Design and development of a row seeder for Gingelly, Kurakkan and Meneri

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Abstract

A manually operated seeder was designed and developed for small seeded crops such as Gingelly, Kurakkan, and Meneri, after testing the first proto-type seeder and implementing necessary modifications. The developed seeder has a frame, wheel, metering mechanism, hopper, seed tube, handle and marker. Laboratory and field experiments were conducted to evaluate the performance of the seeder. A comparative performance of the new raw seeding technique incorporated in the designed seeder was compared with traditional hand broadcasting method. Weight of 1000 seeds, hardness, moisture content, germination and bulk density of seeds were measured in the Laboratory. Seed delivery rate, rate of damage seed caused by metering mechanism, pattern of seed deposit in the field, working capacity, delivery rate in the field, travel reduction (slippage), depth of seeding, and ratio of established plants to seeds sown were considered as criteria for evaluation of the designed seeder.

The delivery rates observed in the laboratory for gingelly kurakkan and meneri were 5.8 kg/ha, 5.9 kg/ha and 7.2 kg/ha respectively. The damage seed percentage of the designed machine for Gingelly, Kurakkan, and Meneri were 9.7, 7.5 and 3.4, respectively. The effective working capacity of the seeder was 0.66 ha/day, which was significantly higher to that of broadcasting. It showed that broadcasting was 5 times costlier than machine seeding. On the basis of above results, the design seeder could be recommended for successful row seeding of small seed crops.

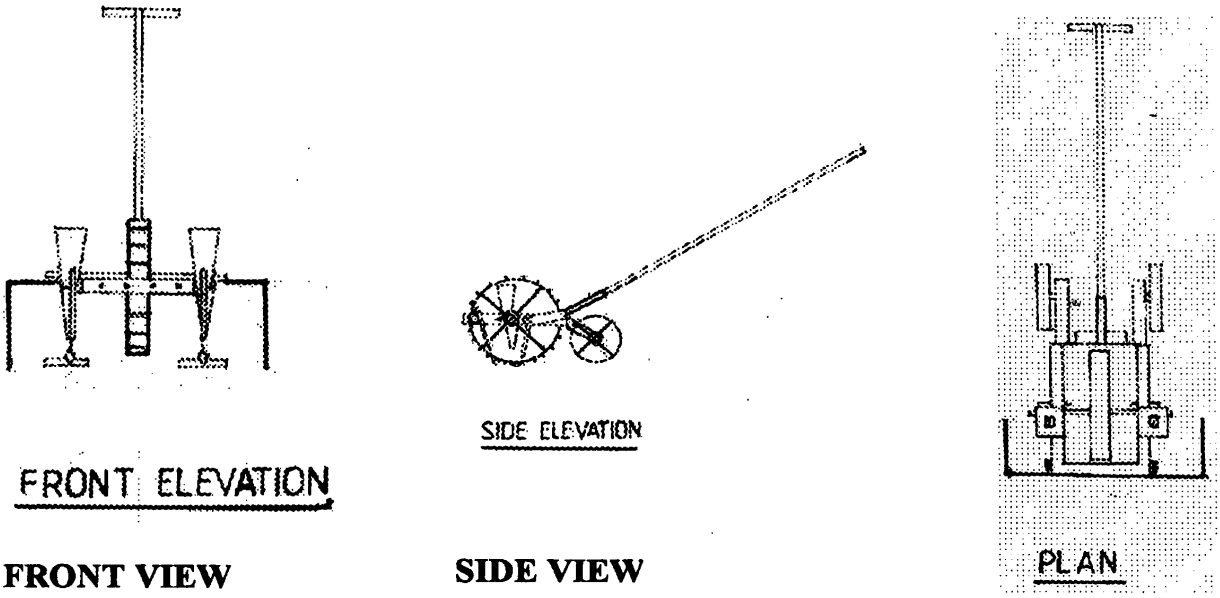
Keywords: Row Seeder, planting techniques, small seed crops, Gingelly, Kurakkan, and Meneri

Introduction

Cereals and legumes with small seeds such as Gingelly, Kurakkan, Meneri and Thanahal are being used for human and livestock feeds. For increasing production of these food crops not only high quality seeds and effective cultural practices are needed, but more appropriate techniques and tools are equally important. There is good scope for increasing yield per hectare of these food crops as well as the total area sown through the adoption of advance technology including mechanization. One of the major constrains to enhance the increased production of gingelly, kurakkan, and meneri lies on the planting techniques. The objectives of the present research were to design, develop and evaluate the performance of a low cost manually operated seeder for gingelly, kurakkan and meneri.

