

INFLUENCE OF LEGISLATION/SUBSIDIES TO HELP AGRICULTURE AND/OR AGRICULTURAL MECHANIZATION ON THE MARKET OF AGRICULTURAL MACHINERY IN INDIA

Gajendra Singh* and Indra Mani**

1. Agricultural System

1.1. Economic conditions: GDP per Capita, Manpower in Agriculture

India is second largest democracy in the world with total population of about 1100 million and growing at the rate of about 1.5 percent annually. The majority (70%) of people live in rural areas. The total land area of India is 297.3 million ha, very similar to the land mass of 15 states of EU. India has a population density of 360 persons per square kilometer. The Gross Domestic Products (GDP) of India is more than 550 billion US dollar growing at the rate of 8-9% annually. Based on the Purchase Power Parity (PPP) it is ranked as 4th largest economy after USA, China and Japan (World Bank). The GDP per capita is about US\$ 500.

The growth in GDP is driven by service sector contributing about 53% backed up by manufacturing contributing about 27%. The share of agriculture in India's Gross Domestic Products has declined to 20% now from 56 % in 1950 with about 52 % of the population still depending on the agriculture for their livelihood (FAO). In other words, about 150 million labour

force of total 270 million in India is engaged in agriculture which includes both men and women. The population is expected to reach 1160 million in the year 2010 and over 1400 million in 2020 .Thus, the biggest challenge before the agriculture sector of India is to meet the growing demand for food to feed her increasing population. To increase food production, the productivity of the land and the labour need to be increased substantially, this will require higher energy inputs, modern agricultural technologies and better management of food production systems. According to the Human Development Report 2006 of UNDP climate of India is headed for a change over next 50 years. One-third of the land in Tarai Region and North-East States which is already well endowed with rainfall will have more rainy days and more rains while it will decline in other two-third of the country comprising of arid and semi-arid areas in Rajasthan, Andhra Pradesh, Gujrat, Madhya Pradesh and Maharashtra. This climate change may affect the food production adversely.

1.2. Agricultural Areas, Products, Manpower and Possible Extension

India is a country with various landforms ranging from lofty mountains to ravine, deltas and also including high altitude forest of Himalayas, sprawling grasslands of Indo-Gangetic plains, peninsular plateaus of South East and South West India and many other geological formations.

*Vice Chancellor, Doon University, Dehradun, Uttaranchal-248006, India

**Senior Scientist, Indian Agricultural Research Institute, New Delhi-110012, India

The climate of India is full of extremities; for example its temperature varies from arctic cold to equatorial hot and rainfall from extreme aridity with less than 100 mm in Thar Desert to per-humid with world's maximum rainfall of 11200 mm at Mawsinram in the state of Meghalaya. Due to presence of a wide range of geological and climatic conditions, Indian agriculture is diverse and complex with both irrigated and dry land areas, capable of producing most of the food and horticultural crops of the world. For the purpose of planning, better management of natural resources to curb environmental degradation and to give impetus to the agricultural productivity for food and nutritional security to its ever increasing population, the country has been grouped into 20 agro-climatic regions and 60 agro-ecological sub-regions on the basis of soil, agro-ecological conditions and physiographic situations. India has an estimated 142 million ha cultivated area of which about 57Mha is irrigated and remaining 85 Million ha is rain-fed. The cropping intensity is stagnating at 1.35 which could be increased with increase in irrigation and mechanization particularly in the eastern part of India. With increasing level of industrialization, creation of special economic zones, urbanization and development of housing sector there is possibility of decline in the arable land. Rice, wheat, maize, sorghum, and millet are the five main cereals grown in India. Along with this the pulses, oilseeds, cotton, jute, sugarcane, and potato are the other major crops. Pulses include mainly gram (chickpea) and pigeon pea and oilseeds include mainly groundnut, mustard and rapeseeds, soybean, and sunflower.

The food crops share 73.41 per cent of

total sown area and remaining is under non-food crops. Under food crops, food grains cover 65.53 per cent of sown area which includes cereals, millets and pulses followed by fruits and vegetables, sugar, condiments and spices. Non-food crops include oilseeds, fibres, plantation crops, fodder, green manures and others. The cropped area under rice and wheat together accounts for about 60 per cent of the cropped area under the food grains. Average yield of wheat was 2718 kg/ha and that of rice was 2026 kg/ha in 2004-05. The total grain production in 2004-05 was 204.6 MT. The percentage labour force in agriculture will continue to decline in the coming decades; however the percentage of female agricultural workers is expected to increase from 39 % in 2001 to 50 % in 2020. This would necessitate more intensified mechanization in Indian agriculture and design and development of woman friendly agricultural tools and machine.

