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Frontline demonstration on bullock-drawn planter enhances yield of soyabean crop

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ABSTRACT

Frontline demonstration on bullock-drawn planter was organized by the department of Agricultural Engineering during kharif 2009-10 and was continued during 2010-11. All the selected farmers had purchased bullock-drawn planter. The benefit of the planting by use of planter was demonstrated to other farmers of the village.The results of the demonstration based on 12 farmers' fields in an area of 5 ha are presented in this paper. It was observed that the time required for sowing was reduced by 62.5 per cent with cost reduction of 28.57 per cent. Plant population in fields planted with planter was higher by 34.78 per cent which resulted in yield increase of 15.82 per cent on an average. Many farmers showed satisfaction over the performance of the planter and showed interest for buying and hiring the implement in future. Bullock-drawn planters are becoming necessity for sowing as the skilled workers for sowing are almost diminishing.

Keywords: Frontline demonstration, bullock-drawn planter, sowing, farmers

INTRODUCTION

The basic objective of sowing operation is to put the seed and fertilizer in rows at desired depth and spacing, cover the seeds with soil and provide proper compaction over the seed. The recommended row to row spacing, seed rate, seed to seed spacing and depth of seed placement vary from crop to crop and for different agro-climatic conditions to achieve optimum yields and an efficient sowing machine should attempt to fulfil these requirements. In addition, saving in cost of operation, time, labour and energy are other advantages to be derived from use of improved machinery for such operations.

In past, it has been reported by many research workers that sowing in time and saving in labour reduced the cost of sowing operations to a great extent.There is saving in time (50 - 70%), saving in cost (50 - 85%), increase in labour productivity (200-300%) and increase in animal productivity (100-300%). Besides, proper, uniform placement of seed and fertilizer in desired quantities resulted in better plant stand and higher yields (5-95%) and increase in land productivity (5-97 %) depending upon field conditions.

Timely sowing operations increased yield to the extent of 12 to 78 per cent and precise placement of seed and fertilizer showed 25 to 50 per cent and 22.5 to 57 per cent increase in yields, respectively. Productivity of these inputs increased by 45 to 100 per cent. Better seed germination and emergence due to proper soil cover and better seed-soil contact under deficient soil moisture conditions has resulted into higher yields to the extent of 3 to 20 per cent. Drudgery to human and animals reduced to the extent of 50 to 80 per cent, depending upon number of rows of the drills/planters.

Traditional sowing methods have following limitations:

a) In manual seeding, it is not possible to achieve uniformity in distribution of seeds. A farmer may sow at desired seed rate but inter-row and intra-row distribution of seeds is likely to be uneven resulting in crowding and gaps in field.

b) Poor control over depth of seed placement.

c) It is necessary to sow at high seed rates and bring the plant population to desired level by thinning.

d) Labour requirement is high because two persons are required for dropping seed and fertilizer, other than the operator.

e) The effect of inaccuracies in seed placement on plant stand is greater in case of crops sown under dry farming conditions.

f) During kharif sowing, placement of seeds at uneven depth may result in poor emergence because subsequent rains bring additional soil cover over the seed and affect plant emergence.

The functions of a well-designed seed drill or planter are as follows:

a) Meter seeds of different sizes and shapes,

b) Place the seed in the acceptable pattern of distribution in the field,

c) Place the seed accurately and uniformly at the desired depth in the soil,

d) Cover the seed and compact the soil around it to enhance germination and emergence and

e) Save time, labour and energy through enhanced work capacity.

Metering mechanism is the heart of sowing machine and its function is to distribute seeds uniformly at the desired application rates. In planters it also controls seed spacings in a row. A seed drill or planter may be required to drop the seeds at rates varying across wide range. Common type of metering devices used on seed drills and planters are:

a) Adjustable orifice with agitator known as gravity feed,

b) Fluted roller (standard and with small or larger flutes),

c) Vertical rotor with cells,

d) Plate with cells (horizontal, vertical, inclined) and

e) Cup feed

The designs of furrow openers of seed drills vary to suit the soil conditions of particular region. Most of the seed cum fertilizer drills are provided with pointed tool to form a narrow slit in the soil for seed deposition.

a) Narrow pointed reversible shovel type furrow openers of 100 to 200 mm size are used on seed drills in medium to heavy soils for medium to deep placement of seeds, most suited for rainfed farming situations in black soils.

b) Single hoe or double point reversible shovel type furrow openers are used for placement of seeds at shallow to medium depths in light to medium soil and where soil capping or encrustation problem exists.

c) Shoe type openers are used in black soil regions. Seeds are dropped through a tube connected to boot at rear of opener for placement at shallow to medium depths. When used on seed cum fertilizer drills or planters a special narrow boot is designed to place seed and fertilizer in soil at same depth but in dispersed bands.

d) Runner or sword type openers are used on planters for shallow sowing. Soil over seed flows back in furrow during operation and seeds are covered with a leveling bar, chain or by operating a wooden plank behind the drill.

e) Inverted Tee openers are used for placement of seeds under saturated soil conditions in compact and untilled fields mostly suited for direct seeding of wheat after harvest of paddy.

