



भारतीय कृषि एवं खाद्य परिषद्
INDIAN COUNCIL OF FOOD AND AGRICULTURE

FARM MECHANIZATION

NATIONAL ROUND TABLE CONFERENCE



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INDIA INTERNATIONAL CENTRE, NEW DELHI

INDIAN FARM MECHANIZATION MARKET OVERVIEW



INTRODUCTION

The agriculture sector value chain includes all the steps involved from land preparation to harvesting and post-harvest processing. For every step in the production lifecycle, use of equipment enhances the efficiency of the unit involved. Farm mechanization not just reduces labor time and post-harvest loss but also helps to cut down production cost in the long term. and technology, multiple options to access modern technologies have become available. It is evident from the replacement of indigenous varieties of seeds by high-yielding varieties and traditional equipment and practices by power tillers, tractors and others machines.

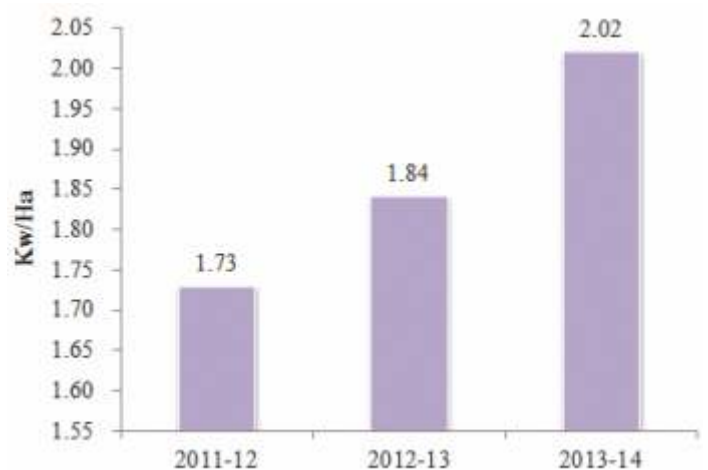
Farm mechanization has been known to provide a number of economic and social benefits to farmers. Primary among the economic benefits is the improved yield that comes as a result of greater level of mechanization. Looming water scarcity crisis along with the need to ensure food security in the country, the benefits of farm mechanization makes it a crucial component of shaping the future of the Indian agriculture.

FARM MECHANIZATION

The agriculture sector in India has witnessed a considerable decline in the use of animal and human power in agriculture related activities. The trend has paved a way for a range of agricultural tools. A large number of these are driven by fossil fuel operated

vehicles such as tractors, diesel engines. This has resulted in a shift from the traditional agriculture process to a more mechanized process.

Farm Power Available on Indian Farms; 2011-14



Source: Country presentation paper, Agricultural Machinery Manufacturers Association (AMMA) India, October 2014

Though, farm mechanization in India stands at about 40%-45%, which is still low when compared to countries such as the U.S. (95%), Brazil (75%) and China (57%). While the level of mechanization lags behind other developed countries, it has seen strong growth through the last decade. The farm power availability on Indian farms has grown from 1.47 kW/ha in 2005-06 to 2.02 kW/ha in 2013-14.

The different sources of power available on the Indian farm for doing various mobile and stationary operations are mobile power viz.

- ◆ **Agricultural Workers**
- ◆ **Draught Animals:** Bullocks, Buffaloes, Camels, Horses And Ponies, Mules and Donkeys
- ◆ **Tractors**
- ◆ **Power Tillers**
- ◆ **Self-Propelled Machines:** Combines, Dozers, Reapers, Sprayers etc.
- ◆ **Stationary Power:** Diesel/Oil Engines for Pump Sets, Threshers, Sprayers and other stationary operations
- ◆ **Electric Motors:** For Pump Sets, Threshers, Sprayers and Other Stationary Operations

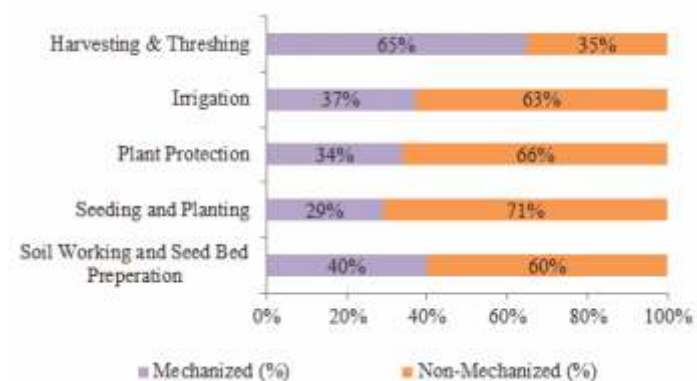
Farm Power Available on Indian Farms by Different Sources; 2011-14