1.3 Social and Work Conditions

India has witnessed a phenomenal changes in many fields particularly agriculture, space and information technologies. Despite these significant changes, balance development i.e. the creation of equal opportunities, for all people to participate in, contribute to and benefit from development has not taken place. Although, the social conditions of the people in India have improved with time, however, 26 % population of India still lives below poverty line. There are disparities between urban and rural workers. Agriculture, in many parts of the country, has remained in subsistence form and needs to be made remunerative. A number of programmes have been

launched to improve the conditions of the poor; their participation in political process through Panchayati Raj, welfare schemes for socially and economically backward people, women emancipation and empowerment, Sarb Shiksha Abhiyan (education for all scheme), reservation in jobs in government sector and legislative institutions, creating technical and educational institutions in rural areas are few examples. Some measures taken by the government are provision of minimum wages act, distribution of land to landless, creation of housing sites for socially and economically deprived people and abolition of bonded labour. The government has also started special employment programmes like National Rural Employment Scheme, Training for Rural Youths for Self-employment, Rural Landless Employment Guarantee Programme (RLEGP), Jawahar Rojgar Yojna and Prime Minister's Rojgar Yojna. These schemes have shown positive results but there is a need of creation of infrastructure, and training for self employment in rural areas itself.

Work conditions for agricultural workers are not conducive to good health and proper living due to low level of mechanization. With appropriate mechanization of different operations in production process of various crops, drudgery of rural workers can be mitigated. From safety point of view, there have been efforts from technical angle by developing tools and methods for safe working conditions at work place particularly while using agro-machinery and agro chemicals. Government has also enacted safety laws like Dangerous Machinery Act (1972) for designing and manufacture machine particularly threshers which used to cause permanent disability

to farm labours working on threshers. Overall there is ample scope to improve work conditions of farmers and agricultural workers particularly woman workers. Efforts are on these fronts by developing safety devices and through policy changes.

1.4 Technical Capacity and Level of Manpower

Technical capacity of India in terms of infrastructure and level of manpower has improved manifold since its independence. The literary rate has gone up to 65.38 per cent. A large network of educational institutions, both technical and non-technical, exists in the country. In case of agricultural education, National Agricultural Research System (NARS) has 36 State Agricultural Research Universities, four deemed to be Universities and number of colleges under different State Universities. There are number of Polytechnics and Industrial Training Institutes for producing technical manpower. In information technology India has emerged as giant in the world. There are about 130 million cell phone subscribers in India. There is no dearth of technical manpower in the country, however, at grass root level labourers and farmers are lacking technical capability which needs to be strengthened. A large network of training centres is required to impart skills at grass root level particularly to farm workers.

1.5 Evolution of Production Techniques Affecting Mechanization

During sixties the food position of India was termed as *ship to mouth*. During late sixties important policy planning, research

and technology development decisions were taken by the Government of India for bringing in transformation. The foundation for modern agriculture was laid by way of investments in irrigation and fertilizer. Sixties and seventies witnessed the development and widespread adoption of the seed–irrigation–fertilizer–plant protection technologies, ushering in the **Green Revolution**. The total food grain production increased from 51 million tons during 1950, to 210 million tons in 2002 and land productivity increased from 0.58 ton/ha to more than 2.34 ton/ha/yr. The irrigation and mechanization played major role in increasing the cropping intensity and yield. The improved seeds have been the catalysts for making other inputs cost effective.

