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Role of Farm Mechanisation in Indian Agriculture

Gajjela Indira and Alladi Chandrakanth
Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, U.P.

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Introduction

Farm mechanisation refers to the development and use of machines that substitutes human and animal power in agricultural operations with a motive to attain better productivity and production with better profitability. In India the extent of farm mechanisation is lesser compared to other western countries. Mechanization plays a key role in commercialization of agriculture. The utilisation of farm machineries is increasing continuously in Indian Agriculture as it contributed to the increase in productivity due to timeliness of operations and increased precision in input application. In the contemporary scenario, farm mechanisation start-ups, especially those built on the farming as a service (FAAS) model, are rapidly integrating technology with an emphasis on precision agriculture in India. Farm mechanisation is using machinery and technology to increase output, productivity, and profitability. The availability and wise application of farm power by farmers affects farms' production significantly.

By facilitating timely farm operations, better input management, increased work quality, and a decrease in post-harvest losses, agricultural machines maximise the productivity of land and labour. Farm mechanisation is a catalyst for increased production and productivity in agriculture by transforming many subsistence farmers who worked on small holdings with animal and human power into vibrant commercial farmers using mechanised sources of farm power. Mechanization not only makes a significant contribution to multiple cropping and agricultural diversification, but it also makes it possible to use inputs like seeds, fertiliser, and irrigation water efficiently (Singh and Sahni, 2019). Farm mechanisation level in India is still between 40 -45% whereas it is more than 90% in industrialised economies. The adoption of farm mechanisation among the Indian farming community is highly imperious and is important for sustainable development. The adoption of mechanised solutions in Indian agriculture is driven by a number of factors such as the growing population, urbanisation, surge in agri exports like tractors, improved flow of

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agricultural credit, labour migration, and shortages, in addition to the agricultural, social, and economic growth drivers of mechanisation.

India is one of the top six nations in the world for the volume of agricultural technology transactions. According to leading industrial research, India is home to one out of every nine Agri-Tech start-ups worldwide. India presently houses more than 450 start-ups in the agri-tech industry, growing at a rate of 25% each year (NASSCOM, 2019). With the expansion in emphasis and scope of technology integrations in the farm mechanisation sector, four specific areas of Agri-Tech themes applicable to the Farm Mechanisation sector have been identified. The next phase of evolution in farm mechanisation and the nation's entire agriculture sector will be driven by the advancement of technologies in these categories (FICCI, 2019).

The four identified categories are

1. Farming as a Service (FAAS)
2. Big data-based mechanisation technologies
3. Internet of Things (IoT) mechanisation technologies
4. Artificial intelligence (AI) mechanisation technologies.

At present, farmers in India are adopting agricultural mechanization at a faster rate as compared to the past. Although, the sale of tractors cannot be considered as the only measure of farm mechanization but to a great extent it reflects the farm mechanization level of the country. Tractor industries in India have emerged as the largest in the world and account for about 1/3rd of total global tractor production. In India, agriculture sector has observed a considerable reduction in the use of animal and human power (animate power). The role of tractors in India reflects the increasing trend of tractorization in the country. Different sources of farm power available for performing various farm operations are human, draught animals, tractors, power tillers, self-propelled machines, diesel/petrol/kerosene engines and electric motors.

Advantages of Farm Mechanisation:

1. Increment in farm income through better utilisation of agricultural land in a commercial way.
2. Reduction in farming costs which in turn can pave the way to deal with increasing labour costs.

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3. Reduction in workload for the farm labour thereby causing an increase in work efficiency.
4. Time saving by reduction in the time required to carry out farm operations and activities by 15-20%.
5. Saving the use of inputs such as seeds and fertilizers by 15-20%.
6. Helps in conversion of uncultivable land to agricultural land through advance tilling machines and shifting land use for feed and fodder production.
7. Increase in cropping intensity.