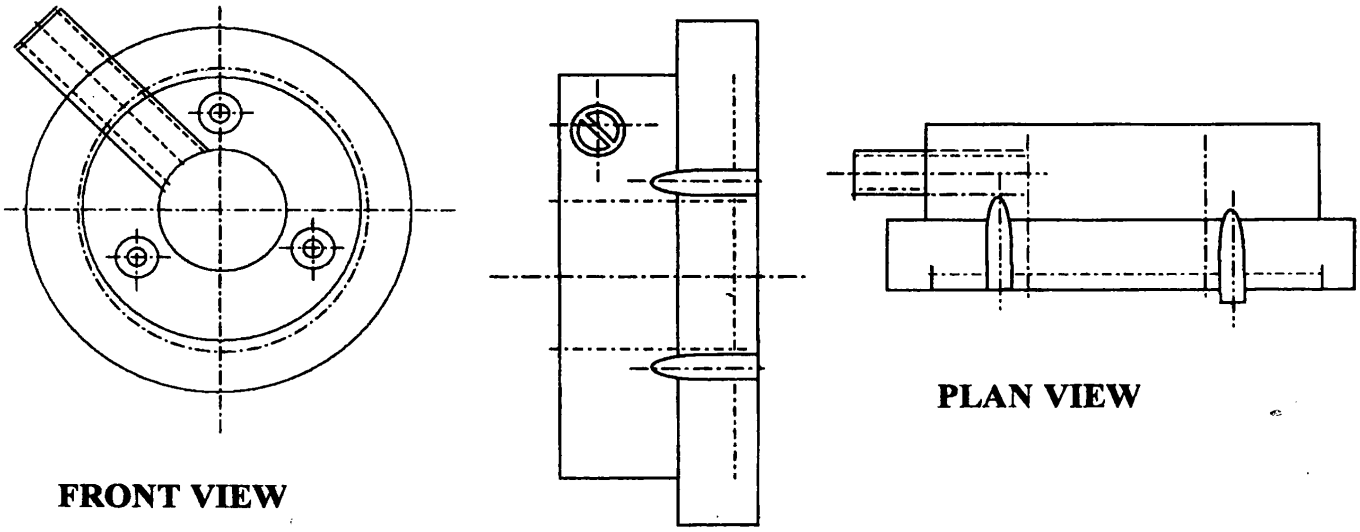
Methodology

A manually operated seeder was designed and developed for small seed crops such as kurakkan gingerly, and meneri after testing first proto-type seeder and implementing necessary modifications. The developed seeder has a frame, wheel, metering mechanism, hopper, seed tube, handle and marker. (see figure 01 and figure 02 for design details).



FRONT VIEW **SIDE VIEW** **PLAN VIEW**

Fig. 1: Drawing of the designed seeder



FRONT VIEW **SIDE VIEW** **PLAN VIEW**

Fig. 2: Brass core of the metering device

New double ring internal feed cup mechanism was designed and developed for the new seeder. This feed cup mechanism was tested for small seeds such as gingelly, kurakkan and meneri. The specific characteristic of this mechanism is shown in Plate.01. The seeder has a solid main frame and adjustable handle. The axle passes through the iron housing, which is attached to the main frame and supported middle with one ground wheel (Plate 02). The adjustable furrow openers and seed covering shovels are also provided on this seeder. Laboratory and field experiments were conducted to evaluate the performance of the designed seeder. A comparative performance of the raw seeding technique (Plate 03) introduced by the designed seeder was compared with traditional hand broadcasting method (Plate 04).

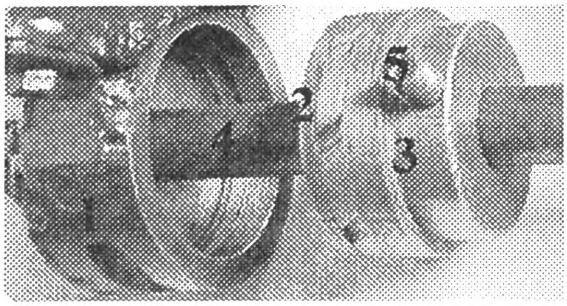


Plate 1: Designed double ring internal feed cup mechanism for new seeder

1-Iron housing, 2-Seed metering ring,
3-Brass core, 4-Drive axel, 5-Clamping screw