The use of chemical fertilizers has increased from 65,600 tons (about 0.5 kg/ha) in 1950 to 16.8 million tons (121 kg/ha) in 2003. The estimated amount of manure and compost applied has changed only slightly over the years and the contribution of plant nutrients is estimated to be about 8 kg/ha. The use of plant protection chemicals has increased from 8620 tonnes in 1960 to 56110 tonnes in 1996 and has come down to 41000 tonnes in the year 2003. The increased cropping intensity and higher quantities of inputs and outputs could no longer be effectively managed by animate power alone. Therefore, farmers adopted tractors, irrigation pumps, harvesters and power threshers, extensively. The growth of farm power and agricultural machinery over last 50 years has been phenomenal. The land holding is one of the major reasons of low adoption of mechanical power and machinery by Indian farmers. However, some small farmers have also started owning tractors due to opportunity of

custom hiring. Mani et al (2003) reported a farmer's family in western UP with almost no land owned a fleet of 20 tractors for custom hiring purposes. The increase in mechanization level with evolution of production techniques during the green and post green revolution era in the country has been hallmark in Indian agriculture. Custom hiring of combine harvesters has been another remarkable success in mechanization of Indian agriculture. A village Shyamgarh near Karnal in Haryana owned 135 combines mostly for custom hiring covering almost five states in one crop season and earning on an average Rs 300,000 per annum.

Not only the farmers having large holdings are reaping the benefits of mechanization, even farmers with small holdings utilize selected improved farm equipment through custom hiring to increase productivity and reduce cost of production. The small plot size might restrict the use of large tractors, but small tractors and power tillers can be used. The power operated implements being more efficient, the numbers of all the power-operated equipment in use has been increasing during the last five decades. One of the major inputs adopted by the Indian farmers for modernization of agriculture is irrigation pumps. The government encouraged the farmers to have their own irrigation facilities. By giving them financial incentives, presently subsidy is provided to the farmers for adoption of sprinkler and drip systems under promotion of cultivation of horticultural crops. The number of electric motor operated pumps is 16 million now as compared to 4 million in 1981 and is expected to increase to 23 million by the year 2015. The number of diesel operated irrigation pumps has also increased from

3.3 million in 1981 to 6 million now and is expected to reach 7 million by 2015.

1.6 Influence of Aid on Agriculture

Indian agriculture has greatly benefited due to aid in the form of credits or soft loans from the International bodies. The seeds of **green revolution** were sown based on aid from International Organizations. During the last 20 years, the World Bank has supported development of agricultural research, extension and education programme of India in several ways. The prominent and foremost have been the National Agricultural Research Project (**NARP**) for strengthening the agricultural research capability and the National Agricultural Extension Project (**NAEP**) for augmenting and strengthening the technology transfer and extension capability. The **NARP** was implemented through National Agricultural Research System (NARS) and **NAEP** was implemented through State Governments. There was need of a bottom up response to the demands of technology users and closer interaction between research, extension and farmers. To fulfill this, a very ambitious National Agricultural Technology Project was launched by Indian Council of Agricultural Research (ICAR) with the support of World Bank in 1998. The performance of NATP was adjudged as highly rewarding, in all its sub-components, by the Final Review Mission of the Bank. This was the only project in Asia which received such a high rating. In addition, FAO-AHRD programme was launched by ICAR for human resource development which proved to be very much rewarding in terms of training the scientists in world class labs and developing collaborations with

international institutions. Recently, ICAR has launched a National Agricultural Innovation Project with total budget of US\$ 250 million of which US\$200 million will be as credit from the World Bank and US\$ 50 million will be borne by Government of India. This project would facilitate acceleration and sustainable transformation of Indian agriculture in support of poverty alleviation and income generation by collaborative development and application of agricultural innovations by the public research organizations in partnership with the farmers' groups, the private sector, the civil society organizations and other stakeholders. Overall, India's experience with international aid has been very productive and rewarding.

2. Agricultural and Food Markets

2.1 Internal Market

The nature of agricultural and food marketing in India is varying and wide. It ranges from local village shops and weekly markets on rural roadsides to well established mega marts. Government has control over organised market only whereas a huge material transaction takes place in unorganised market. There is a large and flexible framework of government intervention in agricultural marketing. The current policy framework under which agricultural produce markets function can be divided into six components, namely, (a) regulatory measures (b) marketing infrastructure (c)administered price regime(d) direct entry of public agencies (e) export and import regime ,and (f) macroeconomic policies.

According to one estimate out of 7169 wholesale markets in the country, 7001 are covered by the market regulation programme. A huge sum of transaction takes place through these markets. For example during 1992-93, agricultural commodities worth Rs. 620 billion were traded in these wholesale markets amounting to around 58% of the total value of marketable surplus of agricultural commodities. In addition, market in rural areas like haats, play very crucial role; there are around 27040 such markets or locations in rural areas where farmers and rural people gather periodically to sell their surpluses and purchase articles of their use including farm input like agro-machines, seeds, fertilizers and draft and milch animals. Out of these, only about 15% are reported to have been provided with the physical infrastructure needed so far.