Current issues to be addressed in Indian agriculture are as follows:

1. In India, 63% of the total landholdings are below one hectare and more than 86% landholding are less than two-hectare accounting for 19% and 40% of the cultivated area (142 million hectare), respectively. Fragmentation of farm land holding is a major concern and average size holding has reduced from 2.82 to 1.1 hectare from 1970-71 to 2010-11 (Tiwari *et al*, 2019).
2. Increase in the cost of farm labours due to increased migration of rural workers to the urban areas.
3. Overdependence of Indian agriculture on the monsoons.
4. Decrement or stagnant productivity of the rice-wheat cropping system.
5. Demand for sustainable agricultural productivity to feed our present and future human and animal populations.
6. Due to intensive involvement of labourers in various agricultural farm operations, there is need for the high-cost machinery for better turnout in shorter period of time.

Some of the Government initiatives to support Farm mechanisation are as follows:

1. **Sub-mission on Agricultural Mechanisation (SMAM)**: This mission was launched by central government in 2014-15 with the following objectives:
    a. Increasing the reach of farm mechanisation to small and marginal farmers and to the region where availability of farm power is low.
    b. Promoting custom hiring centres to offset the adverse economies of scale arising due to small landholding and high cost of individual; ownership.
    c. Creating hubs for hi-tech and high value farm equipment's.

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d. Creating awareness among stakeholders through demonstration and capacity building activities.

Under this scheme assistance is provided to the state governments to impart training and demonstration of agricultural machinery and financial assistance. Mission has eight components namely, first-

- promotion and strengthening of agricultural mechanisation through training, testing and demonstrations,
- demonstration, training and distribution of post-harvest technology and management
- financial assistance for procurement of agriculture machinery and equipment
- establish farm machinery banks for custom hiring,
- establish hi-tech, high productive equipment hub for custom hiring
- promotion of farm mechanisation in selected villages,
- financial assistance for promotion of mechanised operations per hectare carried out through custom hiring
- The scheme will be implemented in all the states, to promote the usage of farm mechanization and increase the ratio of farm power to cultivable unit area up to 2.5 kW/ha.

2. **Yantra Laxmi Scheme:** This is an initiative of the government of the Telangana state. Under this scheme, state government will provide a subsidy of 50% and 100% for SC and or ST small and marginal farmers (having 2.5 hectares of land) for purchasing of mini-tractors, rotavators, power welders and transplanters.
3. **Multilingual mobile app/FARMS-app:** Farmers are connected with CHC (s) which are situated in their locality to take farm machineries on the rental basis for various agricultural operations. This mobile app was developed by the Ministry of Agriculture and Famers Welfare, Government of India.
4. **Crop residue management scheme (CRMS):** This is a central government scheme which was launched in 2018 by the Ministry of Agriculture and Famers Welfare. Under this scheme, farmers are provided farm machineries for in situ-management of crop residues through establishment of custom hiring centres.

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5. **Other schemes/missions:** Farm mechanisation are also being implemented through schemes/missions such as Rashtriya Krishi Vikas Yojana (RKVY) 2007, Mission for Integrated Horticulture Development of Horticulture (MIDH) 2014-15 and National Mission on Oilseed and Oil palm (NMOOP) 2014-15.

Approaches that can be adopted for futuristic development of farm mechanisation in India:

- Improvisation of Farm machinery quality for further adoption of farm mechanisation.
- Promote skill development in the area of farm machinery operation, maintenance, and repair.
- Encouragement of cooperative farming
- Advanced and modern farm machinery should be demonstrated by farm machinery manufacturers.
- Provision of financing for purchase or to establish Custom Hiring Centres (CHCs).
- Efforts should be made for development of equipment that is gender-neutral.
- Development of individual farm equipment for small and marginal farmers at the affordable prices.
- There should be a significant rise in the number of custom hiring centres, particularly in areas with small and marginal land holdings.
- Enhanced support for Research and Development (R&D) services, testing and standardization, human resource development in support of farm mechanization. Manufacturing facilities should be developed especially in areas with low level of farm mechanization by providing incentives to manufacturers establishing such facilities in these areas (Tiwari *et al*., 2019).

Conclusion:

Agriculture mechanisation is essential for modernising and commercialising the sector since it increases productivity in agricultural operations, supports value addition, lowers cultivation costs, and facilitates adaptation to climate change. The progress of farm mechanization in India is hindered by some of the attributes of Indian agriculture such as fragmented land holdings, huge number of small and marginal farmers, and unavailability of advanced farm technology and the practice of subsistence agriculture. In India, agricultural

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mechanisation is anticipated to expand quickly in light of national driving factors in relation to global driving forces.

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