the plan we have to distinguish between the figures of weight and value. The principal layout could be the following:

4.3.4.1 Raw Material:
It must be distinguished between ferrous and non-ferrous metal.
To the group of ferrous metal belong:

unalloyed steel in bars and pipes,
alloyed steel in bars and pipes
steel plates
bastard plates
sheet
steel casting
spherical graphite cast iron
malleable cast iron and,
grey cast iron

The iron ferrous group comprises:

bronze, aluminium, copper
fuels, oils, greases
paints and colours
auxiliary materials, textiles etc.

4.3.4.2 Brought Out Finished (B.O.F.)

This item includes all parts which are purchased as ready made products and which are being put together during the assemblage. Those are usually products delivered by the ancillary industry or, at the beginning of the manufacture.

4.3.4.3 Grand Total of Material:

For the overall plan, one must point out the total amount of raw materials and BOF in the above-mentioned specification.

4.3.5 Technical and Commercial Assistance:

This assistance has to be seen from the point of view of the complete training programme. Like the stations of the product it can be divided into:

4.3.5.1 Training the Consumer

4.3.5.2 Training the Dealer and the mechanics in the workshop and,

4.3.5.3 Training the Men in the Production and the Salesmen

While the training of the consumers, the dealers and mechanics has to be carried through at the holding or the stop on the one hand and at the factory on the other, the training of the men in the production - and the salesmen is possible in the factory as well as at the parental Company. That is why we must distinguish between the training under local conditions and the training abroad. In the latter case, the return air tickets, the travelling expenses, possible medical and other expenses usually paid by the daughter Company while the expenses for the training and the accommodation

is taken care of by the parental Company.

4.3.5.4 Foreign advisers

When the full plan, as described in section 4, is being worked out, the partners of the developing land have to send at least three experts, who must be employed at the indigenous Company for the time of its foundation. The task of these three advisers (commercial, technical and service) is to work out the detailed plan for the service network, the import, the workshop, the assembly line, the complete factory and the financial problem. In co-operation with the indigenous collaborators, they have to choose the location of the warehouse, the assembly line and the factory. The service adviser is responsible for the testing of the machines and implements as well as for the basic work of setting up a service network. 60% of the salary of the foreign experts is to be paid in hard currency. Taxes and duties are paid by the indigenous Company. For the rest, the terms of employment will be settled according to the local customs

Essential seems to be that during the time of co-operation the advisers should be employed by the daughter Company. The Governmental authorities should not try to shorter the time of the presence of the advisers. The author thinks that it would be favourable to a successful co-operation, if advisers of the parent Company were always in leading positions of the indigenous Company, because they are always necessary for sending new products and for introducing them. Naturally in a real partnership between developing and developed countries, there are always new products that would be interesting for the market in the developing area.

4.3.6 The selection of the Location of the Factory:

For the selection of the location, the following aspects have to be taken into account, unless existing factory

can be completed.

- traffic conditions important for receiving the goods necessary for the manufacture and for the distribution of the products;
- price for the ground and the costs for supplying the factory with energy and water;
- existing ancillary and supporting industries;
- existing auxiliary means;
- the sales to be expected;
- the facilities of labour and
- the conditions of living for the working people

4.4 Prices of the Products:

As it has been pointed out under 3.3 "Sales Analysis", the prices have to be competent. To gain one's end one has to calculate seriously. The regulation of prices, which function automatically makes it obvious that at least 15% of the products have to be exported. Generally, it is accepted, that the wholesale price ex-factory should be lower than the CIF price of the products.

It has to be mentioned here that the expected reduction of the prices for delivery under semi-knock-down (skd) and complete-knock-down (ckd) conditions cannot be realized, because there are additional costs for collecting, transporting, controlling and preserving the goods. The expenses for the package is at least twice as much as the savings made at the assemblage.
The following items are usually necessary for the calculation:

Ex-factory price
Margin for the dealer
Delivery charge

total = customer's price without taxes

The ex-factory price is composed of the following costs:

Raw material
B.O.F.
Material overheads
Labour for production
Labour for assembly and painting
Royalty
Sales expenses such as advertising costs manipulation before delivery and the profit.

Besides it is only fair that a lump sum is paid for the furnishing of drawings and other technical documents. It is a habit to pay this lump sum as well as the royalty in hard currency.

4.5 Financing the Manufacturing Project

When the Company is being founded, the intended composure of the capital, the volume of the paid up and the authorised capital is being fixed. The founders pay their share of the share capital in the currency of their country. In addition to these own means, the method of raising loans from national and international banking houses is to be used. The remaining financial requirements for the business capital and the floating capital should be secured on the national financial market.

Since usually it is not possible for manufacturers of small countries in the developed area to finance those developing projects by themselves - the co-operation with those companies is of special interest, for the developing countries, because they are more flexible and more easily mancurveable than the big companies. Of course, the contract with international organization for technical assistance such as FAO and UNIDO on the one hand and the international banking establishments such as worldbank, IFC (International Finance Corporation) and ADB (Asian Development Bank) on the other is necessary.

4.6 The Time-Table of the Manufacturing Project

To control the progress and the co-operation in the several phases of the manufacturing programme, a detailed time-table is necessary. This time-table is a prerequisite for the proper functioning of the manufacturing programme.

5. Steps after the Production

A few statements concerning the subjects sales and service have been made in chapter 3, "Steps before the Production" at the section 3.3 "Sales Analysis" and 3.5 "Service Analysis". Further detailed facts are pointed out presently.

5.1 Distribution

5.1.1 Channels of Distribution:

Especially in developing markets, when new products are being introduced, the right channels for distribution are essential. The proper place of the dealer in relation to the market, (Please see app. 7 "Tractor Distribution 1966 in India") is as important as his mental attitude and his financial possibilities. It seems to be an advantage for the dealer to trade with agricultural products. It is even better for the sales if the dealer also makes credit business. The best thing might be the combination of

selling agricultural machinery,
purchasing agricultural products,
running a workshop and a stock of spare parts and,
making credit business

All those characteristics are given by some of the agricultural co-operators.

The channels of distribution have to take into account the national market as well as the international one. Especially, the export business has to be observed from

the beginning, because it takes longer to develope it.

5.1.2 Payment and Financing of the Products

As it has been stated in 3.2.2 "Product Analysis" (Choice of the Product) a lot of the tractors are sold on a credit basis to farmers who are doing hire work. Therefore the possibilities of credits for purchasing farm machinery is very important. Those credits are not available on a private basis, therefore a well developed credit system established by a teamwork of banks and Governmental authorities is one of the prerequisites for a successful selling of farming equipments.

5.1.3 Ways and Costs of Advertising

Advertisements are necessary both in a market of great demand and in a saturated one. Therefore these costs are taken and have to be calculated. (4.4 "Prices of the Products") The advertising programme has to be built up according to the motives of purchasing and the view of the buyer, the standpoint of the user must also be taken into account.

5.1.4 Buying and Selling of used Products

This might be no problem for developing countries at the moment, but it has to be regarded since in the future this might change. These should be clear regulations about testing, repairing and selling from the beginning. It has been stated several times, that for the reason of service and the stock of spare parts, developing countries are not interested in the import of used machines.

5.1.5 "Full Time" Programme

That is why tractors should only be supported which allow for an application of suitable implements. The same experiences have been made all over the world, that it is reasonable for a successful business in agricultural

machines to have the full line of farming equipment. Therefore it is not necessary to produce all implements buy the own Company, but it is essential that all products should be in the selling programme of the Company. This is true particularly for tractors and combines, because they have the largest share on the market.

5.2 Service

As it has been emphasized in 3.5 "Service Analysis" and in the second phase of 4. "Steps of Production", the service is the main problem in developing countries. Only machines that are working are of interest to the buyer and seller, because only they are able to make profit and only profitably working customers are able to buy further products.

