Adoption of Skill Enhancement Techniques and Quality Improvement in Manufacturing of Agricultural Implements in Madhya Pradesh, India

by
Dushyant Singh K. P. Saha S. P. Singh
Central Institute of Agricultural Engineering
Nabibagh, Berasia Road, Bhopal, INDIA

Abstract

A study was conducted to ascertain the extent of use of different sources of information for product identification, improvement of skill and production techniques for agricultural implements, the expectations of manufacturers and the constraints faced and the adoption of improved manufacturing practices. Information was collected on a sample of 118 manufacturers from 18 districts of the state of Madhya Pradesh in Central India. The study revealed that the large category manufacturers with the largest establishment and highest turnover of more than Rs. 4 million were in a advantageous position with easy access to information, strong linkages with government agencies, initiatives taken for improvement of skills and production technologies and higher investment capability. This enabled them to obtain the lion's share of the market as compared to small and medium firms manufacturing agricultural implements.

Introduction

In India, agricultural implement manufacturing is a significant segment of the small scale manufacturing sector. The agricultural implement manufacturing activity in registered small scale industries is comprised of 28 clusters spread over 7 states; i.e. Punjab, Rajasthan, U.P. West Bengal, M.P., Gujarat and Karnataka. According to the third All India Census for Small Scale Industries (2001-02), there were 18354 units engaged in agricultural implement manufacturing activity with a gross output of 6,632.4 million per annum. This segment also provided employment to about 45 thousand persons and generated foreign exchange of about 69 million US$ through export of agricultural implements (Arora, 2005). Apart from this, a larger number of agricultural implement manufacturing units belong to the unregistered small-scale industry segment. Though their average gross output and earning from export is less than that of the registered segment, they still play a significant role in providing employment to a large component of skilled manpower.

The agricultural implement manufacturing industries in the state of Madhya Pradesh, located in Central India, mainly belongs to an unorganized or semi-organized sector, along with rural craftsmen and artisans; mostly manufactures of conventional agricultural implements and hand tools. However, with the rapid modernization of the agricultural sector and mechanization of farm operations, new and improved agricultural implements are coming into the picture as an outcome of sustained research and development efforts (Singh and Saha, 2006). Therefore, the manufacturers have taken up the production of such agricultural implements to meet the demand. However, without any of their own research and development activity, they are mostly dependent on the government research organization and their extension services for getting information on such development. Sometimes they also rely upon the direct feedback collected from their customers; i.e. farmers, for identification of new implements to be manufactured. The socio-economic profile of the manufacturer

also governs access to available information, linkage with government organizations, capability of continuous improvement in human skills and adoption of new manufacturing technologies to survive in an era of aggressive competition.

It is important to examine the access to information of the manufacturers for product identification and development, their expectation of cooperation from government research and development organizations, capability for skill improvement and quality upgrading and adoption of new manufacturing technologies for agricultural implements.

Materials and Methods

The state of Madhya Pradesh has 50 districts out of which 18 districts were randomly selected. A total of 118 manufacturers participated in the study and responded to the correspondence. The data were collected from the manufacturers on their socio-economic profile, types of implements manufactured, constraints faced in the business, access to information sources, linkages with and aspirations from government organizations, skill improvement, quality upgrading techniques and adoption of improved manufacturing practices by using a pre-tested proforma through direct personal interviews.

Results and Discussion

All the manufacturers covered in this study were divided into three groups according to their annual turnover in rupees; i.e. small (having annual turnover less than 1 million rupees), medium (annual turnover between 1 to 4 million rupees) and large (more than 4 million rupees). The distribution of the manufacturers into different categories of annual turnover is depicted in **Fig. 1**. The small manufacturers were in the majority with 47 percent share of the total population. Medium and large manufacturers contributed 36 percent and 17 percent to the total population of manufacturers of agricultural implements.

The average floor area of the production workshop for different categories of manufacturers is presented in **Fig. 2**. With an increase in the business turnover, the size of manufacturing yards have been increased by many times.

The average number of regular employees and the manufacturing experience of the manufacturers in years are shown in **Fig. 3**. The large manufacturers employed more skilled workers for scaling up the production as compared to small and medium manufacturers though the average manufacturing experience among different category of manufacturers was similar.