Development of marketing infrastructure was another major step in promotion of agriculture marketing in the country. The increase in storage capacity and transportation are the major achievements. The quick dissemination and exchange of market information has helped in increasing the integration of markets. In the domestic market, grading has remained voluntary. However, a network of central and regional laboratories for the certification of 157 commodities has been established under the Directorate of Marketing and Inspection. The state government were also encouraged to establish such laboratories.

Government of India has taken many steps with regards to the administered price regime which includes (a) minimum support price (MSP) for major cereals, pulses, oilseeds, copra, raw cotton and raw jute); (b) statutory minimum prices for sugarcane; (c) levy prices for rice and

sugar; and (d) central issue prices for rice, wheat and coarse cereals for sale under the public distribution system. The objective of the minimum support price policy is to reduce the price uncertainty faced by the farmers and to induce them to adapt new technology and increase the production of agricultural commodities.

Government control on agricultural market includes the maintenance of stocks of rice and wheat and the distribution of cereals and sugar at prices lower than market prices. Under the public distribution system (PDS) Government supplies a proportion of cereals required by the poor consumers at prices lower than market prices. The sugar collected through levies on the sugar factories, is also distributed to retail cardholders through the PDS at below market prices. In addition, open market sales of wheat and rice are undertaken during specific periods and are kept limited to pre-decided quantities.

The size of the marketed surplus of farm produce in India is quite large. It is estimated that the value of farm products entering the marketing system during 1990-91 was Rs.1067 billion which was around 64 percent of the total value of agricultural output. Private players have the lion's share. According to one estimate, the quantity of agricultural produce handled by government's agencies has been not more than 10% of the total value of market surplus. Similarly, around 10 per cent of the marketed surplus was handled by the cooperatives. There are around two millions wholesale and five million retailers, including 0.41 million fair price shops, in agricultural produce trade. Nearly three-fourth of PDS shops are in the private sector. In addition, processors also play a key role in agro produce marketing. The Indian fruit and

vegetables market is lacking processing facility as a result about 98 percent of the fruits and vegetables produced in India are traded as fresh products. Similarly, out of total Indian food market, the processed segment is only 10%, the semi-processed is 15% and the remaining 75% is constituted by fresh foods.

2.1.1 Subsidy and Credit

Irrigation, Fertilizer and electricity are major items subsidized by the government. At the top was subsidy in irrigation to keep the cost of supply of water to farmers low as a matter of policy. Fertilizer and electricity stood second and third, respectively. Over last ten years, total subsidy has consistently increased from Rs 140.7 billion in 1993 to 350.3 billion in 2002. The subsidy on seed was given to marginal farmers and farmers' cooperatives which was to the tune of Rs. 12.6 billion in 2003. According to the World Bank, in India, 13% of the population has access to irrigation. In this group the richest one third receive 73% of the subsidy.

The long-term credit are usually availed for the purchase of mechanisation inputs and short term for the purchase of seed, fertilizer etc. The agricultural machines and tractors are purchased through credit, available from organised financial institutions. NABARD is the main refinancing institutions. During the Budget 2006-07, the Finance Minister relieved the farmers of interest liability up to 2% on crop loans of principal up to Rs 100,000 taken during 2005-06. Also, the government has set a target that the short-term credit to farmers should not exceed 7% during 2006-07. According to All India Kishan Sabha as reported in Hindustan Times, 13th November 2006 only 27%

farmers get institutional credit. Remaining 73% farmers are dependent on non-institutional sources such as money lenders, traders, contractors and other middlemen for their credit requirements.

2.2 External Market

In the past agricultural exports and imports in the country were strictly regulated through quantitative restrictions such as quotas and licenses or channeled through trading organizations or combination of both. With the new trade policy initiated in 1991, major changes were made in export and import of agricultural products. Channeling of trade was abandoned so that the government does not determine the value or nature of imports or exports, except for the exports of onion and imports of cereals, pulses and edible oils. Most of the quantitative restrictions on the agricultural trade flows were dismantled. At present, there is no commodity under prohibited list of exports. In order to make its policies consistent with WTO obligations, the Government of India undertook several policy initiatives during 1999-2000 to liberalize import of agricultural commodities.

