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Performance Evaluation of Seed-Cum-Fertilizer Drill

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Abstract: ***The study was conducted in the farm of the institute to assess the performance of tractor operated seed cum fertilizer drill for sowing paddy seeds. It was observed that there was no effect of stubble on the performance of seed-cum fertilizer drill. However, the loose straw spread on the surface offers some hindrance in the working of the drill. The standards test code was adopted. Each test was replicated minimum three times. The forward speed and depth of sowing were taken as independent variables while wheel slippage and field capacity as independent variables. The field capacity, depth of sowing and seed rate were found to be 0.21 ha/h, 5.50 cm and 0.60 q/ha respectively as compared to 0.50 ha/h, 1.5cm and 1.25 q/ha in case of conventional broadcasting method. The mechanized method of sowing resulted in higher depth of sowing compared to broadcasting method. The tractor operated seed cum fertilizer drill was found to be better as compared to traditional broadcasting method.***
Keywords: Seed cum fertilizer drill, broadcasting method, Paddy sowing

I. INTRODUCTION

The basic objective of sowing operation by seed-cum-fertilizer drill is to put the seed and fertilizer in rows at desired depth and maintain seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed without mechanical damage. The traditional method of ground sowing involves the seed dropping by hand in the furrow opened by a country plough or metallic funnel fitted to the plough. But this method is very slow, labour consuming and there is lack of precision, which affects the yield per hectare. The seed requirement is 10 to 20 per cent higher and it also requires thinning operation (Kalkat, 1978). Seed-cum-fertilizer drill facilitates line sowing and proper application of seed and fertilizer in the field. Thus, there is saving of 10-15 percent inputs. About 30 per cent saving of fertilizer is estimated, if properly applied (Sahay, 1990).

Farm machinery is the key driver for increasing farm productivity. A seed-cum-fertilizer drill facilitates line sowing and proper application of seed and fertilizer in the field, thereby saving 10-15 percent inputs. About 30 per cent saving of fertilizer is estimated, if properly applied. A seed-cum-fertilizer drill requires calibration to ensure the highest chance of success in any seeding. The seed cum fertilizer drill is calibrated to avoid over-seeding or not placing enough seed on the site as required. Even though one may have set the drill to seed a given rate, it is important to calibrate the drill to ensure proper seed rate. The seed-cum-fertilizer drill controls depth of sowing and width of sowing the lines of crop as required under the prescribed package of practices. The use of seed-cum-fertilizer drill has influenced the production, reduction of labour, timely sowing and proper depth and width of fertilizer application, on the growth of plant and ultimately the production, as well as reduction of labour. Timely sowing and proper fertilizer application shows great effects on the growth of plant and ultimately the production increases.

Rice is one of the most important crop and staple food of millions of people which is grown in many countries of the world. The total area planted under rice crop in India is 42.20 million ha, which isthe largest in the world as against the total area of 148.40 million ha (Choudhary and Varshney, 2003).Paddy is largely grown traditionally by manual transplanting. Manual transplanting requires a lot oflabours besides involving drudgery and is also very expensive. Scarcity of labours is another majorproblem in some paddy growing areas of the country. Manual transplanting takes about 250-300 manhours/ha which is roughly about 25 per cent of the total labour requirement of the crop. Hence, lessexpensive, farmer friendly and labour saving method of paddy transplanting is urgently needed. Themechanical transplanting of paddy has been considered the most promising option, as it saves labour,ensures timely transplanting and attains optimum plant density that contributes to high productivity.

Due to the global demand for food items, the increased costs of mechanization on the farm and the current disposition of financial institutions towards agricultural credits, it became very critical for existing farmers, farm managers and agricultural investors to make informed decisions based on figures, and improve the management of mechanization operations. Bamigboye and Ojolo (2002) opine that the cost of operating farm tractors can be reduced if the right tractor is used for the right operation as well as operating at manufacturers' recommended annual use.

The steep rises in the price of tractors and other farm machines have lowered the purchasing power for farm machines by rural farmers and this trend is calling for management planning tool (Asoegwu and Asoegwu, 2007).