Source: Singh (2013); Singh et al. (2010); Singh et al. (2009)

Operation-wise, the level of mechanization varies for soil working and seed bed preparation, seeding and planting, plant protection and irrigation, which are stated below in the form of a table:

Extend of Farm Mechanization at Different Levels of Value Chain Process



Source: UNESCAP CSAM

Region-Wise Farm Mechanization

In India, the level of mechanization varies greatly by region. States in the north such as Punjab, Haryana and Uttar Pradesh have high level of mechanization due to the highly productive land in the region as well as a declining labor force. The state governments in these states have also provided timely support in promoting mechanization of farms.

The western and southern states in the country have a lower level of mechanization due to the smaller land holdings prevalent in these regions as well as the land holding being more scattered. As a result, in many cases, mechanization has been uneconomical leading to the lower development.

In north-eastern states, the level of mechanization is extremely low. There are a number of reasons behind this. Factors such as hilly topography, high transportation cost, lack of state financing and other financial constraints due to socio-economic conditions and dearth of agricultural machinery manufacturing industries have hindered the growth of farm equipment sector within these states.

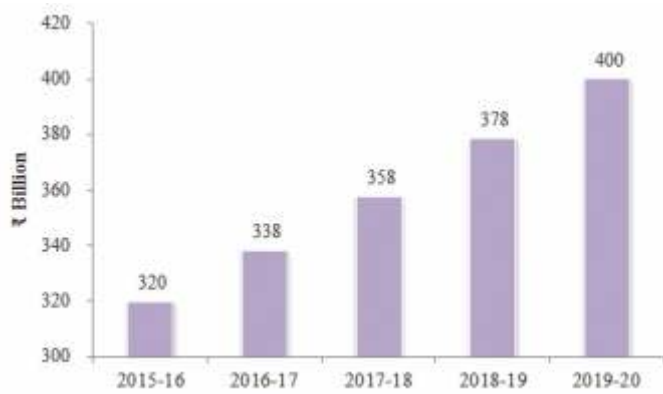
Indian Farm Mechanization Market

The Indian farm mechanization market, which was valued at ₹320 billion in 2015-16, is expected to upsurge at a CAGR of 5.74% at reach ₹400 billion by 2019-20. Shortage of farm labor and the need to enhance farm productivity are among the main reasons for increasing farm mechanization in India.

However, farm mechanization provides different streams of employment related to handling of farm machines thus resulting in increased rural employment. Increased farm mechanization is a key step towards doubling farmer's income and better rural prosperity.

The availability of abundant and cheap labor in India has largely confined farm mechanization to tractors and power tillers. While tractors and power tillers still outsell other farm equipment like paddy transplanters and combine harvesters, the gap has closed in recent years. It is because of rural youth population is migrating to cities in search of better paying jobs in services and factories. This is creating a big market for specialized machineries, such as threshers, rotavator, transplanters, reapers, zero till drills, laser levellers and power weeders.