5.2.1 Tasks of the Service

The main tasks of the service department are:

- instruction and training of the customers at the holdings as to the maintenance and application of the customers (user or buyer)
- instruction and training of the workshop personnel (basical training of mechanics, centralized further schooling at the dealer's)
- controlling and supporting of the service organization

5.2.2 Phases of Service-layout:

The particular phases in the service layout are in accordance to the manufacturing plans:

1st phase: service and advice for testing tractors and implements

2nd phase: set up a service network corresponding to the distribution plan

3rd phase: building up installation and maintenance of a central stock of spare parts

4th phase: training of mechanics as to maintenance, repair and application of the products

5th phase: furnishing a rented building for training (capacity up to 100 people), dealers, workshop - salesmen, and important customers (all users and buyers will be trained at the delivery of the products).

6th phase: the working of the free guarantee service in a co-operation with the workshops of the dealers; besides, the stationary servicemen, there are also mobile servicemen with service cars.

7th phase: the giving of full support to the customers and dealers as to free guarantee service and special questions of service.

5.2.3 Guarantee:

5.2.3.1 Terms of guarantee:

The manufacturer is responsible for the qualification and selection of the material used and the appropriate manufacturing to the first owner for the time of the factory's guarantee, i.e. 6 months after the taking over of the first owner

5.2.3.2 Free Services:

For every sold unit, three free services are granted:

1st free service: after 100 working hours or after one month depending on what takes place sooner,

2nd free service: after 300 working hours or after three months depending on what takes place sooner,

3rd free service: after 600 working hours or after six months, depending on what takes place sooner.

5.2.3.3 Expiring of the guarantee

The guarantee expires if:

- the rules for maintenance and operation are not regarded,
- repairs are not made by authorized workshops or especially authorized personnel,
- not original spare parts are used
- damages arise on the tractor that have been caused by abnormal use or overload,
- damages are done to the tractor that have been caused by an accident and this accident has not been caused by unsuitable material or unappropriate manufacturing.

5.2.3.4 Settlement of Guarantee:

The settlement of the guarantee usually made as a lump-

sum which is a fixed percentage of the sales value.

5.2.4 Range of Service and Service Cars:

The demanded service capacity can be calculated as follows:

	working hours for each old tractor
3 free services á 3 hours	9
Adequate non-productive time (including driving time)	9
Guarantee work à 10 hours	10
Adequate non-productive time (including driving time)	10
	38 hours/cash

Multiplied by annual sales figure makes the annual demand of mechanical work for free service and guarantee

For the maintenance of a tractor 10 working hours have to be taken into account; if multiplied by the total number of the tractor population it makes the annual demand of mechanical working hours for maintenance of the tractor. Both figures added and divided by 185 working hours makes the number of the necessary monthly mechanical periods, divided again by the annually available figures of months (12 without, 11 with holidays) makes an average of the necessary capacity of mechanics.

To get the costs of the total amount of working hours, they have to be multiplied by one hour's wage. For every guarantee and free service working hour a certain amount for spare parts, including filters, batteries, fuel, oil and grease to put have to be calculated. It is known from experience that the amount of guarantee spare parts is three times as much for an repair working hour than for an service working hour.

To these calculated costs there are to add the amount written off, the investments of the phases worked out in the service layout (item 5.2.2) as well as the personal costs of this plan.

At the end, one has to point out that it is necessary that the service costs are covered by the turnover of the service work and the annual sales. At the beginning of the production the turnover of the service work is not sufficient. Therefore, it is necessary from the economic point of view to start the production with the import of quite a number of units.

5.2.5 The Service Network in Developing Countries

Based on the experiences of the Company[1] in developing countries, there are following items worth mentioning:

- reasonable sales are necessary to cover the expenses of the service
- a period of building up and expansion work is necessary to get dealers with sufficient workshops
- the actual distance between two workshops should not be, on the averages, be more than 1 - 1 1/2 hours drive. (The chief parts of the sold units are placed at a circle of approximately 20 miles, so that the distance to the dealer is not more than that, - even the work shops are to be 50 - 150 miles apart.
- the furnishing of the workshops is of a very low level, because the costs of repairs are very low compared with the selling price of the tools. Some tools are unknown at all.
- service cars are very successful for the service and training. They are an essential instrument in training the customer and dealer, particularly in making acquainted with the usage and application of tractors
- technical literature as used in developed countries has to be modified for developing countries, the basical technical knowledge is of a lower level and therefore instruction and training has to take these facts into consideration.
- the mechanics are usually willing to learn, but the education until they are useful workers takes quite a long period of time, and consequently cost a lot of money. Nevertheless, the training programme is one of the essential programmes in the wide field of planning in developing countries. It might be

1) See page 48

helpful if this kind of work would be appreciated by the Government by way of supporting those expenses by subventions and remissions of the taxes.

footnote 1) The tractor type STEYR-PLUS-650 of Steyr-Daimler-Puch A.G. Austria is for instance a licenced production by THAI MACHINERY INDUSTRY LTD. Bangkok at the delivery

6. Joint ventures:

The experience has been made, that the joint ventures between developing and developed countries are a successful way of uniting the industrial capacity of the developed countries successfully with the demand of developing countries and to raise the economy of the latter.

Different kinds of joint ventures have been tried:

6.1 Co-operations based on the Government

The joint ventures between various Governments are mostly bilateral and that belongs to the pre-investment phase, which has been stated in this report under "Steps before the Production". In this form of co-operation the fieldwork of experts could be promoted. The manufacturing of products in a joint venture of Governments is to be realised only by industries that are publicly owned. Furthermore, the participation of the Government is possible by financing manufacturing projects.

6.2 Co-operations Based on International Organisations

Here is nearly the same situation as described in chapter 6.1 "The Financing of the expert work in the pre-production should be done in the same way as it is done by the "Specially founded projects" of FAO and the UNDP. In this organisation, the co-operation may be bilateral as well as multilateral. The financing of the projects is possible by the several branches of those organisations (WORLDBANK / IFC[1], ASIAN INDUSTRIAL DEVELOPMENT COUNCIL / ASIAN DEVELOPMENT BANK).

1) INTERNATIONAL FINANCIAL CO-OPERATION

6.3 Private collaboration

A wide scope of activities is open for the private Companies. In regard to the flexibility of those firms, they have a lot of advantages. To be sure, private initiative and a healthy business spirit are valuable impulses for a successful increase of the economy in developing countries.

The expansion of private collaboration is limited on the one hand by the tremendous demand of work and by the means, which are necessary to realize the project on the other. Therefore, programmes concentrating on special items have to be set up. Furthermore, a programme of procurment is necessary. A lot of statistical figures are essential on an international basis. The problem is to get in touch with this material, to elaborate it and come to the right conclusions. As to the lack of means, there are possibilities to improve the situation through an intensive collaboration with international organizations (FAO, UNIDO, WORLDBANK, ECAFE). For the private Companies, it is necessary to train and educate people, who are able by this knowledge and character to do such planning for developing countries.

6.4 Mixed collaboration

The last paragraph of point 6.3 shows that nearly all and most of the successful joint ventures are mixed collaborations. Pre-investment or pre-production work is done by official authorities as well as by private Companies in collaboration with the Government and international organizations. Production work is done mainly by private Companies, and the support of the financial section of the project is taken care of by the Government and the international organizations.

