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Modification of manually operated multi tool for small and marginal farmers

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Abstract
The study was conducted to modification of manually operated multi tool for small and marginal farmers at Department of Agricultural Engineering, UAS, GKVK, Bangalore. Before the seed drill is taken to field, it is calibrated in the laboratory condition. The seed drill is tested on 25 m^2 area in concrete floor, actual field and it is compared. The ergonomic study gives the conclusion that the human drudgery can be saved by 10 times by using seed drill than by working manually in sowing the seeds. It was found that the actual field capacity of using seed drill for sowing is 60 h/ha whereas it is found that manual sowing needs 247 h/ha. The cost of sowing one hectare of land by seed drill is 4200 Rs/ha and the same operation can be done by manual sowing with 12350 Rs/ha. It was found that the sowing efficiency on concrete floor and actual field are 98% and 88%.

Keywords: Maize, groundnut, sowing, weeding, seed drill

Introduction
Farmers perform agriculture mostly with manual operation. The pain involved in doing each and every operation has to be reduced by the way of introducing simple technology. The aim of the present study is to develop a seed drill to suit the varied topographic condition. The specific objective of the study is to develop a seed drill and test the performance of the seed drill. Sowing is one of the basic operations needed to get better revenue from agriculture. Manual sowing has the problem of not giving adequate spacing between row to row and plant to plant. Also there is the problem of placing the seeds at correct depth and correct soil coverage. Manual sowing is time consuming and costly. Keeping the above observations in view, a study was undertaken to Develop and evaluate the manually operated multi tool frame implement which suit the local soil conditions for furrow opening, sowing, weeding and inter cultural operations in maize and ground nut in the Department of Agricultural Engineering, UAS, GKVK, Bangalore as a project work with the following objectives. To modify a manually operated multipurpose tool for sowing and weeding, to test and evaluate the efficiency of the modified multipurpose tool and to determine the cost economics of the multipurpose tool.

Materials and Methods
A study on design, fabrication and evaluation of manually operated multipurpose tool for maize and groundnut crops was taken up in the Department of Agricultural Engineering, UAS. GKVK, Bangalore during 2012-13. The soils of the site belong to red sandy loam with good moisture retention and well drained in an infiltration rate. The materials used for designing and fabrication of power operated intercultural implements are as follows

Table 1: Materials required

Materials
Round rod(3/4 inch,3feet)
Flat (1.50 length, 1.25 inch)
Pipe(I inch,1length,16 gauge)
Nuts and bolts(1.5 inch length, ¾ inch thickness 3 in numbers)
Chain and Sprockets
Paint materials(green and black of 200 ml)

Main frame of seed drill consists of handle, seed metering disc, mild steel tube of 40 mm diameter so that it can withstand all types of load during operation, and a hopper is made of trapezoidal shape of dimension 17 x 14 cm on top side and 6 x 4 cm on bottom side. The height is 18 cm. The hopper has the seed holding capacity of 1.5 Kg of dried seed.

Seed Metering Mechanism
Seed metering mechanism is fitted at the bottom of the seed box to allow the desired quantity of seed. It consists of seed disk, cover of seed disk, seed tube and seed holes.

Seed Metering Disk
It consists of rod of 3 cm diameter and. It is circular shape having the diameter of 16 cm. It has 3 holes around the circumference of the circle at equally spaced distance and it is used for sowing seeds. The distance between centers of hole to next centre of hole is 10 cm.

Seed Holes on the Metering Disk
The function of the hole is to collect the seeds from the hopper and transport it to seed tube. The distance between two successive holes is 10 cm for maize and is for groundnut the holes are in the shape of a cup having 2.3 cm diameter and 1.5 cm depth.

Cover of seed disc (hopper)
Hopper is made of metal sheet cut in to two separate circular shapes. The two parts are welded with a rectangular sheet of length equal to the circumference of the circular sheet, which is 63 cm length and width of 5 cm.