Indian Farm Mechanization Market; 2015-20



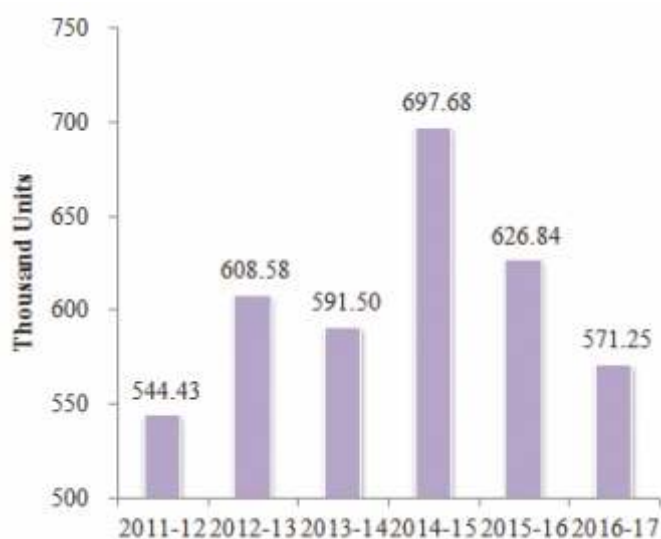
Source: agrination.org.in

INDIAN FARM MECHANIZATION MARKET SEGMENTATION

Indian Tractor Market

Tractor is the largest segment in the equipment category with an annual sale of 600,000-700,000 units. The market has grown at a CAGR of 8.62% till 2014-15. However, there is a sharp downturn since 2015-16. This has been attributed to a reduction in farm incomes due to the decline in production of major crops as well as softening commodity prices with lower procurements by the government on account of adequate buffer reserves. Penetration of tractors in India is higher in northern India, mainly Punjab, UP and Haryana.

Indian Tractor Market; 2011-17



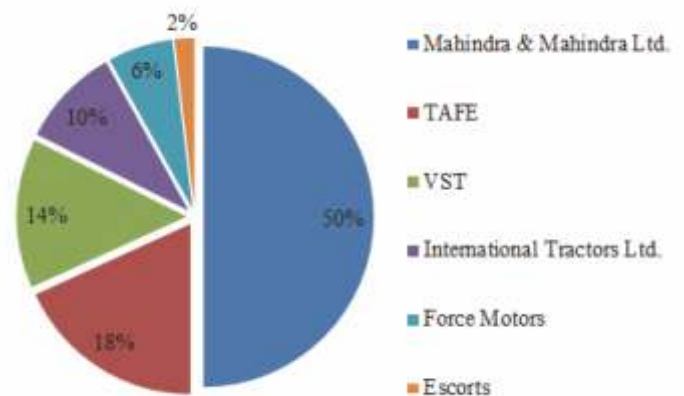
Source: Department of Agriculture and Cooperation, State of Indian Agriculture 2013-14, ICRA, A report on 'Farm Mechanization in India',

Within the tractor market, the 41-50 HP segment is the largest selling unit, followed by the 31-40 HP segment, which has been sourced mainly from the > 50 HP segment.

While the country produces a large volume of tractors, it also exports tractor units to other countries across the world. On an average, the country exports an average of 60,000 tractors annually. India's tractor export markets primarily include African countries and ASEAN countries where soil and agro-climatic conditions are similar to India.

The major players in the market include, Mahindra & Mahindra, TAFE, VST, International Tractors, Force Motors and Escorts.

Indian Tractor Market Players; 2016-17



Source: Company Reports

Indian Power Tiller Market

A larger portion of the farming population of the country falls into the small and marginal segment. Hence, affordability of farming equipment and the size of the yield are some of the factors that come into play. Hence, the power tiller category has not seen much growth in the past several years.

However, if compared, then utility wise, power tillers can perform a lot of functions just like tractors in the fields. Tractors cannot till the land, cultivate crops, and are especially difficult to use in smaller fields.

Power tillers are particularly useful in rice fields. China is the highest rice producing country in the world, and Sifang and Dongfeng Motors are two of the main suppliers in the country. Next in line is India, with

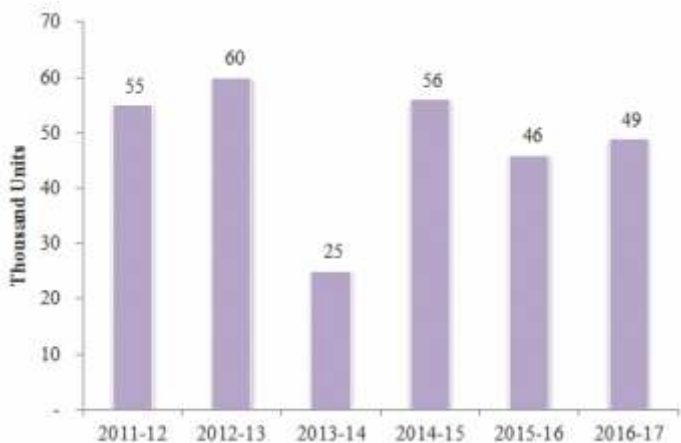
companies like Crompton Greaves, Shracchi, VST and KOEL, Indonesia (Quick Tractors, Yanmar), Vietnam (VEAM), Thailand (Siam Kubota), and Japan (Kubota, Yanmar, Mitsubishi).