During the last 15 years agricultural imports have constituted about 3-8% of total imports into India. On the other hand agricultural exports have accounted for about 11-20% of total exports from India (Table 1). During 2002-05 imports of agricultural products accounted for 5-6% of total imports while the exports accounted for 11-13% of total exports from India. Main agricultural products imported include vegetable oils, pulses, cashew nuts, cotton and wood and wood products. Main agricultural products exported include food grains (mainly rice

and wheat), marine products, oil meals, cashew, tea, coffee, fruits and vegetables (fresh and processed).

3. Market of Agricultural Machinery and Tractors

3.1 Domestic Production and Demand

India has a big network of agricultural machinery manufacturing. There are twelve tractor manufacturer, two power tiller manufacturers and a number of agricultural implement and machinery manufacturers including about one million village craftsmen (Table 2).

Tractors are used in multifarious and flexible role varying from land preparation, water pumping and threshing of crops to transportation of goods and people as well as in construction works. Growth of tractor manufacturing industry has been very rapid starting with 881 tractors in 1961 to above 310,000 tractors in the year 2005 (Uniparts). India has emerged as the leading producers of wheel type tractors accounting for about one third of the global production and more than 50% of tractors in <60 hp category. The highest concentration of tractors is in northern India using dry land preparation and growing wheat mainly. Ninety three percent of sales of 264,790 tractors during 2005-06 were concentrated in 12 major states namely, 16% in Uttar Pradesh; 10% in Rajasthan; 9% each in Madhya Pradesh, Gujrat and Karnataka; 8% in Andhra Pradesh; 7% each in Maharashtra and Tamilnadu; 6% in Haryana; 5% in Punjab; 4% in Bihar and 3% in Orissa.

The average size of tractor in India at present is about 35 hp. The average size is slowly increasing and is expected to increase to 45 hp in the year 2020. The

annual production and sale of tractors of major manufacturers (except for Eicher and Gujrat, Hindustan) is given in Table 3. Tractor sales of major manufacturers are given in Table 4. M/s Mahindra & Mahindra with 85,028 tractors manufactured in 2005-06 top the list. Assuming an average life of a tractor in India as 15 years the total population of tractors (based on sales data) should be around 3.2 million at the end of March 2006.

Power tillers are becoming popular in low land flooded rice field, and hilly terrains. The growth in annual sales and population of the power tillers is comparatively lower than the tractors. A few foreign models (mostly Chinese) power tillers are being marketed in India. The annual sales of power tillers have remained static at around 16,000 during last five years. Total number of power tillers in India is estimated to be around 100,000. At present there are only two manufacturers, namely, VST Tillers & Tractors Ltd., Bangalore and Kerala Agro Machinery Corporation, Ernakulam.

There is increasing conscious of quality with regards to implement manufacturing. In India, standardization and quality control is ensured mainly by Bureau of Indian Standards (BIS). A list of standards on agricultural machinery is given in Table 5. A total of 540 standards have been developed and are adhered to in machine manufacturing. However there is scope of improvement in quality of agricultural implement particularly in case of small manufacturers.

3.2 Subsidy on Agricultural Machinery

The incentive by the government in the form of financial loans is encouraging the

farmers to purchase tractors. The purchasing power of the farmers is low. The government provides subsidy and credit at reduced rate to the farmers who are economically and socially at disadvantage to adopt modern technologies. The rate of subsidy on different agro machinery is given in Table 6. Subsidy on tractors and power tillers can be given to those which have been tested at Central Farm Machinery Training and Testing Institute, Budni (MP) and fulfill the guidelines issued by the Department in this regard. Subsidy on power tillers is allowed on those having 8-15 BHP and fitted with rotavator. While the State Governments shall keep the same rate of subsidy, the maximum amount could be reduced depending upon the cost of the equipment. The states / UTs may select the items depending upon their area specific requirements. Irrigation devices and plant protection equipment shall bear the certification mark issued by the BIS. For other items, they should have been tested in accordance with the Test Codes published by the BIS, by an authorized test station of central/ state government. The above stipulations have been made compulsory with effect from 1st April 2005. Year wise funds released and tractors subsidized during 9th and 10th Five Year Plans are given in Table 7. The number of other farm machines subsidized during 2002-03 to 2005-06 under Macro Management Scheme is given in Table 8. As a result of above efforts, good number of machinery have been sold to farmers. States have been asked to allocate 5-10% of their total allocations for prompting gender friendly equipment w.e.f. 2005-06 under Macro Management Scheme. The New Innovations have been allowed to the States up to 10% of their total allocations

under Macro Management Scheme.2005-06.