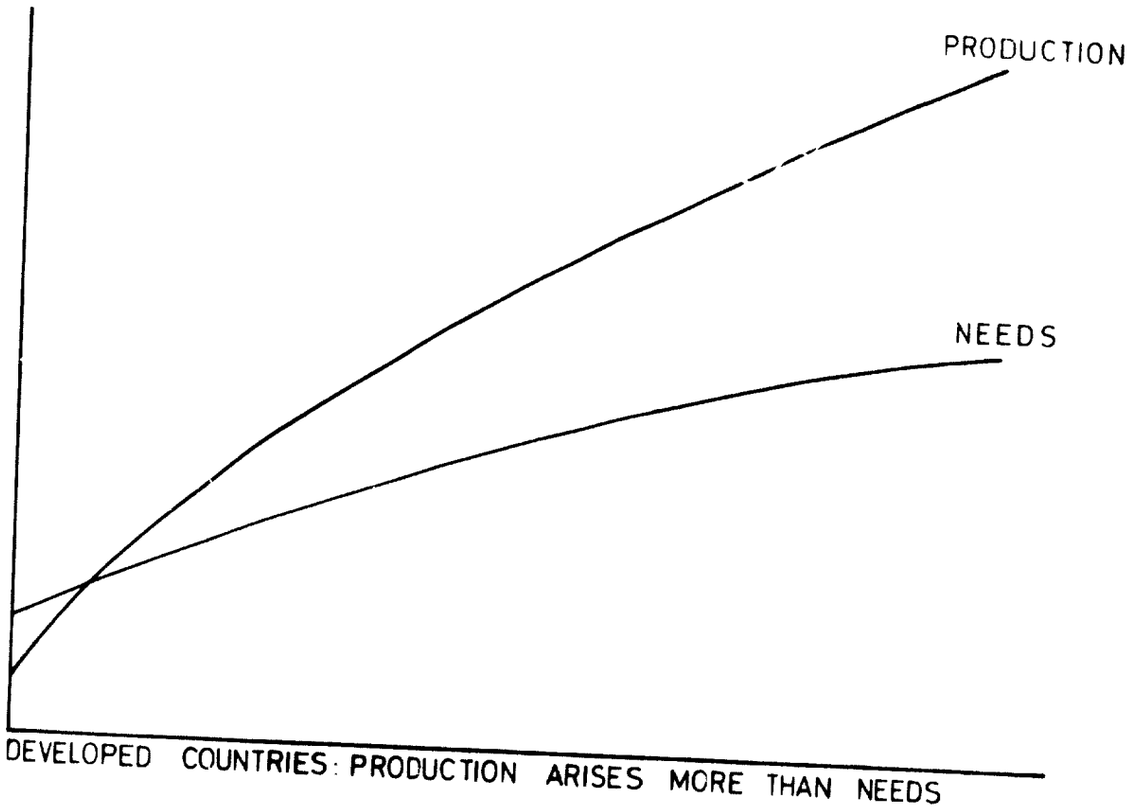
6.5 Exchange of the Joint Ventures

At least one has to point out that there is a further

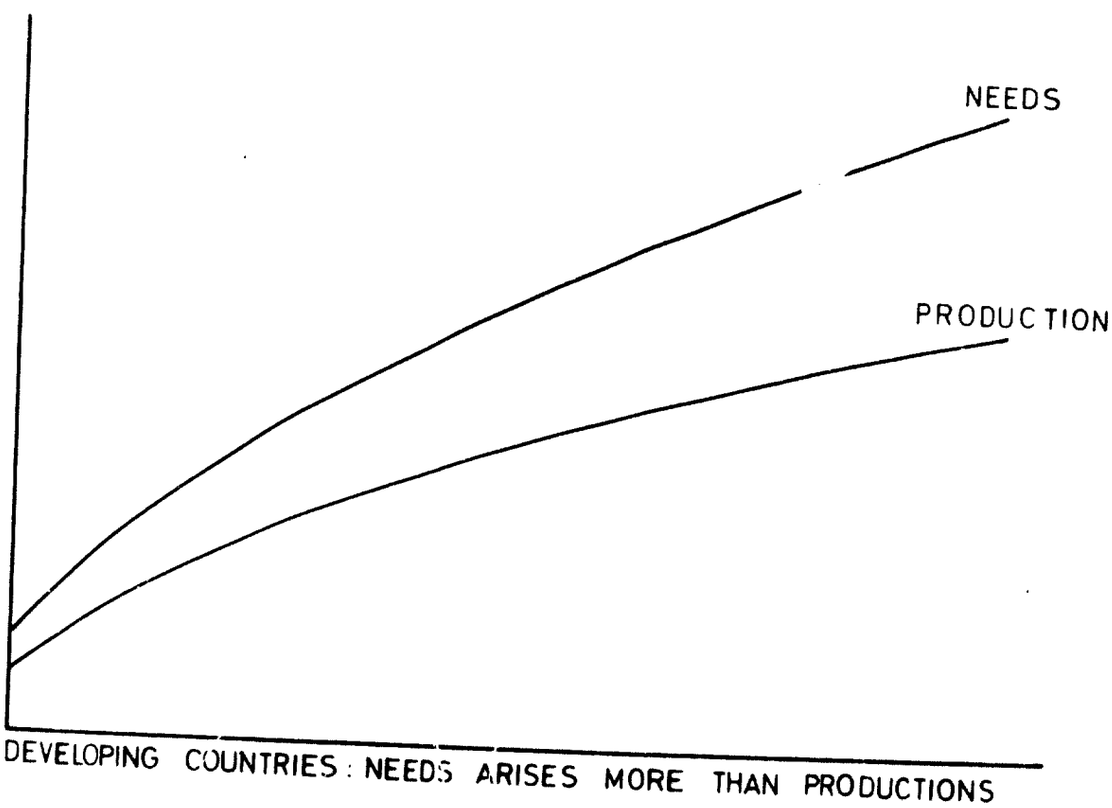
interest in a special form of joint ventures for the planning in developing countries, particularly for the manufacturing Companies, but also for the Governments. There are some joint ventures of bilateral basis. Based on those joint ventures, it should be possible to export products of well established factories in developing countries in a trade exchange to other markets, which are usually closed. In connection with a Governmentably promoted joint venture, it might be possible to open such closed markets for the export in order to promote the total economy of developing countries.

