



**INSTITUTION OF AGRICULTURAL TECHNOLOGISTS,  
BENGALURU**



**EVALUATION OF RKVY PROJECTS  
OF  
UNIVERSITY OF AGRICULTURAL SCIENCES,  
RAICHUR**

**"DESIGN AND DEVELOPMENT  
OF  
LOW COST AGRICULTURAL TOOLS AND EQUIPMENT  
FOR  
MECHANIZATION OF SMALL AND MARGINAL FARMS"**

**INSTITUTION OF AGRICULTURAL TECHNOLOGISTS,  
#15, QUEENS ROAD, BENGALURU 560 052**

# **“DESIGN AND DEVELOPMENT OF LOW COST AGRICULTURAL TOOLS AND EQUIPMENT FOR MECHANIZATION OF SMALL AND MARGINAL FARMS”**

## **EXECUTIVE SUMMARY**

Agriculture, as a significant contributor to employment and livelihood creation, continues to be the mainstay of India's rural economy. Over 60 per cent of the Indian population continue to depend on agriculture and allied activities for their livelihood. Hence, growth of this sector is an essential prerequisite for overall economic growth.

The mechanization of agriculture that took place during the 20th century led to major changes in how farmers plant, irrigate and harvest crops. Agricultural mechanization is the process whereby equipment, machineries and implements are utilized to boost agricultural and food production. It is the application of machineries, equipment and implements in the day to day farm activities to increase marginal output in food production and poverty eradication. Agricultural mechanization reduces drudgery which hitherto makes it difficult for large scale food production and which has also been making it difficult for nations who have to meet their food requirements for the teeming population. In order to solve the problem of drudgery and other problems associated with food production, various measures have been introduced to combat these problems through mechanization. Agricultural mechanization involves the design, manufacture, distribution, use and servicing of all types of agricultural tools, equipment and machines. The efficiency of mechanization can be judged from the fact that modern plough is about 200 to 300 % efficient than indigenous plough, efficient machinery helps in increasing productivity by about 30% besides enabling the farmers to raise a second crop or multi crop making the Indian agriculture attractive and a way of life by becoming commercial instead of subsistence (Arun Khurana, 2020).

Innovation in farm machinery sector will drive the next phase of agricultural growth in the country, with focus on spreading farm mechanization to small and marginal farmers and regions that have low farm power availability. As a result, Indian farmer is fast adapting farm mechanization than ever before. The agriculture equipment market in India is presently valued at 6.5 billion USD and has enormous potential for further growth. The tractor market is expected to grow at a CAGR of 8-9 % in next five years. The joint efforts made by Government and farm equipment industry in the country have led to such progress in mechanization over the years (Arun Khurana, 2020). Research and development efforts and approaches in agricultural mechanization in India have been directed towards finding cost-effective solutions to location-specific problems of agriculture.

It is against this background, the present project of "**DESIGN AND DEVELOPMENT OF LOW COST AGRICULTURAL TOOLS AND EQUIPMENT FOR MECHANIZATION OF SMALL AND MARGINAL FARMS**" has been taken up by University of Agricultural Sciences, Raichur at their College of Agricultural Engineering, Department of Farm Machinery and Power Engineering, Raichur. The project was implemented from 2010 to 2014. The details of the project are as under:

1.	<b>Title of Project</b>	:	<b>"DESIGN AND DEVELOPMENT OF LOW COST AGRICULTURAL TOOLS AND EQUIPMENT FOR MECHANIZATION OF SMALL AND MARGINAL FARMS"</b>
2.	<b>Nodal officer</b>	:	<b>Er. Ravindra S. Yaranal</b> Asst. prof (Sr. grade), (Department of Farm Machinery and Power Engineering) College of Agricultural Engineering, Raichur
	<b>Principal Investigator (PI)</b>		<b>Er. Ravindra S. Yaranal</b>
	<b>Co- investigators</b>		<b>1. Er. Sushilendra 2. Dr. M. Anantachar 3. Dr. K.V. Prakash 4. Dr. M. Veerangouda 5. Dr. Vijayakumar Palled</b>
3.	<b>Implementing Institution (S) and other collaborating Institution (s)</b>	:	Department of Farm Machinery and Power Engineering, College of Agricultural Engineering, Raichur
4.	<b>Date of commencement of Project</b>	:	2010
5.	<b>Approved date of completion</b>	:	2014
6.	<b>Actual date of completion</b>	:	2014
7.	<b>Project cost</b>	:	Rs. 50 lakhs