The different types of agricultural implements manufactured by these manufacturers are described in **Table 1**. The manufacturers focused more on the commonly tractor operated implements like the cultivator, seed drill, thresher and trailer with an increase in business volume. The same trend was observed for other tractor operated implements like the mouldboard plough, disc harrow, land leveller and reaper. However, the manufacturing of such implements was given less priority by

Fig. 1 Percentage of manufacturers in Different Categories

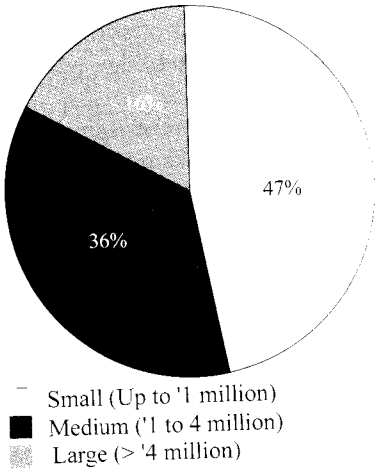


Fig. 2 Average floor area (m^2) for different categories of manufacturers

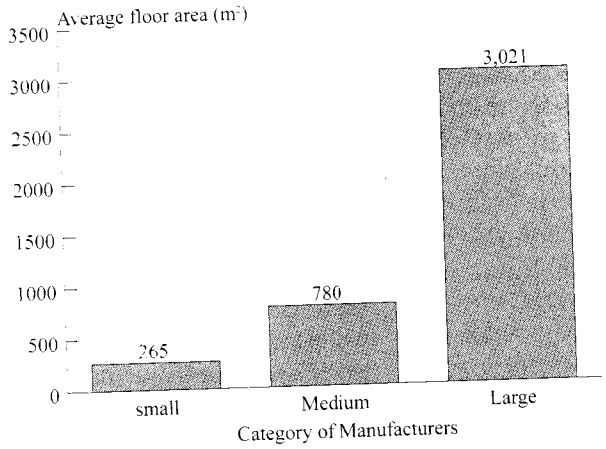


Fig. 3 Average number of regular employee and manufacturing experiences (years) of the manufacturers

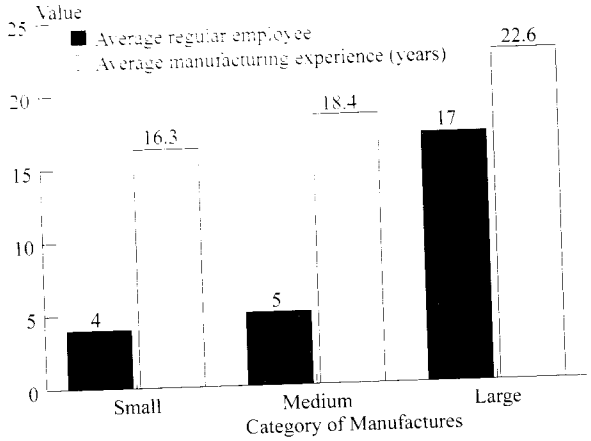


Table 1 Types of agricultural implements being manufactured

Name of the implement	Percentage of manufacturers taken up		
	Small	Medium	Large
Tractor drawn mouldboard plough	27.3	46.5	60.0
Tractor drawn cultivator	81.8	90.7	95.0
Tractor drawn disc Harrow	10.9	16.0	25.0
Tractor drawn land leveller	9.1	28.0	35.0
Tractor operated Seed drill	63.6	88.4	95.0
Tractor operated reaper	7.3	9.3	15.0
Tractor / power operated thresher	63.6	72.1	95.0
Tractor Trailer	63.6	79.0	90.0
Animal drawn plough	3.6	2.3	5.0
Animal drawn seed drill	21.8	13.9	5.0
Bullock cart	20.0	-	5.0
Manually operated weeder	10.9	9.3	-

Table 2 Constraints faced by the manufacturers

Type of constraints faced	Small	Medium	Large
Shortage of electricity supply	94.55	93.02	85.00
Shortage of working capital	92.73	88.37	40.00
Lack of continuous demand - seasonal demand	89.09	81.40	60.00
Lack of technical know-how and tools	78.18	79.07	30.00
Marketing problems	76.36	76.74	40.00
Management problems	60.00	39.53	70.00
Labour related problems	50.91	48.84	70.00
Non-availability of raw material as per quality or time	45.45	44.19	20.00

Table 3 Access to information for identification of new product

Source of information	Access by percentage of manufacturers		
	Small	Medium	Large
Electronic Mass Media	0.00	2.33	5.00
Print Media	16.36	18.60	40.00
Farmers' / Clients' Feedback	89.09	83.72	85.00
Government Extension Services	5.45	6.98	35.00
Dealers	0.00	0.00	25.00
Farmers' Fair / Agri. Expo	38.18	44.19	70.00
Internet and worldwide web	0.00	0.00	5.00

Table 4 Linkages and expectations from government organizations

Particulars	Small	Medium	Large
Guidance for development of new machines	9.09	16.28	40.00
Technical support for product improvement	10.91	16.28	50.00
Training for skill improvement of workers	50.91	72.09	85.00
Material and product quality testing	5.45	6.98	75.00
Standardization of the developed implement	0.00	2.33	40.00
Certification of the developed implement	5.45	6.98	70.00

most of the manufacturers, as these were less preferred implements for the farmers of this region. The manufacturers rarely preferred the manufacturing of animal drawn implements due to very low demand.