app. 1

PRODUCTION AND DEMAND IN DEVELOPED AND DEVELOPING COUNTRIES

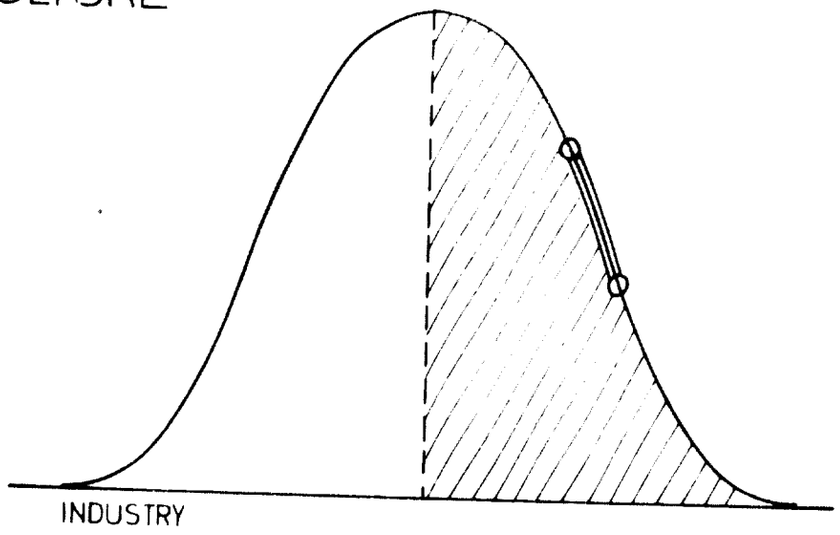


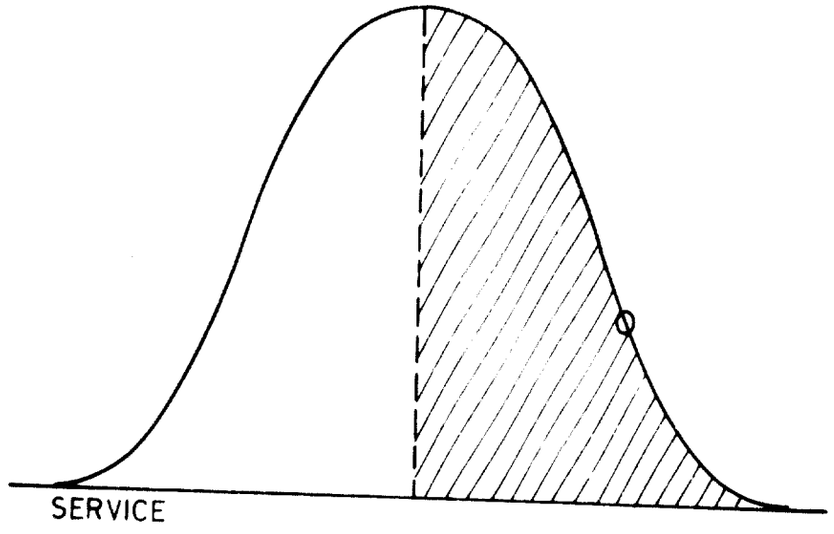
DEVELOPED COUNTRIES: PRODUCTION ARISES MORE THAN NEEDS

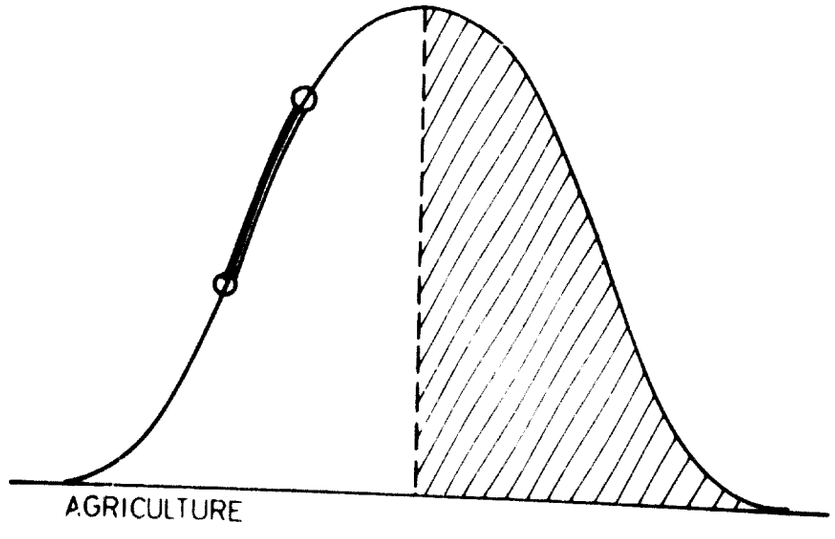


DEVELOPING COUNTRIES: NEEDS ARISES MORE THAN PRODUCTIONS

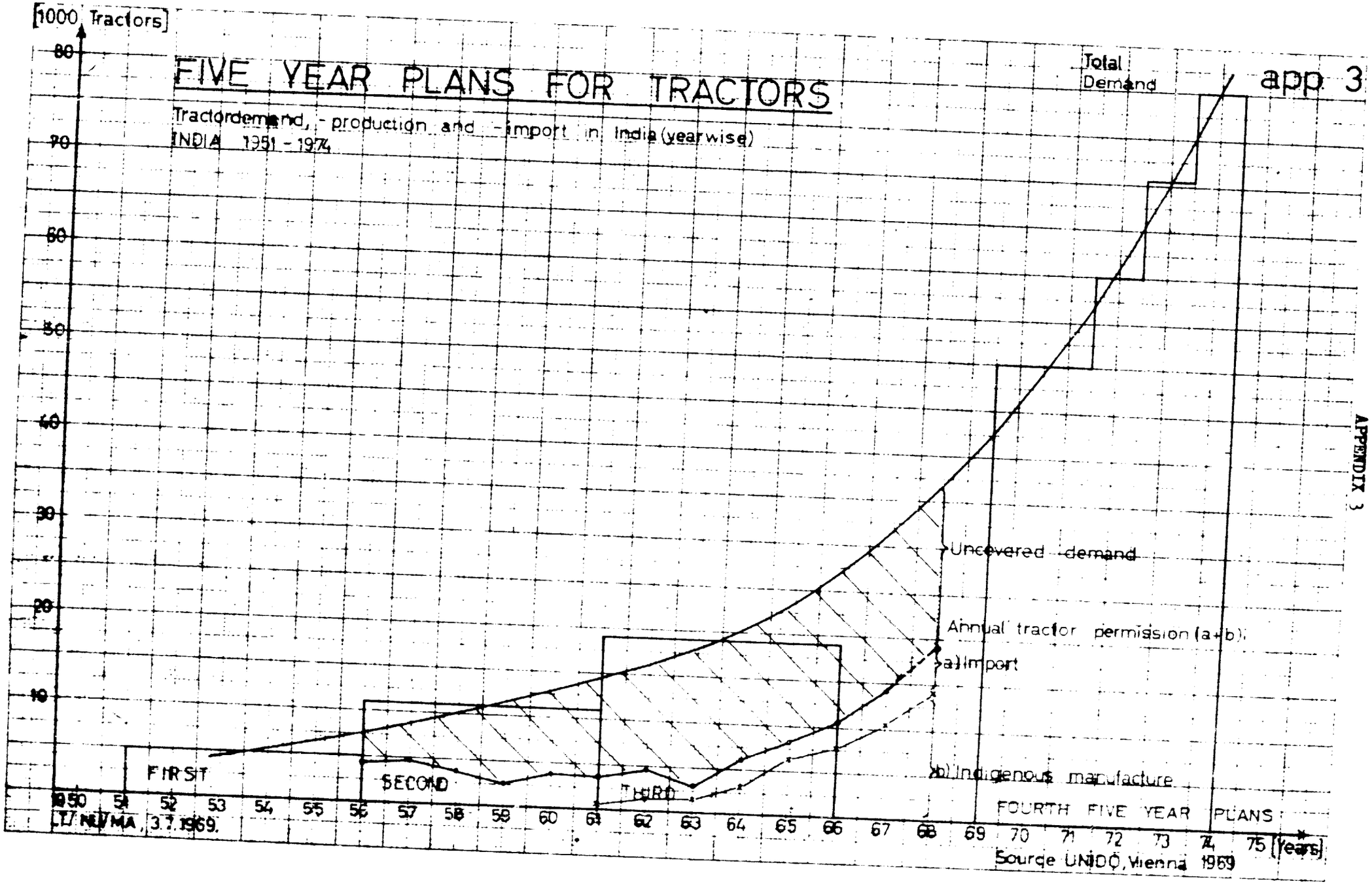
CURVE OF GROWTH IN ECONOMICS IN THE STRUCTURE OF INDUSTRY, SERVICE AND AGRICULTURE







INCREASE SIZE
DECREASE SIZE


[1000 Tractors]
FIVE YEAR PLANS FOR TRACTORS
app 3
Tractordemand, - production and - import in India (yearwise)
INDIA 1951 - 1974
Total Demand
Uncovered demand
Annual tractor permission (a+b)
a) Import
b) Indigenous manufacture
FIRST
SECOND
THIRD
FOURTH FIVE YEAR PLANS
80
70
60
50
40
30
20
10
50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 [Years]
LT/ NEUMA, 3.7.1969.
Source UNIDO, Vienna 1969