The objectives of the project were as under:

- To identify, design, development and performance evaluation of agricultural tools and equipment required for the mechanization of small and marginal farm
- To conduct large scale demonstrations of developed agricultural tools and equipment in farmers' fields of selected villages for their promotion

- To conduct training programmes on cost effective production technology of agricultural tools and equipment for small scale manufacturers, farmers and village artisans

The focus of Evaluation is:

- i. Review of data on design and development of new equipment for various crops and modifications of existing equipment
- ii. Review of data on procurement and custom hiring of farm machinery and economic feasibilities of identified agricultural equipment/ machinery.
- iii. To get feedback from farmers on usefulness and techno-economic feasibilities of various equipment.
- iv. Study level of knowledge transfer to farmers.

The intention of the scheme was to design and develop crop specific, cost effective, easy to operate and efficient and innovative farm equipment and machinery to enable farmers to take up intensive farming and provide expertise to manage higher productivity and profitability per unit area transfer this technology to the farmers through large scale demonstrations and trainings.

The underlying logic is;

- a. The farm machinery will help farmer in bringing in timeliness and precision to agricultural operations, greater field coverage over a short period
- b. Cost effectiveness, efficiency in use of resources and applied inputs bringing precision in metering and placement of inputs, reducing available input losses, increasing efficiency of costly inputs
- c. Reducing cost of production by quicker and efficient operations and minimized losses in production, processing and preparing the produce for market.

The following tools and equipment were developed in the project:

- Pedal operated maize sheller
- Hand operated single acting maize sheller
- Hand operated double acting maize sheller
- Push/pull type weeder cum collector
- Hand operated push type sprayer
- Manual operated multicrop thresher
- Manual operated double row planter
- Hand operated dibbler
- Standing khurpi type weeder

The efforts made by University of Agricultural Sciences, Raichur in identifying, design and development of small equipment suitable for small and marginal framers are noteworthy and appreciable. However, the information relating to large scale demonstrations and trainings involving farmers, small manufacturers and village artisans is lacking vis a vis the preset objectives.

However, there is need to critically examine the efficiency of equipment being used presently in cultivation of the major crops in the area of operation of the University of Agricultural Sciences, Raichur including Bidar, Kalaburgi, Yadgir, Raichur, Ballari and Koppal. Suitable steps may be taken to develop/ modify the equipment to reduce the drudgery of work, improve efficiency leading to improvement on production and productivity.

No scientific and systematic evaluation on the efficiency and economic feasibility of the machineries developed/ modified by UAS, Raichur has been made. This would have thrown light on the usefulness of the new machineries developed/ modified. In the absence of this information, acceptance of the machineries by farmers and their popularization will be difficult.

While the pedal operated and to some extent manual single and double cob maize shellers are better than the traditional methods of shelling, their usefulness appears to be doubtful as they do not do away with human drudgery. The farmers are more inclined to hire power driven maize shellers which are more efficient and more time saving. Use of power driven maize shellers has become a regular practice in most maize growing areas of the state.

The weeder developed are noteworthy and have to be popularized in the area through field demonstrations and commercial production.

The dibbler developed will be useful especially in cotton crop where manual planting of seeds has many a times resulted in low/ thin crop stands due to planting done at different depths by labourers. The equipment needs to be popularized among farmers. The sprayer developed is a useful innovation.

## REFLECTIONS AND CONCLUSIONS

1. More efforts are required by UAS, Raichur to demonstrate these equipment in association with Karnataka State Department of Agriculture and Department of Horticulture and extension wing of University and identifying manufacturer to produce in large number These machines have to be added in the Custom Hire Service Centres and leased to farmers to improve their popularity and usage. More

publicity for newly developed equipment through both print and electronic media is required to make them popular and for wider usage. KSDA and Department of Horticulture should chalk out the strategy to popularize the equipment by way of including the equipment through existing various subsidy schemes (particularly in all district mechanization programmes to be supported by ZP).