3.3 Export

A net importer up to 1976 India started to export tractors in 80's, mainly to African countries. During 1990's export of tractors grew from a few hundred to about 3,000 annually. Indian tractors are gaining acceptance in the international market and during the last three years the export of Indian tractors have grown at compound rate of more than 55%. During 2005-06 the industry exported 28,118 tractors. USA has merged as a major export market and other countries in South Asia, Malaysia, Turkey and African countries are growing fast as well.

3.4 Marketing and Import Barriers

Up to 1960, the demand of the tractors was met through imports only. Although India started to produce tractors in 1961 it continued to import tractors up to 1976. The prices of tractors from East European countries were lower than Indian tractors; there was a 40% duty on imported components during sixties. The production of tractors increased to 33,000 in 1975; over 71,000 in 1980; 140,000 in 1990 and reached one million units in 1989. In 1992 the industrial license to manufacture tractors was abolished. The production of tractors in 1997 was over 255,000 units. There are no restrictions on import of agricultural machinery including tractors and power tillers. There is a standard custom duty of 12.5% on imports of tractors and other equipment. All imported farm machines including tractors must be tested at the Central Farm Machinery Testing and Training Institute

(CFMT & TI), Ministry of Agriculture, Government of India, Budni, M.P. and must satisfy Minimum Performance Standards guidelines. All farm machines must satisfy Minimum Performance Standards guidelines prepared by the Central Farm Machinery Testing and Training Institute (CFMT & TI), Ministry of Agriculture, Government of India, Budni, M.P. to qualify for finance from the National Bank for Agriculture and Rural Development (NABARD).

4. Possible Trends (next 10 years) of Agricultural Machinery and Tractors Market

India is a large country with a wide agro-ecological diversity having predominance of rainfed agriculture. Farm holdings are small due to higher population density and land fragmentation will continue due to “Law of Inheritance” and “Hindu Succession Act”. Poor conditions of the farmers, vagaries of weather and improper planning at large scale in time and space are major hindrances in marketing of agricultural machines in India. Mechanical power for tillage, irrigation, harvesting and threshing will be preferred through custom hiring by those farmers who cannot afford to own machines. The present trend in agricultural mechanization is for high capacity machines to be used for custom hiring and for contractual field operations. The mechanization of rice, sugarcane, cotton, potato and horticultural crops, green houses and covered cultivation are new emerging areas, which need greater attention. Water is a scarce commodity and in near future with increasing demand for more irrigation water, concerted efforts will be needed for controlled application of water through drip, sprinkler and micro-

sprinkler systems to economize use of water and increasing water use efficiency. With the shift in agriculture towards diversification and agro-business, substantial areas will go under fruits, vegetable crops, plantation and floriculture. Design of green houses, handling of products and environmental control including mechanized cultivation, will assume greater importance. Presently, almost no efforts have been made to mechanize hill agriculture in India, where there is a tremendous potential of growing fruits, vegetables and flowers. This calls for developing appropriate technologies for mechanizing hill agriculture.

The difficulties are encountered in getting equipment for mechanization of critical operations of crops like sugarcane, cotton, paddy, ground nut, millets, pulses and oil seeds. Machines like sugar cane harvesters, cotton planters, paddy transplanters and harvesters are not available. Equipment for vegetable mechanization is almost non-existent. Harvesting machinery for sugarcane, paddy, pulses, millets oilseeds and fruit crops and commercial flower crops are not available. Thus, machines which are commercially manufactured, there is no difficulty encountered in sourcing and introducing.

The investment in farm machines for the year 1997, based on annual sales and average unit prices was estimated to be about 180 billion Indian Rupees (INR) or over US \$ 5 billion (Singh, 1998). The unit prices were assumed as an average since the prices varied from region to region. By 1997 the total estimated investment was around 180 billion Indian Rupees (INR). The investment in the power operated equipment was around 124 billion INR (US \$ 3.5 billion) which is about 70

percent of the total Investment in agricultural tools and implements.