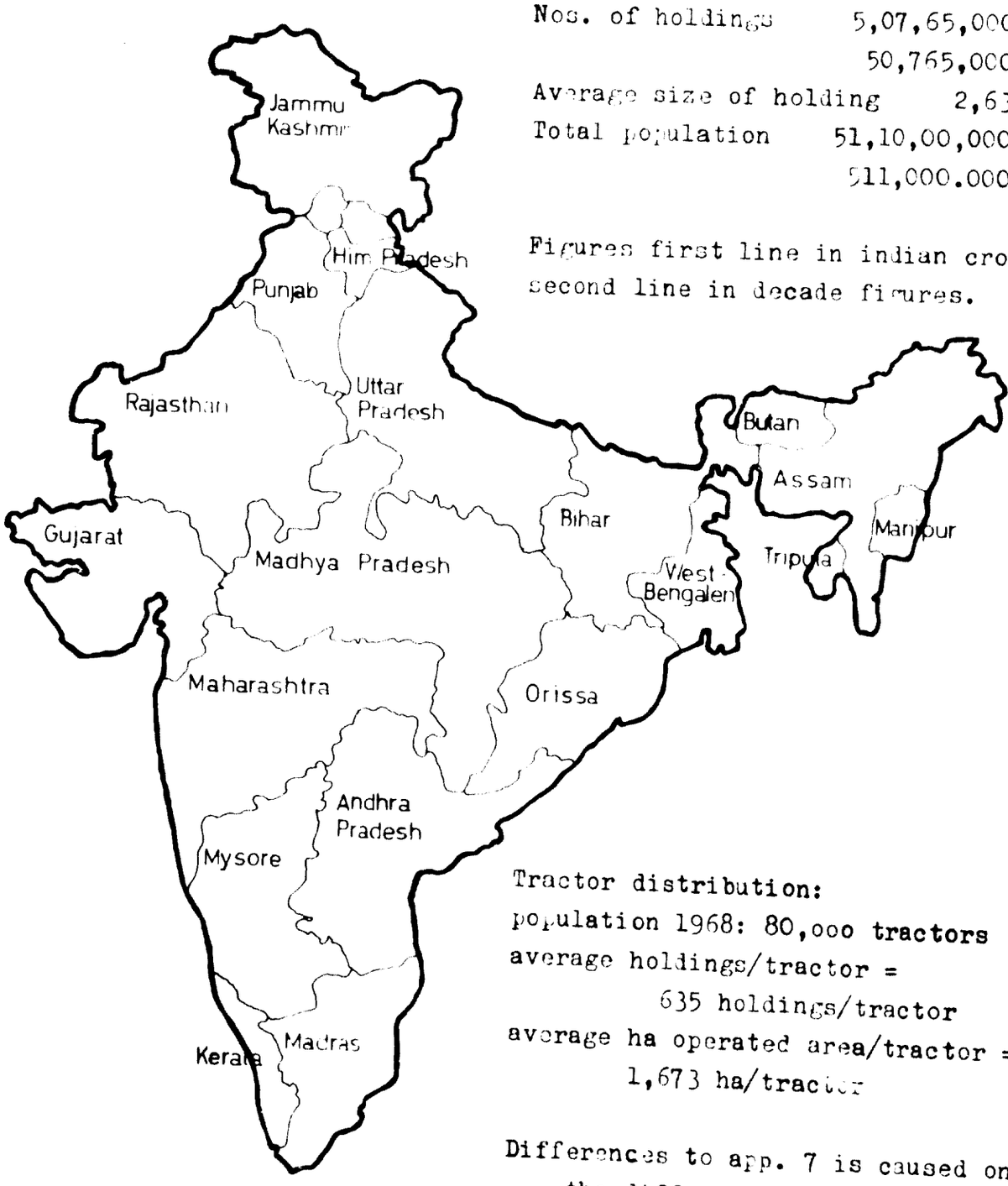
APPENDIX 3

GENERAL PATTERN OF AGRICULTURE IN INDIA

INDIA 1968

Total Area	32,68,09,000	ha
	326,809.000	ha
Operated area	13,33,76,000	ha
	133,376,000	ha
Nos. of holdings	5,07,65,000	
	50,765,000	
Average size of holding	2,63	ha
Total population	51,10,00,000	
	511,000.000	

Figures first line in indian crores, second line in decade figures.



Tractor distribution:
population 1968: 80,000 **tractors**
average holdings/tractor =
635 holdings/tractor
average ha operated area/tractor =
1,673 ha/tractor

Differences to app. 7 is caused on the different statistic dates (tractorpopulation 1966 to 1968).