Seed-cum-fertilizer drill controls depth of sowing and width of sowing lines of crop that it manages the sowing operation. The use of seedcum-fertilizer drill has much influenced on the production as well as reduction of labour. Timely sowing and proper fertilizer application shows great effects on the growth of plant and ultimately the production increases

II. MATERIAL & METHODS

SL NO	PARTICULARS	SPECIFICATION
1	Model name	BAE9X18
2	Product type	Seed-Cum Fertilizer Drill
3	Brand	Bharat Agro
4	No. of tynes	9
6	Tyne spacing (inch)	9”
7	No. of rows	9
8	No. of pipes	18
9	Row spacing , (mm)	210
10	Working width (mm)	207
11	Depth of operation (mm)	50-100
12	No. of seed & fertilizer openings	9
13	Overal all diameter l*W*H (mm)	2160 x1700 x1850
14	Overal weight without seed&fertilizer,kg	385
15	seed box capacity (kg)	45
16	Fertilizer box capacity (kg)	45
17	Source of power	35-45 hp tractor
18	Source of power for driving mechanism	Ground wheel
19	Hitch Type	Three Point linkage
20	Tractor	Mahindra 475DI(Bhumiputra)

Major Components and their description

1) Frame
2) Furrow openers
3) Seed and fertilizer boxes
4) Seed metering device
5) Fertilizer metering devic
6) Power transmission uni
7) Depth-control
8) Hitch points
9) Furrow Closer

A. Frame

The frame is usually made of mild steel angle section and flats . All other parts of a seed drill are fitted to the frame. The frame of the seed cum fertilizer drill is of the size of 185 × 46 cm. It is made of two mild steel angle irons welded together to provide the desired strength and rigidity. This is true in a drill of 9 tines, the length of frame is about 184 cm. Holes 1.2 cm in diameter and 2.5 cm apart from each other are provided in the frame, to vary the spacing between furrow openers. the frame in seed cum fertilizer drill provision for fastening clamps (diamond/box typeshas been made to overcome this drawback. The machine can easily be drawn with the help of any 35 HP tractor. The height of the machine ranges from 110 to 145 cm andweighs around 250 to 260 kg.

B. Furrow Openers

These are the parts which open up furrows in the soil for placing the seeds.
In cultivator type seed drills the tines work as furrow openers.

FURROW OPENERS	
Tyne and tilt angle with respect to vertical	Reversible Shovel,48^0
No of openers	9
Arrangement of openers	Furrow openers are arranged on the toolbar in two rows(4 at front and 5 at rear)
Range of selection of opener	9
Method of changing row space and range	provided
Nominal width(cm)	4.35
Lifting and lowering of openers	By hydraulic levers of tractor
Depth control	Through tractor hydraulic

C. Seed & Fertilizer Box

It is a box like structure made up of either mild steel or galvanized iron and provided with a lead. Seed metering mechanism is placed at the bottom of the box.

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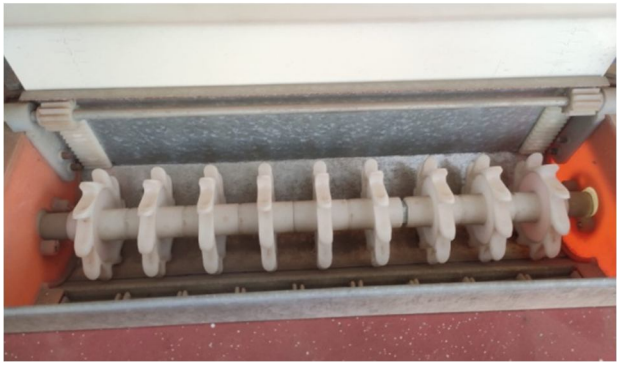
Trapezoidal shaped seed and fertilizer boxes, made of mild steel sheet (2 mm thick), aremounted side by side on the frame, fertilizer box in front and seed box in the rear. The boxes are generally 120 cm long and 28 cm width sufficient to hold 50 kg urea and 50 kg paddy seed at one time, respectively. Box dimensions can vary but these generally depend upon the effective width of the machine and will increase with the increase in the number of the furrow openers.