Seed Tube
Seed tube is made of plastic having 2 cm diameter circular cross section. The height of the seed tube is 13 cm. The seed tube carries a furrow opener to make the furrow for placing seed. The back side of the seed tube has furrow closer to cover the seed with soil.

Furrow Opener and Closer
Furrow opener and closer are provided at the bottom of the seed tube to facilitate the correct amount and placement of seed at desired uniform depth. It also helps to close the furrow and compact the soil after placement of seeds.

Ground wheel
The rim of the wheel is made from a metal rod of 3 cm wide and 0.5 cm thickness. It is bent and welded to form a circular form of 49 cm diameter. The periphery is fitted with 15 numbers of lugs at equal spacing. The lugs are of rod form of 3 cm side. It reduces the slippage while moving in the field.

Performance testing of seed drill in actual field condition
The field testing of the seed drill is done on a well prepared and levelled land. The testing of seed drill is done with medium moisture content. These testing are compared to the field sown manually.

Germination of seeds after sowing
After preparing seed bed of 50 cm of depth, groundnut and maize grains have been sown at a depth of 3 cm using the seed drill. The seed to seed distance was 25 cm and the row to row distance was adopted as 30 cm.

Benefit cost analysis
The cost sowing in 25 m² areas by the manual method and also using seed drill was calculated and compared. The time saving between the two methods are also worked.

1. Modification –by studying all dimensions and designs of existing models, a new model is modified and fabricated.
2. Fabrication –by using metal, wood and plastic as required.
3. Evaluation–field evaluation is done based on its performance.

Cost economics –material cost, labour cost and other expenses are computed.

Results and Discussion
The field evaluation study was conducted on effect of different manually operated multi tool implements for maize and groundnut at GKVK during 2012 to achieve the desired objectives of the project.

Table 2: Dimensions

Specification	Model
Dimensions, m	1.20×0.42×0.97
Weight, kg	10(With attachment) 25(With all attachments)
Size of attachments,mm	
V-Blade	300
Straight blade	180
Furrow opener	170×100
Type of metering	Fluted roller type
Power source	One or two persons

Calibration of seed drill
Before the seed drill is taken to field, it is calibrated in the laboratory condition. It is calibrated to regularize the quantity to be sown. Calibration is done as follows:

Table 3: Details of calibration of seed drill:

1. Circumference of ground wheel =π D=3.14 x 49 = 153.86 cm = 1.54 m
2. Number to turns the ground wheel make in running 100 m =100 m / 1.54 m = 65 turns
3. Width of seed drill =Number of furrow opener x width of seed drill = 1 x 0.7 m = 0.7 m
4. Area covered for one revolution =Circumference of ground wheel x Width of seed drill = 1.54 m x 0.7 m = 1.078 m²
5. Number of turns needed/ha= 10000 m²/ 1.078 m² = 9276 turns
6. Number of grains dropped assuming the seed hole capacity is 2 seeds = 2 grains / hole x 5 holes / revolution = 10 grains
7. Therefore for 9276 tunes, the number of grains to be dropped =10 x 9276 = 92760 grains / hectare.

No. of grains needed for 25 m² is worked out to 232 grains.

Testing the performance of seed drill
The seed drill is tested on 25 m^2 area in concrete floor, actual field and it is compared. The field is divided into 6 rows and 15 columns. The total number of seeds from each place of dropping is counted. It is found that total number of seeds dropped in concrete floor and actual field is 193 and 159 seeds.

Sowing efficiency is computed by the formula
Sowing efficiency = Number of seeds placed in rows.
Sowing efficiency in the on concrete floor is 98%.
Sowing efficiency of seed drill in actual field conditions is 88%.