LT/NÜ, 3 7. 1969

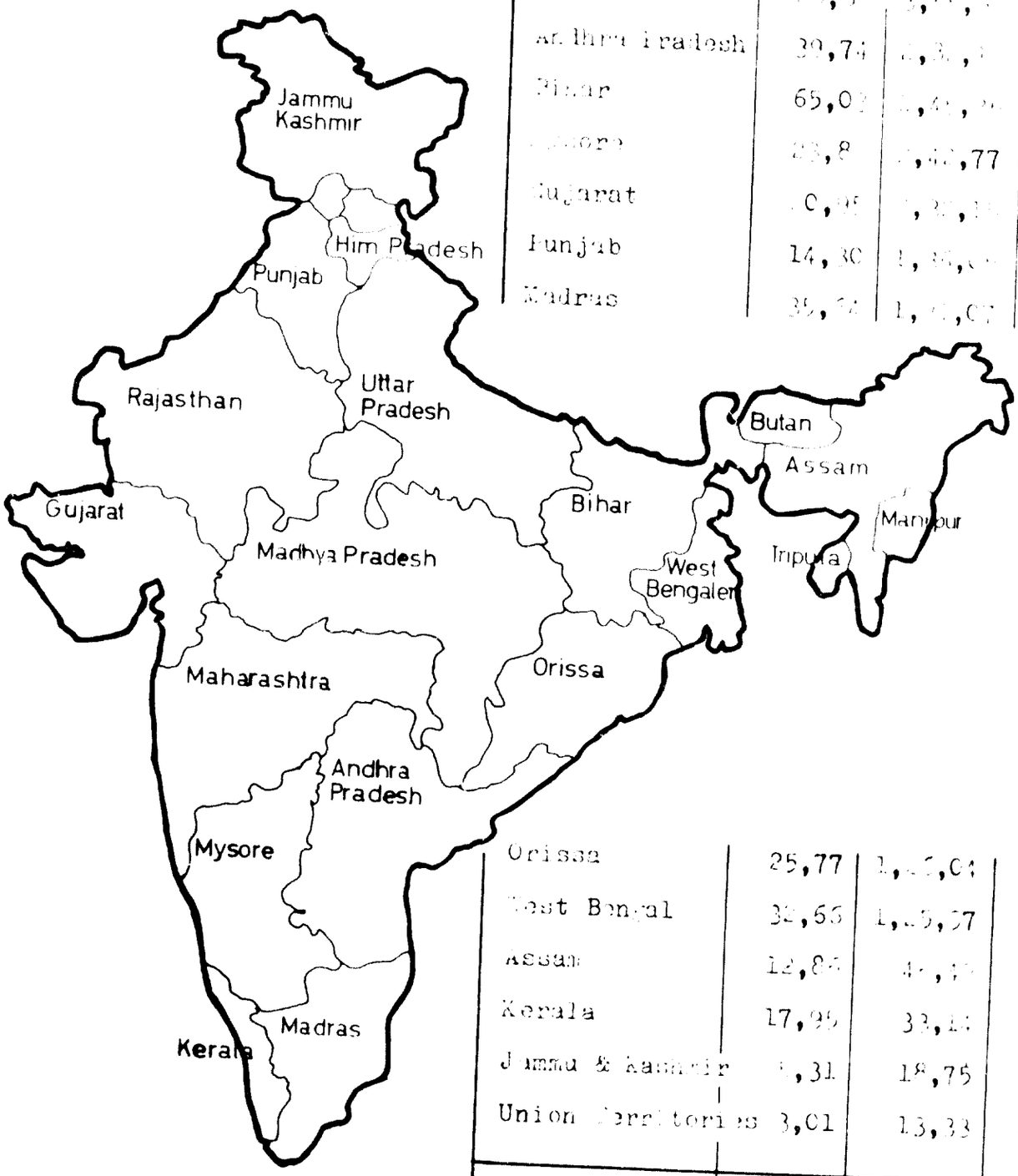
Source, UNIDO, Vienna 1969

STATEWISE AGRICULTURAL DATES OF INDIA

app. 5

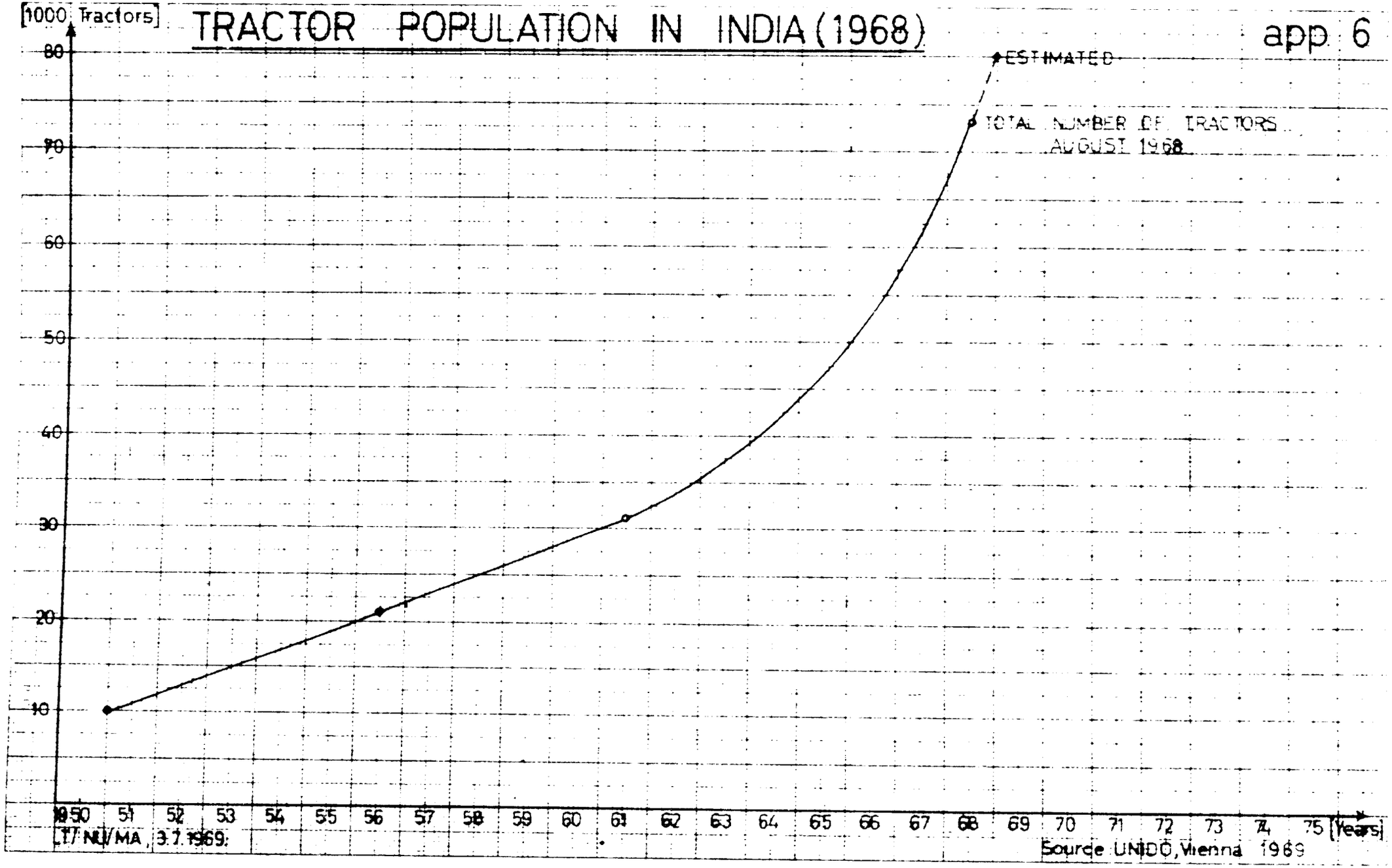
INDIA 1968
FIGURES IN CRORES

STATE	NUMBER OF HOLDINGS ('000)	AREA OPERATED ('000 ACRES)	AVERAGE SIZE (ACRES)
Uttar Pradesh	[illegible]	[illegible]	[illegible]
Madhya Pradesh	[illegible]	[illegible]	[illegible]
Maharashtra	[illegible]	[illegible]	[illegible]
Rajasthan	[illegible]	[illegible]	[illegible]
Andhra Pradesh	39,74	[illegible]	[illegible]
Bihar	65,0[illegible]	[illegible]	[illegible]
Mysore	[illegible]	[illegible],77	[illegible]
Gujarat	[illegible]	[illegible]	[illegible]
Punjab	14,30	[illegible]	[illegible]
Madras	[illegible]	[illegible]	[illegible]
Orissa	25,77	[illegible]	[illegible]
West Bengal	[illegible]	[illegible]	[illegible]
Assam	[illegible]	[illegible]	[illegible]
Kerala	[illegible]	[illegible]	[illegible]
Jammu & Kashmir	[illegible],31	[illegible],75	[illegible]
Union Territories	3,01	13,33	[illegible]
India Total	[illegible],07,65	[illegible],[illegible],85	[illegible]
India Total in ha		13,33,76	[illegible]