The Indian power tiller market, in terms of the volume has been fluctuating during 2011-17. Domestic power tiller industry is government subsidy-driven and the subsidy can range from ₹40,000-₹90,000 per power tiller and can even extend beyond ₹1,00,000 for farmers belonging to economically backward class.

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Indian Power Tiller Market; 2011-17



Source: Department of Agriculture and Cooperation, A report on 'Indian Tractor Industry' by ICRA, TechSci Research, DAC - Dept. of Agriculture and Cooperation

The penetration of power tillers in India is higher in southern and eastern India as compared to the others parts of the country on account of the small size of land holdings per farmer in these respective regions.

In fact, small land sizes and high cost of labor, coupled with rising income levels in rural areas, provide a huge untapped opportunity.

MARKET DRIVERS

Agricultural Labor Shortage

Labor shortage is being experienced at peak seasons due to the enactment of the National Rural .

Employment Guarantee Act and huge demand from the construction sector in cities. Labor is available at a higher cost per hectare and this would increase the demand for mechanization. It has been observed that the percentage of agricultural workers to total workers in India has been gradually declining and it is expected to further decline to 25.7% by 2050 leading to severe farm labor shortage.

Contract Farming

Business establishments provide farmers with specialized farm equipment and various amenities to improve crop yield through the adoption of latest agricultural technologies. Many companies in the country have participated in such practices before. The continuation and growth of contract farming with more entities getting involved provides future opportunities for the expansion of the industry.

Credit Availability

The government is promoting 'balanced farm mechanization' by providing subsidy on various equipments and by supporting bulk buying through front-end agencies. The government also provides credit and financial assistance to support local manufacturing of farm mechanization equipment. Both Central and State governments have been increasing its focus to develop farm mechanization in the Himalayan and North Eastern region where the Centre alone has allotted ₹3,700 crore for next five years starting 2016-17. This would push the demand for machines such as power weeder, sprayers, and other smaller implements suitable for hilly and terrace cultivation.

Low Penetration of Farm Equipments

Penetration of farm equipment in India provides a strong growth opportunity. As mentioned above, only about 40%-45% of agriculture in India is mechanized. In 2012-13, it was estimated that the penetration of tractors was about 20 per 1,000 hectares. The penetration is lower with the small and marginal farmers who own land less than 5 hectares. This segment forms over 80 percent of the land holdings in

the country. Thus, there is a lot of potential for increasing the penetration and therefore growing the market size.

Rise in Demand for Food Grains

As per the Vision 2030 document by Indian Council of Agricultural Research, domestic demand for food grains is expected to increase at around 2% CAGR in CY2000-30. Food grains demand is expected to reach 355 MT in CY30 vis-à-vis 192 MT in CY10. Fruits and Vegetables demand is expected to reach 290 MT in CY30 vis-à-vis 136 MT in CY10. However, given the limitations in land use and in increasing cropping intensity over a certain period, increasing the yield from the same land is an urgent requirement to meet the needs of a growing domestic population.

This limitation can only be overcome by increasing the food productivity, for which farm mechanization plays a vital role.

INDIAN FARM MECHANIZATION MARKET OPPORTUNITIES

The farm equipments sector is yet to become a major market segment and tractors remain a major sector of investment. The irrigation sub sector also presents immense investment opportunities. Indian players like Jain Irrigation have already built up on this opportunity, but there certainly is scope for market entrants. With the recently launched Pradhan Mantri Krishi Sinchai Yojana, the government is keen to support the reach of irrigation to every farm. Innovation in farm machinery sector will drive the next phase of agricultural growth in the country. Also the vision of 'Make In India' is set to increase innovation and investment in the sector.

The following table shows the farm mechanization opportunities across the Plains and Hilly Regions in India.