Ergonomics as applied to seed drill and manual operation
Ergonomics is the study of computing human drudgery and finding the solution by manipulating the operational parameters of the machine used for sowing. The number of

body movements made in manual sowing and in the seed drill method is assessed for a comparative study. The number of body movements in manual sowing for 25 m^2 plot was estimated to be 1561 and for the type seed drill it is 154 only. Drudgery for manual and seed drill sowing can be worked out to be 10:1. The ergonomic study gives the conclusion that the human drudgery can be saved by 10 times by using seed drill than by working manually in sowing the seeds.

Benefit cost analysis

- Initial cost of the seed drill = 30000 Rs
- Life of machine = 15 years
- Taxes, shelter etc = 1.5 % of cost of machine = 450 Rs
- Repair and maintenance = 2.5 % of cost of machine = 750 Rs
- Operating charge = 400 Rs/day of 8 hours (50 Rs/h).

(It was found that the actual field capacity of using seed drill for sowing is 60 h/ha whereas it is found that manual sowing needs 247 h/ha).

- Therefore, in using seed drill for operating 60 h to complete one hectare area.
- Operating cost = 60 h x 50 Rs = 3000 Rs Total cost of sowing by seed drill for one hectare = Cost of taxes, shelter etc + Cost of repair and maintenance + Operating cost
- Total cost of sowing by seed drill/ha = 450 + 750 + 3000 = 4200 Rs /ha.
- Cost of sowing by manual method/ha = 247 h x cost/h = 247 h x 50 Rs/h = 12350 Rs/ha

The cost of sowing one hectare of land by seed drill is 4200 Rs/ha and the same operation can be done by manual sowing with 12350 Rs/ha. Hence, it is advantageous to go in for using seed drill for sowing the seeds. A modified manually operated multipurpose tool is developed to sow the maize seeds at the spacing of 30 cm seed to seed and 60 cm row to row, and ground nut at the spacing of 15cm seed to seed and 30cm row to row. The seed drill is tested on the flat concrete floor and actual field and it was compared. It was found that the sowing efficiency on concrete floor and actual field are 98% and 88%.

References

1. Duraisamy VM, Tajuddin A. Rotary weeder for mechanical interculturing in sugarcane. Agro India. 1999; 3(1-2):48.
2. Srivastava AP, Panwar JS, Garg RN. Influence of tillage on soil properties and wheat productivity in rice (*Oryza sativa*) – wheat (*Triticum aestivum*) cropping system. Indian Journal of Agricultural Sciences. 2000; 70(4):207-210.
3. Singhal OP. Farm mechanization and farm machinery and power, 2001, 1-2
4. Sharma RK, Chhokar RS, Chauhan DS, Gathala MK, Kundu VR, Pundir AK. Rotary Tillage – A Better Resource Conservation Technology, 12 p. Bulletin No. 12, Directorate of Wheat Research, Karnal, Haryana, 2002.
5. Chandel SRS. A Hand Book of Agriculture STATICS. Achal Prakashan Mandir, Kanpur, 2004.
6. Singh AK, Sharma SK. Conservation tillage and crop residue management in rice-wheat cropping system, 2005, 23-32. In: Abrol, I.P., Gupta, R.K. and Malik, R.K. 2005. Conservation Agriculture – Status and Prospects. Centre for Advancement of Sustainable Agriculture, NASC Complex, New Delhi.
7. Hobbs, P.R. Conservation Agriculture: What is it and why is it important for future sustainable food production? Proceedings of an International Workshop on Increasing Wheat Yield Potential. CIMMYT, Mexico, 20-24 March, 2006.
8. Manuva S; Ademosun OC. Draught and soil disturbance of model tillage tynes under variening soil parameters. Agriculture engineering international: the CIGR Ejernal, manscript PM 06 016, 9, 2007.
9. Marakoglu T, Carman K. Effect of design parameter of cultivator share on draft force and performance of soil loosing in soil bin. J agronomy. 2009; 8(1):1-26.
10. Elements of agricultural engineering by Dr Jagadishwar sahay, standard publisher's distributors, 2010.
11. Anonymous. Policies need to be farmer friendly. In: The Hindu Survey of India, 2012.