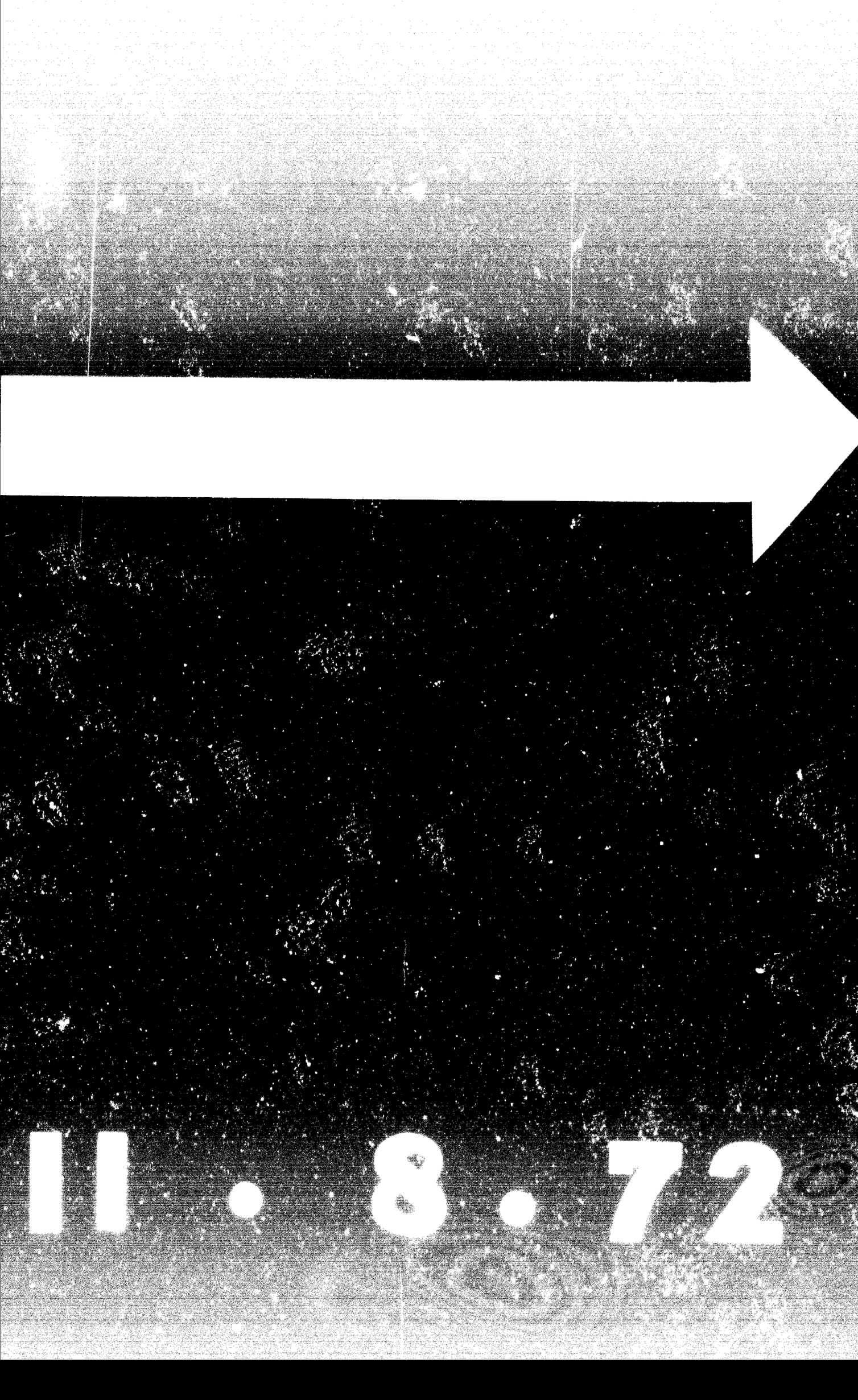


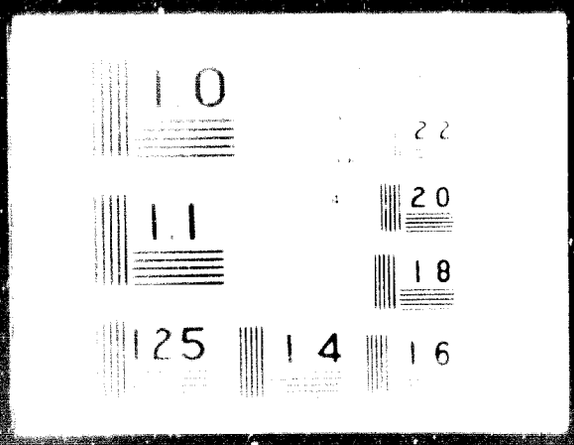
LT/NÜ, 3.7.1969.

Source: UNIDO, Vienna 1969


[1000 Tractors]
TRACTOR POPULATION IN INDIA (1968)
app 6
ESTIMATED
TOTAL NUMBER OF TRACTORS AUGUST 1968
80
70
60
50
40
30
20
10
1950 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 [Years]
LT/ NU/MA, 3.7.1969.
Source UNIDO, Vienna 1969

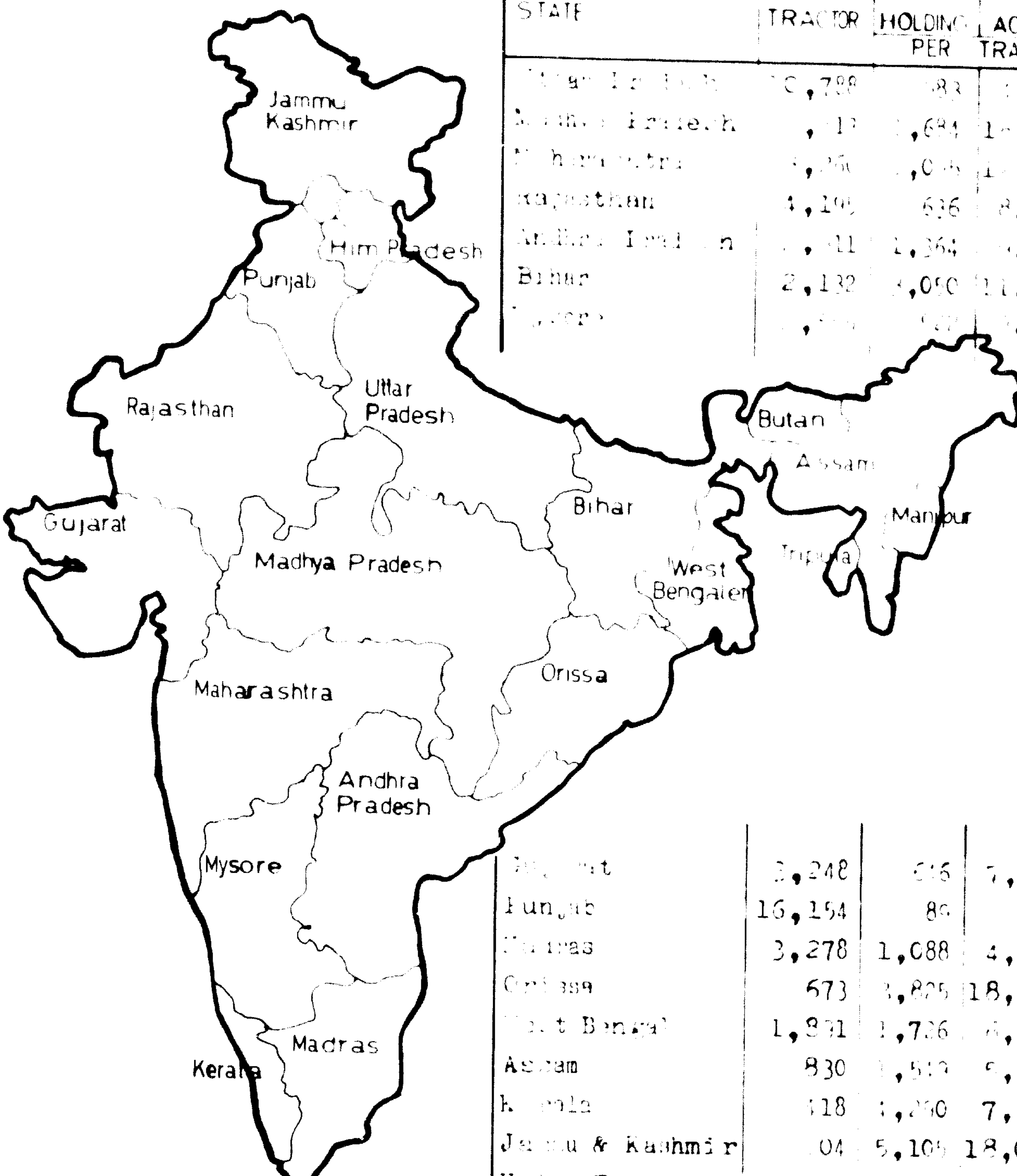
APPENDIX


11.8.72



TRACTOR DISTRIBUTION 1966 IN INDIA

TRACTOR DISTRIBUTION IN INDIA 196[illegible] 55,2[illegible] TRACTORS
(ESTIMATED FOR 1968 [illegible] TRACTORS)
TOTAL OPERATED AREA 32,[illegible]5,85,000 ACRES
NUMBER OF HOLDINGS 5,07,65,[illegible]



STATE	TRACTOR	HOLDING PER	ACRE TRACTOR
[illegible]	[illegible]0,788	[illegible]83	[illegible]
[illegible] Pradesh	[illegible]	[illegible],684	1[illegible],620
[illegible]	[illegible]	[illegible]	[illegible]
Rajasthan	4,10[illegible]	636	[illegible],7[illegible]0
[illegible] Pradesh	[illegible]	1,364	[illegible],710
Bihar	2,132	[illegible],090	11,500
[illegible]	[illegible]	[illegible]	[illegible],[illegible]70
[illegible]	[illegible],248	[illegible]6	7,1[illegible]0
Punjab	16,154	89	81[illegible]
[illegible]	3,278	1,088	4,000
Orissa	673	[illegible],8[illegible]5	18,740
[illegible] Bengal	1,891	1,726	[illegible],640
Assam	830	[illegible],5[illegible]	[illegible],605
K[illegible]	[illegible]18	[illegible],[illegible]0	7,[illegible]10
Ja[illegible]u & Kashmir	[illegible]04	5,10[illegible]	18,050
Union Territories	[illegible]	1,[illegible]6	[illegible],760
India Total	55,[illegible]	[illegible]18	[illegible],[illegible]0

LT/NU, 3.7.1969.