2. The comparative cost efficiency of all equipment vis a vis the traditional equipment and manual labour have not been carried out systematically and scientifically. This would have thrown light on economic advantages of using the newly developed equipment.
3. There is need for creating and documenting scientific data base on equipment efficiency in terms of function, brief description, capacity, benefits, costs, source of availability, name of the manufacturer etc. Information on the following technical aspects may also be documented:
  - i. Fuel efficiency / time efficiency
  - ii. Reducing drudgery.
  - iii. Duration of operation i.e., area covered, equipment overall efficiency, soil condition etc.
  - iv. Cost of cultivation compared to conventional methods i.e. economics of operations and savings needs to be worked out.
4. UAS, Raichur should attempt to apply and obtain patent for the new machinery and commercialize the equipment through tie up with farm machinery manufacturers for mass production of the machinery. There is need for creation of brand name for equipment developed.
5. There is need to design regular training programmes to educate the farmers on upkeep, maintenance and repairs of the farm machinery developed.
6. There is need of Human resource developed in terms of use of machinery in Agriculture. The Agri Diploma graduates may be trained in maintenance of Farm power and machinery for skill development on EARN WHILE YOU LEARN mode.
7. At present, the machinery developed under the project may be compared with the power (1-3.5 KW) operated machinery commercially available and already under Government programmes and they may be introduced in custom hiring center under Krishi Yantra Dhare scheme to mechanize farm operations suitable for small and marginal farmers.
8. A core team of experts at the Institution level to identify the developed equipment as a women friendly equipment and policy support from University to popularize among farmers.
9. To support women friendly equipment, University may post one of the subject matter specialists and an Agricultural Engineering expert in all KVks and popularize this equipment through FLD/Training to propel small and marginal farmers towards adoption of these equipment to reduce drudgery in farm operations.

## ACTION POINTS

1. While commendable efforts have been made to develop cost effective low cost equipment to carry out various farm operations, the performance evaluation of the equipment could have thrown better light on efficiency of the equipment.
2. The project is silent on the information on adoption of the equipment developed under the project by farmers. There is need to evaluate the performance of the equipment in farmers' fields and take up commercial production for use by farmers.
3. Although the equipment developed are said to reduce the drudgery of agricultural operations, efforts are needed to popularize their use through demonstrations in farmers' fields for which convergence of line departments is needed.
4. There is need to list the major farm operations in the major crops of the area and examine the efficiency of the equipment being presently used in these crops for different farm operations and need for development of new equipment. Present study has mostly concentrated on maize and cotton crops although in the area of operation of the University many other important crops like pigeon pea, soybean, green gram, black gram, paddy and Bengal gram are grown commercially. There is need to review the usefulness of the equipment presently being used in these crops.
5. There is need for working out drudgery reduction and cost of covering the cultivable one acre of land (i.e., Benefit Cost Ratio to be worked out).
6. The viability and impact of small low cost agricultural tools and equipment by small farmers is not viable for which the project should continue on PPP mode.
7. There is need to work out the durability/ longevity of the equipment besides economics.
8. Manpower requirement/ training is needed in order to improve the use and efficiency of equipment leading to reduction in cost of production and enhancing the profitability of farmers.
9. KSDA and Department of Horticulture should chalk out strategies to popularize the equipment by way of including the equipment in various existing subsidy schemes (particularly in all district mechanization programmes to be supported by ZP).
10. There is need for developing simple machinery with multiple use at farmer's field with cost effective attachments.
11. Light weight and strong materials non-corrosive in nature should be used in designing and developing new equipment for which collaboration with Defence Research and Development Organization (DRDO), Hyderabad may be sought.
12. The impact of conducting training programmes and the feedback from trainees needs to be documents.
13. The project has not documented the role of local artisans. They should be trained in developing new equipment.