SEED&FERTILIZER BOX	
Seed box(kg)	45
Fertilizer box	45
Type of hopper	Trapezoidal box type with lid and locking system
MARKER DETAILS	PROVIDED

D. Seed & Fertilizer Metering Mechanism

It is a feed mechanism which consists of a toothed wheel,rotating in a horizontal plane and conveying the fertilizer through a feed gate below the Star wheel. If either of the wheels in contact with the ground gets stuck, the whole system rotates over the obstruction. A Tri-Star wheel consists of a three spoked wheel, with 3 leaf wheels on the end of the each spoke, all powered. with the ground. On the flat ground, the leaf wheels will simply turn, and give simple

To make a Star Wheel, fold the white rectangle at the bottom of the outer sleeve so it's underneath the front. Then staple the rectangle to the front at the locations marked by short white lines to either side of the oval. Now slip in the circular sky map so it shows through the oval.



E. Power Transmittion UNI

Power transmission unit has the following main components:

1) Drive wheel
2) Shaft
3) Idler
4) Sprocket
5) Roller chain

The power required to operate the seed and fertilizer metering devices is provided by a floating type lugged drive wheel 40 cm in diameter and 10.5 cm in width through chain and sprockets. However, size of the drive wheel may vary in different models. Fourteen lugs each of 3 cm height at an angle of 900 are provided on the ground wheel to avoid slippage. Wheels are of iron closed type or with rubber on them for better traction.Drive wheel is attached to the frame in front. Traction can be adjusted through a groove and spring as desired. Attachment of drive wheel in the front side of the frame sometimes creates problem in the free movement of wheel due to soil or stubble blockage or due to its location being very near to the hook of the tractor.

A motorcycle roller chain of 12.50 mm pitch with 14 and 37 number of teeth on the mild steel sprocket is provided for power transmission from the drive wheel to seed and Fertilizer metering devices. Power from ground wheel is transmitted to a shaft (1:1) mounted on front frame. From this shaft power is transmitted to seed and fertilizer meteringshafts (2.5:1) through the chain sprocket arrangement. However, size of roller chain andsprocket can vary in different models as per requirements. An idler has been provided totighten or loosen the chain for its smooth running.

No.of wheels	1
Type of wheel	Pegged ms construction
Size(MM)	560
Method of transmitting power to feed shafts	Through chain and sprockets

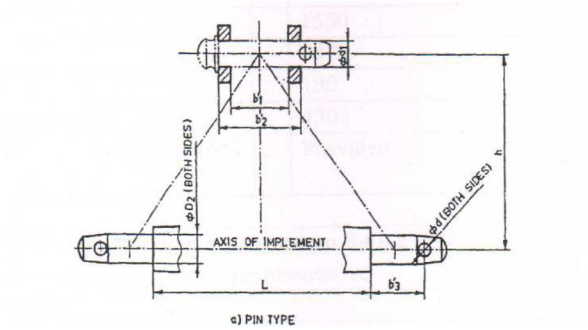
F. Depth Control

The tractor hitch system is that essential element of the tractor which binds the prime mover and the implement into a single working unit. The tractor or the implement will not perform alone but must work together like two wheels of a cart.

G. Hitch Point

The drill has three standard hitch points; two lower and one upper. The machine is attached to tractor through these three hitch points with the help of link pins. The top link hitch point also helps in leveling the machine.

Type	Three point linkage



H. Furrow Closer

Various covering devices are drag chains, drag bars, scraper blades, steel press wheels, rubber covered or zero pressure pneumatic wheels, disc hillers etc.

The function of covering device is to place the moist soil in contact with the seed, press the soil firmly around the seeds, cover them to the proper depth and leave the soil directly above the row loose enough to minimize crusting and promoting easy emergence. Thus for grain drills simple drag chains are used which merely cover the seeds with loose soil where there is ample moisture.