Source INDIA 1968

APPENDIX 8

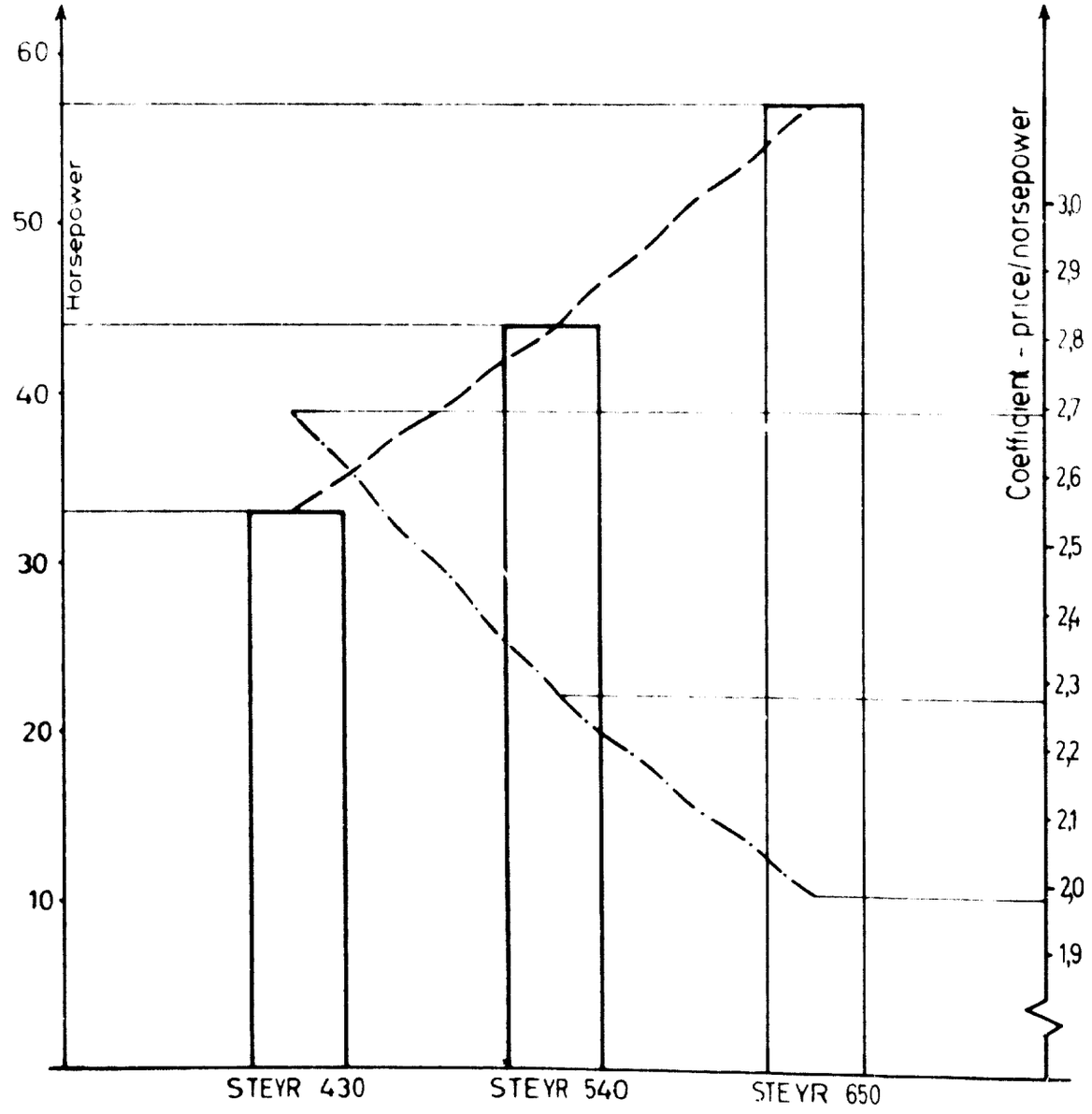
STEYR-DAIMLER-PUCH
AKTIENGESELLSCHAFT
HAUPTWERK STEYR

app 8
LT/N[illegible]/MA 2[illegible]69

RELATIVE TRACTORVALUE IN THE PERFORMANCE CLASSES 30-60 HP

TYP	STEYR 430	STEYR 540	STEYR 650
HORSEPOWER	33	44	57
RELATIVE PRICE*	89	100	113
COEFFICIENT PRICE/HORSEPOW.	2,69	2,27	1,98

x fob - price, standard equipment basis



TRACTORLICENCE AND -PRODUCTICN IN INDIA 1967/68

FIRM	MAKE	HP	LICENCE CAPACITY	PRODUCT 1967 68	PRODUCTION PERCENTAGE
TRACTOR & FARM EQUIPMENTS LTD. MADRAS	MASSEY FERGUSON	35	7000	4087	
HINDUSTAN TRACTORS LTD. BARODA	HINDUSTAN	50 35	5000 2000	1646	
ESCORTS LTD. FARIDABAD	ESCORTS	35 28	7000	2556	
EICHER TRACTORS INDIA LTD. FARIDABAD	EICHER	27	2000	204	
INTERNATIONAL TRACTOR CO. OF INDIA LTD. BOMBAY	INTERNA-TIONAL HAR-VESTER	35	7000	2571	
TOTAL TRACTOR LICENCE AND PRODUCTION 1967/68			30000	11[illegible]4	

APPENDIX 9

Source: [illegible] 1969

LT/NU-Ma/P1
3.7.1969

R E F E R E C E S - APPENDIX 10

1. "Agricultural Survey" Statistical formular, published by UNIDO 1969
2. AIDC Fact Finding Team on Industries Manufacturing Agricultural Machinery - Summary of Recommendations, provisional edition by ASIAN DEVELOPMENT COUNCIL 1969
3. Country Studies on INDIA and THAILAND by UN ECAFE/ UNIDO Fact FINDING TEAM ON DUSTRIES MANUFACTURING AGRICULTURAL MACHINERY
4. Entwicklungsländer, eine Einfuhrung in ihre Probleme, issued by BURGLAND FREUDENFELD, published by C.H. BECK Munchen
5. "Fourth Five-Year-Plan INDIA 1969 - 1974 "Government of India
6. "Motonsierungsland der Landwirtschaft in Europa" by Hans Otto Hamann" published in Landtechnik XIX/10/1964 page 346 - 354
7. New Horizon in Marketing by H. Karstein published by Thacker & Co. Ltd. Bombay
8. Project Report about Manufacturing of the Tractor Type STEYR-PLUS-540 presented by STEYR-DAIMLER-PUCH A.G., AUSTRIA
9. "Report of the working group for formation of fourth five year plan proposals on agricultural machinery and implements" by Government of India, Ministry of Food, Agriculture, community development and co-operation.
10. Stand und Formen der Mechanisierung der Landwirtschaft in den asiatischen Ländern Teil 1: Sudostasien (Wissenschaftliche Schriftenreihe des Bundesministeriums für wirtschaftliche Zusammenarbeit) Ernst Klett Verlang Stuttgatt 1965
11. "Thailand benötigt mehr Landmaschinen" Newspaper (EFA/NFA 31.1.1969)
12. Several articles of Indian Newspapers April 28th - May 16th, 1969


11.8.72.