The manufacturers of agricultural implements have expressed a diversified opinion regarding constraints. The majority of the small and medium manufacturers identified the interruption in electricity supply, shortage of working capital, lack of adequate demand, lack of technical know-how, tools for sophisticated manufacturing techniques and marketing problems for new implements as major constraints faced in the business. The large manufacturers were only concerned about erratic electricity supply, management of business in highly competitive markets and labour problems in terms of supply and cost of skilled manpower in their day to day business (**Table 2**).

The level of awareness among the manufacturers for using information as a tool for business promotion was very limited. The use of electronic and print media for accessing the information is quite low as only a few manufacturers of medium and large category use such sources. Most of the manufacturers mainly depend on opinion and feedback collected from the clients and farmers and occasional visits to agricultural expo and farmers' fairs organized in their locality for getting exposure to new and improved agricultural implements. Sometimes large manufacturers gather information from extension services of government departments and network of dealers supplying agricultural machinery to the farmers (**Table 3**).

During interaction, the expectations of the manufacturers of agricultural implements from government agencies were discussed. The willingness of the manufacturers for establishing linkage with government agencies for various developmental purposes was also examined.

Table 5 Improvement of skills and quality up-gradation for products

Particulars	Small	Medium	Large
Products manufactured on the basis of drawing	0.00	0.00	33.33
Loan taken for investment on scaling up of production	3.64	11.63	80.00
Willingness to enhance the production capacity of the workshop	3.64	9.30	75.00
Certificate / test report acquired for developed products	1.82	4.65	75.00
Implements testing conducted before marketing	5.45	6.98	75.00
Trainings arranged for the skilled workers	0.00	2.33	30.00

Table 6 Adoption of improved production technologies

Particulars	Small	Medium	Large
Arc welding set	100	100	100
Gas welding	45.4	48.8	66.7
Electric Portable drill	90.9	95.3	100.0
Bench drill	41.8	41.9	80.0
Piller drill	12.7	23.3	95.0
Radial drill	0.0	4.7	35.0
Portable grinder	87.3	69.8	80.0
Bench grinder	9.1	18.6	100.0
Lathe machine	61.8	62.8	85.0
Hand saw	10.9	20.9	10.0
Power saw	18.2	41.9	75.0
Power Press	36.4	58.1	90.0
Compressor	7.3	37.2	60.0
Furnace	16.4	27.9	55.0
Bending machine	5.5	16.3	55.0
Profile machine	0.0	0.0	15.0
Shaping machine	1.8	11.6	55.0
Hand Shearing machine	25.5	11.6	30.0
Spray painting gun	38.2	51.2	70.0
Milling machine	1.8	11.6	90.0

It can be seen from **Table 4**, that small and medium manufacturers show little willingness for taking guidance and technical support for development of new machines or product improvement. The inclination of large manufacturers towards these activities was considerably higher. This may have been because of availability of limited resources and very low market share for the small and medium manufacturers. The majority of the manufacturers from all categories were eagerly interested in obtaining training of their workers with government agencies. This results further pointed out that only large manufacturers were interested for material and product quality testing, standardization of the developed implements, and certification of the developed implements because they have a large market share. Sometimes this becomes necessary in getting their products subsidy from governments for supplying to the farmers through agro-industrial development corporations of various states.

Table 5 clearly shows that only large manufacturers are interested in improvement of skill and quality up gradating of products as they have better infrastructure, higher annual turnover, market reputation and higher investment capacity. These are the factors that make the large manufacturers capable of enhanced production capacity in their workshop. They are also capable of taking a loan for scaling up of production capacity and employ skilled manpower with ability to manufacture the implements on the basis of a design drawing while, the small and medium manufacturers only use a sample piece to make the similar machines. Hiring of skilled manpower is out of reach of the small and medium manufacturers. Some large manufacturers have large farmlands (on ownership or hiring basis) for testing of their implements, whereas small and medium manufacturers cannot afford this. As a consequence, improvement of skills and quality upgrading of manufactured products is taken up only by the large manufacturers.

Examining the extent of adoption of improved production technologies reveals that common workshop tools like arc welding, drilling machine and grinders are commonly available with most of the manufacturers of all categories. However, the adoption of specific types of tools is solely governed by the manufacturing capacity. The table also shows that some high capacity machines like a lathe, power press, compressor, saw and spray painting gun were used by the manufacturers. Sophisticated facilities like a milling machine are available with a majority of large manufacturers but small and medium have their milling work done by outside sources (**Table 6**). Overall, manufacturers across different categories have adopted varying levels of improved manufacturing practices as per their requirement.