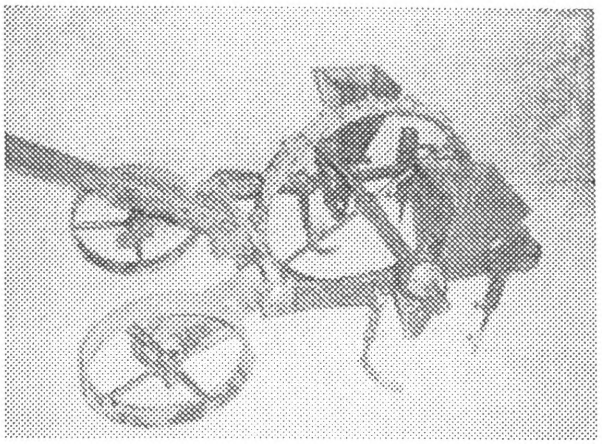


Plate 2: Designed seeder

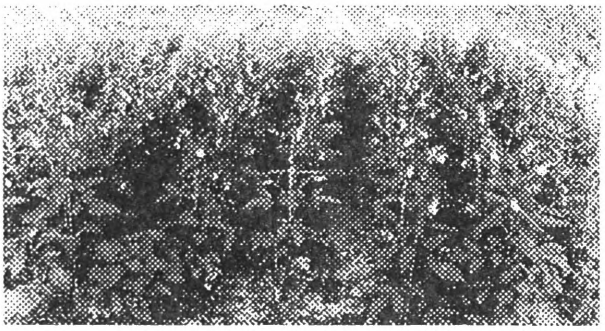


Plate 3: Row cultivation of gingelly by designed seeder

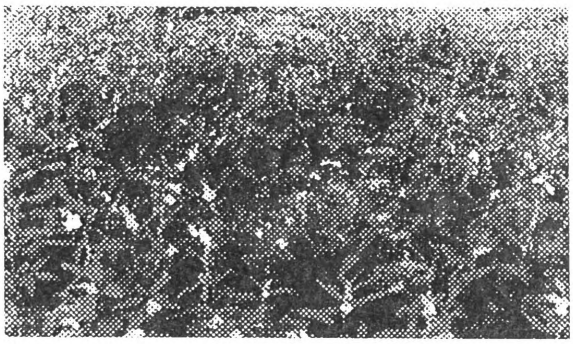


Plate 4: Broadcasting of gingelly by traditional method

Weight of 1000g, hardness, moisture content, germination and bulk density of the seeds were inspected in the Laboratory. Delivery rate, rate of damage seed caused by metering mechanism, pattern of seed deposited, field experiment, working capacity, delivery rate in the field, ravel reduction (slippage), depth of seeding, and ratio of established plants to seeds planted were considered as criteria for the evaluation of designed Seeder.

Designed seeder deposit seeds in rows spaced to permit inter-row cultivation and it has a single seed metering device. The inter-row space can be changed by adjusting the space between the sowing units (unit planter) on the toolbar frame.

The seeder was designed to perform the following functions:

1. Open the seed furrow to the proper depth by adjustable furrow openers,
2. Meter the seed by the double ring internal feed cup mechanism,
3. Drop the seed in furrow by the seed tube,
4. Cover the seed by covering shovels
5. Compact the soil around the seed to the proper degree by the press wheels.

Results

The test data for all the treatments were analyzed. The mean values of the data were determined and shown in Table1.

Table.1 Measured and calculated values of field test data under different test treatments

Criteria	Treatments		
	Gingelly	Kurakkan	Meneri
Laboratory Test			
Weight of 1000 seeds (g)	2.26	1.73	4.92
moisture content (%)	13	8	10
Germination (%)	86	83	84
bulk density of seeds (g/cm3)	0.65	0.77	0.73
Seed delivery rate (kg/ha)	5.83	5.9	7.17
Field Test			
rate of damage seed caused by	9.7	7.5	3.4
metering mechanism working capacity (ha/hr)*			
Theoretical*	0.089	0.089	0.089
Actual	0.076	0.076	0.076
delivery rate in the field (kg/ha)	5.12	6.12	5.45
Travel reduction (slippage) (%)	- 0.06	- 0.5	- 0.04
depth of seeding (mm)	6.4	6.4	6.4
ratio of established plants to seeds sown (%)	71	71	71

The delivery rate observed in the laboratory for gingelly kurakkan and meneri were 5.83 kg/ha, 5.9 kg/ha and 7.17 kg/ha respectively. In the case of field experiment these values were slightly lowered due to minus travel reduction. The sowing depth of local traditional method was not uniform but the sowing depth of designed seeder was adjusted and maintained at 6.4mm. The metering efficiency of the designed seeder was quit high. Therefore the average seed damage percentage for different seed types could be maintained 3 to 10, which is highly desirable from quality points of view.

The damage seed percentage of the designed machine for gingelly, kurakkan, and meneri were 9.7, 7.5 and 3.4, respectively. The average travel reduction of the machine was 4.78%. The effective working capacity of the seeder was 0.66 ha/day, which was significantly higher, compared to that of broadcasting. It showed that the broadcasting was 5 times costlier than machine seeding.

Conclusion

This instrument could be used successfully for row seeding of gingelly, kurakkan, and thanahal. Effective working capacity of the seeder was 0.076 ha/hr which was significantly higher than broadcasting. The working efficiency of seeder was 85.3%. Average ratio of established plants to seed planted (raw seeding) was 71% and it was not significantly different from broadcasting. Percentage of damaged seeds of the seeder was very low. It was 9.3% for gingelly, 7.5% for kurakkan, and 3.4% for

meneri. On the basis of above results, the designed Seeder could be recommended as a suitable planting equipment for successful row seeding of small seed crops.

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