III. RESULT & DISCUSSION

Test conditions during the assessment of seed cum fertilizer drill

Sr. No.	Particulars	Data taken
1.	Farming situation	Irrigated
2.	Location	Gift farm back side field
3.	Type of soil	Sandy loam
4.	Field Preparation	Ploughing and harrowing for breaking of stubbles of previous paddy crop

Performance of technology with performance indicators

1) Field capacity
2) Depth of sowing
3) Labour requirement, man-h/ha
4) Seed rate, kg/ha

A. Depth of Ploughing

Assessment of seed cum fertilizer drill for paddy sowing at GIFT farm, the Seed cum fertilizer drill was field evaluated at the field for raising wheat crop after paddy in comparison to conventional method of broadcasting. Depth of sowing of wheat seed using seed cum fertilizer drill was found be 5-6 cm. It was found that wheat seed was germinated uniformly without any gap using the seed cum fertilizer drill.

Field performance of tractor operated seed cum fertilizer drill for sowing paddy

Parameters of assessment	Broadcasting	Sowing of paddy using seed Cum fertilizer drill
Field capacity, ha/h	0.67	0.214 ha/h
Depth of sowing,cm	NA	4-5
Labour requirement man-h/ha	90	02
Seed rate kg/ha	125	60

IV. CONCLUSION

The performance evaluation of seed-cum fertilizer drill was carried out in the field area of back side of Farm Machinery and power engineering Lab of Gandhi Institute for Technology (GIFT) Bhubaneswar, Odisha. The followings conclusions are taken

1) It was observed that there was no effect of stubble on the performance of seed-cum fertilizer drill. However, the loose straw spread on the surface offers some hindrance in the working of the drill. The standards test code was adopted.

2) Each test was replicated minimum three times. Forward speed and depth and sowing were taken as independent variables while wheel slippage field capacity.

3) Paddy sowing using tractor operated seed cum fertilizer drill with seed rate was found to be 60kg/ha when the openings are one fourth pass.

4) Paddy sowing using seed cum fertilizer drill showed better results over farmers practice and recorded higher yield.

5) The field capacity, depth of sowing and seed rate was found to be 0.214 ha/h, 5-6 cm and 0.6 q/ha, respectively compared to 0.50 ha/h, no depth and 6.13 q/ha observed in case of conventional broadcasting method.

6) The mechanized method of sowing resulted in 50% more depth of sowing compared to broadcasting method. The tractor operated seed cum fertilizer drill was found to be better compared to traditional broadcasting method.

REFERENCES

[1] Aaron, B., D. Kelvin and T. Kastens, 2003.Per unit cost to own and operate farm machinery. Proceeding of the Southern Agricultural Economics Association Annual Meeting. Mobile, Alabama.

[2] Adewoyin, A.O. and E.A. Ajav, 2011.Appraisal of the utilization and performance of farm tractors for ploughing operations in selected states of SouthWesternNigeria.Proceedings of the 11th International Conference and 32nd Annual General Meeting.Nigerian Institution of Agricultural Engineering, Vol. 32.

[3] Al-Suhaibani, S.A. and A.E. Ghaly, 2010.Effect of ploughing depth of tillage and forward speed on the performance of a medium size chieselplow operating in a sandy soil. Am. J. Agric. Biol. Sci., 5(3): 247-255. Asoegwu, S. and A. Asoegwu, 2007.

[4] An overview of agricultural mechanization and its environmental management in Nigeria.Agr. Eng. Int. CIGR J., 9: 13-18.

[5] Bamigboye, I. and S. Ojolo, 2002. Cost of operating farm tractors. Moor J. Agric. Res., 3(2): 229-232. Cecil, P., T. Mataba and E.A. Barveh, 2002.