Conclusions and Suggestions

It can be concluded from the study that the size of a manufacturing unit and its annual turnover is the sole

crucial factor determining the extent of access to information sources, linkage with research and development organizations, skill improvement and quality up grading for developed products. However, exposure to improved technical know-how through trainings and manufacturers meeting with research organizations and support from the government in terms of subsidizing improved implements suitable for marginal and small farmers may also be helpful for a large number of small and medium manufacturers of agricultural implements.

REFERENCES

Arora, R. K. 2005. Diagnostic Study Report on the Agricultural Implement Industry at Karnal (Haryana). Small Industries Service Institute, Kunjpura Road, Karnal-132001 (Haryana).

Singh, D. and K. P. Saha. 2006. Final Report on Survey of Manufacturers of Agricultural Implements for Preparation of Directory of Commercially Available Agricultural Equipment and their Manufacturers. Central Institute of Agricultural Engineering. Bhopal. India.

Directorate of Research on Women in Agriculture: Sub-centre (ICAR) CIAE Campus, Nabi Bagh, Bhopal- 462 038. ■■

ABSTRACTS

The ABSTRACTS pages is to introduce the abstracts of the article which cannot be published in whole contents owing to the limited publication space and so many contributions to AMA. The readers who wish to know the contents of the article more in detail are kindly requested to contact the authors.

1247

Power-Efficient Method of Tillage and Its Technology Model: A. Tukhtakuziev, Republic of UZBEKISTAN; **A. N. Khudoyorov,** same.

At present time soil tillage for sowing and crops preparation are mainly put into practice by means of traditional technologies and engineering tools, that is plowing firstly, harrowing and leveling secondly, after which ridges are cut. Such multi-step tillage provokes big labor inputs, expenditure of energy and fuel, delays sowing time that results in yield drop of agriculture.

On the assumption of the above-stated we have developed a new tillage technology model for cotton-plant sowing and a component unit for its implementation.

The engineered unit is composed of (**Fig. 1**) chassis 1 with mounted element 2, rippers 3, fertilizer plows 4, ridge-forming tools 5, chemical fertilizers feeder 6 and support wheels 7.

The unit in a run mellows the bottom of the last years' irrigation furrows at a depths of 30-40 cm (**Figs. 2a** and **2b**), moulds the old ridges in furrows, moulds new ridges (**Fig. 2c**) dressing them with two-layer strip of chemical fertilizers. In that way, the new ridges are cut due to demolition of the old ridges and soil slip to the area of old ridges (**Fig. 2a**). At the same time a layer of loose soil of 55-65 cm depth is formed as compared to 30-40 cm in the case of plowing. In spring the ridges are touched up and chemical fertilizers are dressed for cotton-plant sowing. Thus there is no need to carry out such traditional operations as harrowing, chisel plowing and leveling. Consequently, fuel consumption and labor inputs are reduced.

Soil tillage is carried out sinusoidally along the frontal projection. Because of this the soil structure is disturbed only once in two years. Loose soil area is formed under the ridge that ensures moisture keeping in the zone of the plant root system, as well as saving of irrigation water consumption.

Realization of the new tillage technology gives an opportunity to reduce 1,3 - 1,4 times labor inputs and fuel consumption for soil tillage for cotton-plant sowing. ■■

Fig. 1 Component Unit Design

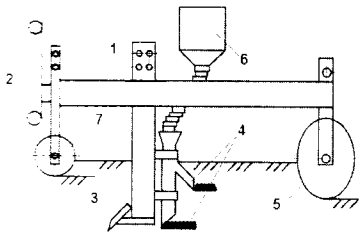
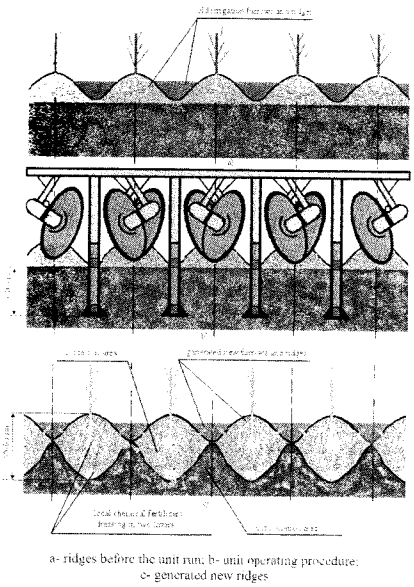


Fig. 2 Component Unit Operating Procedure



a- ridges before the unit run;
b- unit operating procedure;
c- generated new ridges