Operation	Plains			Hilly Region			Precision Farming Machines
	Manual	Animal Drawn	Tractor/Power Tiller/Self Propelled/Power Operated	Manual	Animal Drawn	Tractor/Power Tiller/Self Propelled/Power Operated	
Prime Mover	Manual	Animal Drawn	Tractor/Power Tiller/Self Propelled/Power Operated	Manual	Animal Drawn	Tractor/Power Tiller/Self Propelled/Power Operated	Power Operated
Seed Bed Preparation							
Sowing/ Planting/ Transplanting/ Fertilizer Application							
Irrigation and Drainage							
Weeding/ Herbicide Application/ Intercultural							
Fertilizer/Manure/ Agro Chemical Application							
Spraying							
Harvesting							
Threshing							
Special Package of Equipment							
Other Machines/ Equipments							
Legends							
Available, possibility on improvement, needs to be demonstrated							
Normally, the operation is done using conventional tools or the power source is not used for this operation/system or not applicable							
Available for some crop or in some parts of country, needs refinement, feasibility trials in other parts/crops							
Needs development/refinement							

MARKET CHALLENGES

Small and Scattered Land Holdings

Average farm size in India is less than 2 hectares, which is far lower than regions like European Union (14 hectare) and the US (170 hectare). Large farm machineries are difficult to operate on such land holdings, which in some cases are completely unsuitable.



Therefore, there will be little mechanization unless machines appropriate for small holdings are made available or substantial farm amalgamation takes place. Due to small size of land holdings, it is difficult for the farmers to own machinery. As a result, the benefits of mechanization are enjoyed by only a section of the farmers who have large farm holdings.

‘Tractor-isation’ and Not Mechanization

Tractors have an annual market of 600,000-700,000 units in India whereas, threshers, the next largest segment, has an annual market of just 100,000 units. The penetration of tractors has grown from one per 150 hectares to one per 30 hectares on agricultural land.

However, such a growth in penetration has not been seen in other agricultural implements. This phenomenon has been dubbed as ‘tractor-isation’. It is to be noted that for a sustainable agricultural future, other farm implements, and not just tractors, need to be advanced to farmers in the country.

Procurement Process for the Farmer

The entire process of acquiring farm equipment is very tedious and cumbersome for a farmer. A farmer has to

go through various levels/ departments to get his land records verified. Post clearance, he has to go through further checks from the District Agriculture Officer in order to obtain approval and clearance for the purchase. This process itself becomes a big hindrance and discomfort to the farmer.

Financial Assistance for Farm Equipment

Purchase of farm equipment is a significant investment for most of the farmers in India. Hence, reasonable financing norms are a must for ensuring mechanization. An issue that has been persistent in financing is the purchase of standalone implements. This seems to discourage farmers from investing at large, as they need to shell out a huge amount.

Equipment Cost and Quality

Farm equipment, especially the energy-efficient options, is capital intensive and is a major investment for most of the farmers in India. A majority of them belong to the low income bracket.

The quality and after-sales service of farm equipment is another concern, since agriculture is largely carried out in rural parts of India and there is still an inadequacy of service-centres for proper maintenance.

Conclusion

Though policy makers have initiated preliminary support to farm mechanization by including it as focus area in broader schemes such as in Rashtrya Krishi Vikas Yojna and Macro Management of Agriculture schemes, concerted focus on this sector is still lacking. A lot more focus needs to be brought in to further enhance the growth of this sector and to tap the immense potential it offers.

Some of the innovative measures which can be considered are as follows:

- ◆ Promotion of Custom Hiring Centres (CHC)
- ◆ Creating an institutionalized framework for custom hiring’
- ◆ Make in India’ support for farm implements
- ◆ The subsidy needs to be re-visited for better rate of interest to farmers.

Deliberations

Agriculture being one of the primary employment sector to millions across the country becomes vital for the country's growth. India ranks third in farm and agriculture output globally. It is also the largest producer, consumer and exporter of spices and related products. Agricultural exports constitute 10% of the country's exports, and are the fourth-largest exported principal commodity.

However, productivity in the country has been highly variable due to erratic monsoons, which in turn presents a strong case for farm mechanization and use of more stable irrigation sources such as micro irrigation systems etc.

Farm Mechanization in enhancing farm efficiency and making farming more profitable, Government of India has given highest priority to this sector. But given the plethora of issues and constraints the country is yet to realize its full potential. In this context ICFA hosted a National Round Table Conference on Farm Mechanization on January 31, 2017 at India International Centre, Lodi Estate, New Delhi.

The conference was chaired by Mr. Ashwani Kumar, Joint Secretary – Mechanization, Ministry of Agriculture. The event observed the presence of various eminent personalities from the relevant field. In all thirty six esteemed executive members of Government associations, scientists along with policy makers and corporate heads were present for the brainstorming session.