The investment in the hand operated tools and implements is growing very slowly with the increase in the population of agricultural workers. The investment in the animal operated implements is decreasing gradually due to the decrease in the number of draft animals. However, the investment in the power operated farm equipment is increasing significantly. At the current prices, the total investment in the farm equipment is estimated to be around 300 billion INR (US \$6.5 billion) in the year 2005. Annual investment in agro-processing post harvest equipment was estimated to be around 200 billion INR bringing the total annual investment in 2005 to 500 billion INR or US \$ 11 billion (IASRI, 2006).

Mahindra & Mahindra, the largest tractor manufacturer in India has established assembly plants in USA, Australia and a manufacturing plant in China. It is trying to establish plants as well trying to acquire some existing plants in other countries to become the largest tractor manufacturer in the world. Similarly, Escorts has established tractor assembly plants in USA and Poland. It is in the final stages of setting up units in Turkey and Ghana and has identified two acquisitions in China.

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Table 1. Imports and Exports of Agriculture Commodities vis-à-vis Total National Imports/Exports During 1990-91 to 2004-05

(Value in Million Rupees)

Year	Agriculture Imports	Total National Imports	% Agriculture Imports to Total National Imports	Agriculture Exports	Total National Exports	% Agriculture Exports to National Export
1990-91	12058.6	431708.2	2.79	60127.6	325272.8	18.4
1991-92	14782.7	478508.4	3.09	78380.4	440418.1	17.8
1992-93	28762.5	633745.2	4.54	90403.0	536882.6	16.8
1993-94	23273.3	731010.1	3.18	125865.5	697488.5	18.05
1994-95	59372.1	899707.0	6.60	132227.6	826734.0	15.99
1995-96	58901.0	1226781.4	4.80	203977.4	1063533.5	19.18
1996-97	66126.0	1389198.8	4.76	241612.9	1188173.2	20.33
1997-98	87841.9	1541762.9	5.70	248324.5	1301006.4	19.09
1998-99	145664.8	1783316.9	8.17	255106.4	1397517.7	18.25
1999-2000	160667.3	2155285.3	7.45	253136.6	1590952.0	15.91
2000-01	120662.3	2283066.4	5.29	286573.7	2013564.5	14.23
2001-02	162566.1	2451997.2	6.63	297286.1	2090179.7	14.25
2002-03	176088.3	2972058.7	5.92	346539.4	2551372.8	13.58
2003-04	219726.6	3591078.6	6.12	372665.2	2933667.5	12.70
2004-05	220574.9	4810641.1	4.59	398633.1	3560688.8	11.20

Source: Agricultural Statistics at a Glance, 2005. Directorate of Economics & Statistics (Agricultural Statistics Division), Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India

Table 2. Status of Farm Machinery Industries in India

S.No	Equipment manufacturers	No. of units
1	Agricultural tractors	12
2	Power tillers	2
3	Earth movers	3
4	Pumps	600
5	Sprinkler sets	35
6	Drip irrigation system	35
7	Plant protection equipment	300
8	Combines	48
9	Reapers	60
10	Threshers	6000
11	Seed drills	2500
12	Ploughs, cultivator and harrows	5000
13	Tractors parts and accessories	546
14	Earth moving machinery and parts	188
15	Diesel oil engine	200
16	Rice processing machinery	300
17	Sugarcane crusher	50
18	Chaff Cutter	50
19	Dairy and food industries	500
20	Village craftsmen	1million

Source: TMA Report, 2003-06; and Data Book on Mechanization and agro-Processing since Independence, 1997, CIAE, Bhopal.

Table 3. Production and Sale of Tractors in India

Year*	Production	Sale
1991	150,556	149,973
1992	144,350	143,601
1993	138,770	138,057
1994	164,841	164,309
1995	191,329	191,196
1996	221,689	220,941
1997	255,327	250,378
1998	261,609	262,251
1999	278,556	273,181
2000	255,690	254,825
2001	219,620	225,280
2002	166,889	173,098
2003	190,687	190,348
2004	249,077	247,531
2005	296,080	292,908
Total	3,185,070	3,177,877