Mechanical factors which affect seed germination and emergence are :

a) Seed damage during metering,

b) Non-uniformity of depth of placement of seed,

c) Non-uniformity of distribution of seed along rows,

d) Transverse displacement of seed from the row,

e) Loose and dry soil getting under the seed,

f) Excessive soil compaction above the seed,

g) Non-uniformity of soil cover over the seed and

h) Direct contact of fertilizer with seed in the furrow, beyond permissible limits.

Under arid conditions the top soil becomes very dry, therefore, the seeds are placed 80-100 mm deep in the furrow. This requires the proper furrow opener. In case of lighter soils, the soil cover over the deep-placed seed should be lightly packed to achieve good emergence by better seed-soil contact. In arid regions, dry seeding with deep placement of seed is recommended because the seeds will germinate only when there is sufficient rainfall or adequate moisture at the seed zone.

The recommended fertilizer placement is 50 mm below and 50 mm from the side of the seed. This is difficult to achieve by a single opener in practice. Use of separate openers and deeper placement of fertilizer in such bands is possible if there is no constraint of available power to pull the machine as well as other operational problems like clogging of tines with clods and trashes. Awadhwal and Smith (2007) evaluated four bullock-drawn tillage implements (mouldboard plough, chisel plough, sweeps, and shovels) on a hard-setting Alfisol. Measurements included draft requirement, bulk density, cone index, soil crust strength, water content of the plough-layer and crop yield. Changes in bulk density and cone index due to tillage decreased with time and were negligible by the end of the growing season. After tillage with a mouldboard plough the crust was stronger than after tillage with other implements. The shovel cultivator enabled the soil to store more water, and required least draft per unit effective area of cut. Nitant and Singh Pratap (2000) evaluated the effects of deep tillage on soil properties, weed control, root growth and yield of dryland redgram (*Cajanus cajan* L) on a shallow, gravelly, sandy loam soil (alfisols) of the Bundelkhand region in Central India. Deep tillage, viz mouldboard ploughing (0.20 m deep), discploughing (0.25 m deep) and sub-soiling (0.40 m deep), were compared with shallow tillage, viz bullock-drawn country ploughing (0.075 m deep), bullock-drawn blade ploughing (0.10 m deep) and disc harrowing (0.125 m deep) for two different rainfall distribution seasons. Deep tillage operations were found superior to shallow tillage treatments. Disc ploughing and sub-soiling improved soil properties, suppressed weed growth, reduced water and nutrient losses through weed uptake and enhanced profile water storage compared with shallow tillage. Deep tillage with disc ploughing and sub-soiling also induced deeper root penetration by 34 and 39 cm resulting in 89 and 127 per cent, respectively, more grain yield than the shallow tillage by country plough. Bansal et al (2003) reported that the major portion of energy is utilized in the production of crops. An attempt has been made to reduce energy consumption by introducing a package of low-cost improved animal-drawn implements. There was a

44.3, 37.7, 56.7 and 60.3 per cent saving in energy with the use of improved technology over the control in crops of wheat, mustard, cotton and pearl millet, respectively. Average increases in yield of 5.4, 17.4, 14.8 and 16.3 per cent, and savings in the cost of operation up to 51.6, 28.8, 40.5 and 59.4 per cent, respectively, were observed by the adoption of improved technology, greatly affecting the pattern of energy utilization in agriculture. The reported per cent saving in energy and cost of operation has been calculated by comparing only those operations where improved implements package was used.

METHODOLOGY

Frontline demonstration of bullock-drawn planter was organised by Department of Agricultural Engineering during Kharif 2009-10 that continued during 2010-11. All the selected farmers had purchased bullock-drawn planter. The benefit of the planting by use of planter was demonstrated to other farmers of the village.

RESULTS AND DISCUSSION

The results of the demonstration based on 12 farmers' fields in an area of 5 ha are tabulated in Table 1.

It was observed that the time required for sowing was reduced by 62.5 per cent with cost reduction of 28.57 per cent. Plant population in fields planted with planter was higher by 34.78 per cent which resulted in yield increase of 15.82 per cent on an average. Many farmers showed satisfaction over the performance of the planter and interest for buying and hiring the implement in future.

It can be concluded that bullock-drawn planters are becoming necessity for sowing as the skilled workers for sowing are almost diminishing. Planting

Table1. Results of frontline demonstration on bullock-drawn planter

S No	Performance parameters/ indicators	Data on parameters in relation to technology demonstrated		Change in the parameter (%)
		Demonstraion	Local check	
1.	Time required (h/ha)	4.50	12.00	62.5 (Lower)
2.	Cost of sowing (Rs)	500	700	28.57 (Lower)
3.	Plant population	3.10	2.30	34.78 (Higher)
4.	Yield of soybean (q/ha)	14.55	12.56	15.82 (Higher)

distance and plant population are crucial factors in maximising the yields of crops. These types of implements should be supported partially by government so that their adoption is faster. Private sector manufacturers should also come forward for manufacturing of these devices in large numbers and developing of marketing network so that entire country is covered and farmers get the planter easily.

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