Dr. M J Khan, Chairman, ICFA welcomed all the delegates and underscored the important role of Agriculture and Farm Mechanization in enhancing farm efficiency and making farming more profitable. He pointed out some of the area and concerns, which are as follows:

- ◆ Sensitization of farmers on -As per the crops grown, farm tools need to be ascertain (equipment capacity) depending upon the sizes of farms.
- ◆ New machines and tools should be affordable to the farmer thereby increasing the productivity and income.
- ◆ Equipment lacking in specific environments especially hilly terrains with a view to designing entirely new tools.

- ◆ Lack of R&D involved -ability to operate motorized machines, to know what form of machines to develop.
- ◆ The levels of farmers' proposed investment on farm tools, to ascertain their financial capabilities in purchasing mechanization machines.
- ◆ Availability of crop processing and storage facilities and post-harvest waste management.

Mr. D.S. Balachandra Babu, Managing Director, Farm Implements India, suggested that the state government initiatives in setting up of authorized farmer's choice agricultural machinery industries which should develop or purchased and hired out to farmers at subsidized rates to minimize the level of mechanization of certain farm operations as well as creating mechanization awareness among some farmers.

Dr. Ex-Vice-Chancellor, SKUAST, Srinagar, talked about the sensitization of farmers on -As per the crops grown, farm tools need to be ascertain (equipment capacity) depending upon the sizes of farms the initiatives already taken care by ICAR institutes and KVKs.

Mr. Ravi Beri, Managing Director, Beri Udyog, Government intervention encouraging the local fabrication of replaceable parts which should be tested on the farm for at least two farming seasons to ensure reliability before introducing such parts to the farmers.



Mr. Ashwani Kumar, Joint Secretary – Mechanization, Ministry of Agriculture, told that Government is taking initiatives in organizing workshops/seminars on farm mechanization and operator training to create awareness on mechanization activities and to avoid damage of machinery due to unskilled personnel in taking loop with KVKs.

Mr. Sushil Agarwal, Managing Director, Govind Industries Pvt. Ltd., spoke about needed attention on Fiscal measure in the form of reduction/exemption of agricultural implements & machines from levy of Central Excise Duty.

Mr. R.D. Kapoor, Head Agri Support and Alliances, PI Industries Ltd., stressed on Financial assistance in the form of subsidy to the farmers for the purchase of agricultural equipment. Challenges faced by farmers regarding institutional credit, bank loans besides subsidy for the purchase of various identified equipment.

Mr. V.N. Kale, ADC Mechanization, Ministry of Agriculture, assured the government initiative on establishment of additional training institutes over and above the existing 4 FMTTIs (Farm Mechanization Training and Testing Institute).

Mr. Vikram Ahuja, Director, Zamindara Farm Solutions, emphasized on Testing Centers for Farm Machinery, standardization of documents and testing formats for farm equipment's, streamlining the system

of evaluation of Test Reports.

Mr. Hiroaki Hasebe, COO, Honda R&D (India) Pvt. Ltd., throws concern over the application for test of agricultural machinery/equipment is lengthy and time consuming process. The process need faster approach and more result oriented.

Mr. Randwa, Executive Director, ICFA, constraints in promotion of mechanization include the varied requirement of equipment for each agro climatic zone, the small and fragmented land holding, low investment capacity of the farmers, inadequate irrigation facilities, know how status of the farmers, repairs & maintenance facilities etc.

Mr. A.K. Sharma, Joint General Manager, HMT Limited, requested the authorities of Mechanization, Ministry of Agriculture for Clarity of Dangerous Machines (Regulation) Act, 1983 for its application and registrations.

Mr. Alok Sinha, IAS former Chairman, FCI and Secretary General, ICFA, raised points that Mechanization machines are available, to know their suitability visa-a-vie improvement on them, to suit local conditions lack of awareness in small farmers and land holders.

Conference ended on a happy note.