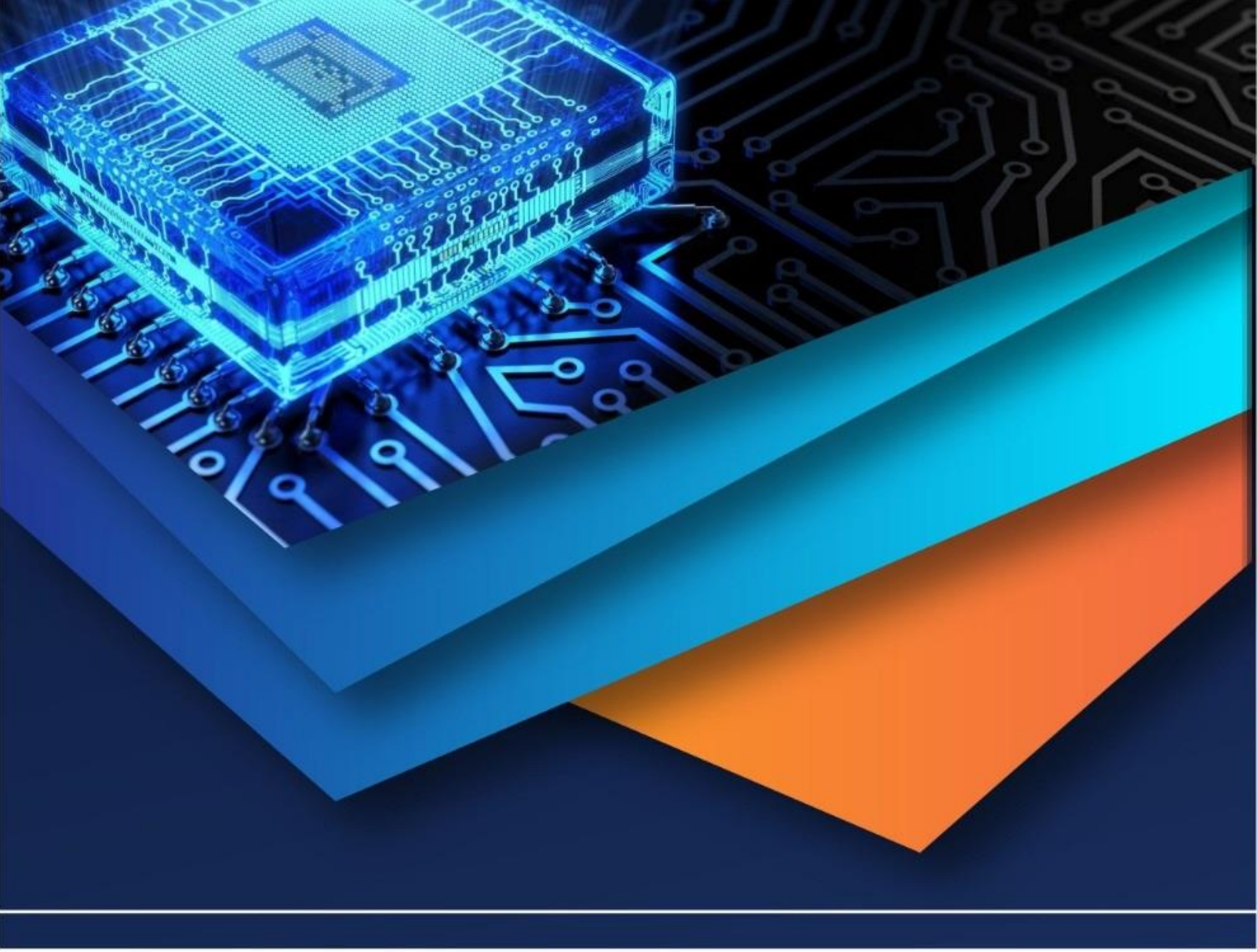
[6] Agricultural tractor ownership and off-season utilization in the Kgatleng district of Botswana.AMA-Agr. Mech. Asia Af., 33(3): 66.

[7] Collins, B.A. and D.B. Fowler, 1996.Effect of soil characteristics, seeding depth, operating speed and opener design on draft force during direct seeding.Soil Tillage Res., 39L: 199-211.FAO, 1991.

[8] Guidelines for Soil Profile Description. 2nd Edn., FAO, Rome. FAO, 2001.The Economics of Conservation Agriculture. FAO, Rome. Fathollahzadeh, H., H. Mobli and S.M.H. Tabatabaie, 2009.Effect of ploughing depth on average and instantaneous tractor fuel consumption with threeshare disc plough. Int. Agrophys., 23: 399-402.

[9] Kheiralla, A.F., A. Yahya, M. Zohadie and W. Ishak, 2007.Modeling of power and energy requirements for tillage implements operating in serdang sandy clay loam, Malaysia.Soil Till. Res., 78: 21-34.

[10] McLaughlin, N.B., L.C. Heslop, D.J. Buckley, G.R.St. Amour, B.A. Compton, A.M. Jones and P. Van Bodegom, 1993.



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