Fiscal year: 1 April – 31 March

Source: Report of Tractor Manufacturers Association for 2003-06

Table 4. Tractor Sales of Major Manufacturers

Company/Make	2004-05	2005-06
Escorts(+Farmtrac)	31,696	28,297
H.M.T. (also Gujrat - Hindustan)	7,032	7,900
Mahindra & Mahindra	65,394	85,028
MGTL (Mahindra Gujrat Tractor Ltd)	2,448	2,749
TAFE Group	52,851	66,667
Eicher (Acquired by TAFE Group in 2005)		
Force Motors	4,016	4,461
Punjab Tractors Ltd.	30,330	31,396
VST Tillers & Tractors Ltd.	935	1,228
L&T-JD (Now John Deere Equip. Ltd.)	16,020	19,951
New Holland International	10,445	13,214
Sonalika	26,364	32,017

Source: Report of Tractor Manufacturers Association for 2003-06

Table 5. List of Standards on Agricultural Machinery

S.No.	Types of machinery	Standards nos.
1.	Tractors and power tillers and engines	160
2.	Soil working equipments	47
3.	Sowing and fertilizer application	28
4.	Irrigation and drainage equipment and system	30
5.	Crop protection	27
6.	Harvesting and threshing	24
7.	Horticulture and plantation	55
8.	Processing machinery	25
9.	Milling equipment	18
10.	Dairy and animal husbandry equipments	58
11.	Farm transport	14
12.	Storage structure	53

Source; Bureau of Indian Standards, 1995

Table 6. Pattern of Assistance for Farm Mechanization under Macro Management Scheme during Tenth Five Year Plan (2002-2007)

S.No.	Name of Implement/ Machine	Rate of Subsidy
1	2	3
1.	Tractor (up to 35 PTO HP), Power Tiller (8-15 BHP), Self Propelled Reaper, Paddy Transplanters and other similar self propelled machines	@25% of the cost limited to Rs.30000
2.	Specialized power driven equipment such zero-till-seed Drill, Raised Bed Planter, Sugarcane cutter planter, potato planter, potato digger, groundnut digger, rotavator, straw reaper, strip till drill, tractor drawn reaper, cleaner-cum –grader, dryer, stubble shaver, mobile fruit harvester, power weeder etc.	@25% of the cost limited to Rs.20000
3.	Manually operated implements / tools And Animal driven implements	@25% of the cost limited to Rs.20000
4.	Animal driven tool carrier	@25% of the cost limited to Rs.5000
5.	Power driven equipment (tractor/power tiller operated), Power Thresher	@25% of the cost limited to Rs.10000
6.	Diesel / electric pump sets	@25% of the cost limited to Rs.8000
11.	Sprinklers	@25% of the cost limited to Rs. 15000 per set for small, marginal, SC& ST and women farmers. @25% of the cost limited to Rs. 10000 per set for other farmer's up to 2 ha.
12.	Drip irrigation	@25% of the cost for small, marginal, SC& ST and women farmers; and 25% for other farmers with limits on amounts.
13.	Plant Protection Equipment:	
	(i) Manual	@25% of the cost limited to Rs. 8000
	(ii) Power operated	@25% of the cost limited to Rs. 20000
	(iii) Tractor mounted	@25% of the cost limited to Rs. 4000
	(iv) Aero-blast sprayer	@25% of the cost limited to Rs. 30000

Table 7. Amount and Number of Tractors Subsidized under “Promotion of Agricultural Mechanization among Small Farmers” and “Macro Management” schemes

Year	Amount of subsidy released (in Million Rupees)	No. of tractors subsidized
1992-93	49.98	1666
1993-94	100.00	3333
1995-96	60.00	2000
1996-97	167.30	5666
1997-98	1669.30	5564
1998-99	1636.94	5456
1999-2000	1577.10	5257
2000-01 Scheme Subsumed in Macro Management Scheme	165.00	550
2000-01	78.87	2629
2001-02	110.88	3696
2002-03	133.77	4459
2003-04	97.50	3250
2004-05	84.30	2810
2005-06	218.76	7292

Table 8. Number of Farm Machines Subsidized during 2002-03 to 2005-06

Item	2002-03	2003-04	2004-05	2005-06
Power tillers	4825	4884	3724	16500
Manually operated equipment/tools	155509	140339	105424	64610
Bullock driven implements	74372	69168	32788	41854
Tractor drawn implements	17863	796	5804	15236
Self-propelled equipment	4631	3698	1236	6080
Plant protection equipment	86542	35500	23772	81496
Irrigation equipment	10500	9666	18484	6587
Gender friendly equipment	-	-	-	66464
New initiatives	-	-	-	1556