Recommendations



1. According to the Agriculture Census, the total number of operational holdings in India numbered 138.35 million with an average size of 1.15 hectares. Of the total holdings, 85 per cent are in marginal and small farm categories of less than 2 hectares and these small farms, though operating only on 44 per cent of land under cultivation, are the main providers of food and nutritional security to the nation, but have limited access to technology, inputs, credit, capital and market. In order to enhance level of mechanization in agricultural operations government needs to extend support to farmers. This support could be in form of custom hiring centers which would facilitate hiring of equipments by small and marginal farmers. It is further submitted that PPP model should be employed for the purpose.
2. Farmers should be extended with financial assistance in the form of subsidy for the purchase of agricultural equipments and should have the discretion to select the quality machinery to be purchased with subsidy rather than it being pre decided vide norms.
3. To acquaint farmers with new farm technologies and to impart required skill for its usage is primitive for better adoption of mechanization. Hence, KVK along with corporates participation in PPP model may be utilized to increase knowledge of farmers on the benefits of using latest farm machinery and to train them for appropriate use of the machinery.
4. Maximum use of farm machinery is made before and while sowing and for harvesting of crops, whereas the use of machinery in between sowing and harvesting is negligible. To promote the use of farm machinery in the intermediate processes there is a need to develop customized farm machines and equipments with special focus on small and marginal land holders. Therefore, dedicated funds are required to promote research to come up with technology suitable to small and marginal farmers.
5. To provide after sale services in the field and to avoid damage of machinery due to unskilled labour there is a need to promote training of personnel at FMTTI, for which Government is already providing financial assistance. Further, promoting such trainings will also generate employment for youth in rural areas. Awareness Campaign should be initiated to sensitize rural youth about available employment opportunities and support provided by the government for the same.
6. After sale service, operational education and performance warranty for at least three years should be inbuilt into the marketing and sale process to avoid hardship to users. Government should intervene and have a regulatory mechanism to ensure after sales services to farmers.
7. In order to expedite the process and conserve resources, it is suggested that imported machinery, if approved by recognized agency need not be retested. Further, some agencies involved in testing and approval of farm machinery worldwide can be enlisted and recognized for the purpose.



LIST OF PARTICIPANTS

1. Mr. Ashwani Kumar, Joint Secretary – Mechanization, Ministry of Agriculture
2. Mr. V.N. Kale, ADC Mechanization, Ministry of Agriculture
3. Prof. Anwar Alam, Former VC SUAST-K, Dy.DG (Eng.) ICAR and VC IGKV, Raipur
4. Dr. K. Alagusundaram, Deputy Director General (Agricultural Engineering)
5. Mr. D.S. Balachandra Babu, Managing Director, Farm Implements India
6. Mr. Mainish Arora, Sr. GM-Sales and Channel Management, Mahindra and Mahindra Ltd.
7. Mr. Sunil Johnson, Sr. GM-Sales and Customer Operations, Mahindra & Mahindra Ltd.
8. Mr. Sushil Agarwal, Managing Director, Govind Industries Pvt. Ltd
9. Mr. Ravi Rastogi, Sales Executive, Govind Industries Pvt. Ltd
10. Mr. Ravi Beri, Managing Director, Beri Udyog
11. Mr. Vikram Ahuja, Director, Zamindara Farm Solutions
12. Mr. Vipin Maghotra, Manager, Axereal Group
13. Mr. Neeraj Gupta, Head- Tractor Division, VST Tillers Tractors Limited
14. Mr. A. Masethung, Divisional Manager, VST Tillers Tractors Limited
15. Mr. Rajesh Menon, Head New Products, Shaktiman Agro
16. Mr. Hiroaki Hasebe, COO, Honda R&D (India) Pvt. Ltd.
17. Mr. Sanjay Bagria, Division Head, Honda R&D (India) Pvt. Ltd.
18. Mr. Mohit Singh, Product Head, Honda Siel Power Products
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20. Mr. Anil Menon, Head Marketing Development, CLAAS Agricultural Machinery
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22. Mr. A.K. Sharma, Joint General Manager, HMT Limited
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26. Mr. Abhishek Somani, Marketing Manager, Somani Kanak Seedz Pvt. Ltd.
27. Ms. Fariha Ahmed, Assistant Editor, Agricultural Today
28. Dr. M.J. Khan, Chairman, ICFA
29. Mr. Alok Sinha, Director General, ICFA
30. Mr. N.S. Randhwa, Executive Director, ICFA
31. Ms. Mamata Jain, Director Cooperate Affairs, ICFA
32. Mr. Vishnu Rathore, CEO, ICFA
33. Dr. Suchita Wadhwa, Director-Organization and KM, ICFA
34. Dr. Priyanka Sarkar, Vice President-Programs and Policy Affairs
35. Mr. Shivam Sharma, Asst. Vice President Project and Coordination, ICFA
36. Mr. Ankit Sharma, Asst. Manager Coordinator, ICFA