



Research Article

PERFORMANCE EVALUATION OF KSNUAHS DESIGNED POWER TILLER OPERATED GROUNDNUT SEED DRILL AT FARMERS FIELD OF UDUPI DISTRICT OF COASTAL KARNATAKA

SHANKAR M., SHRINIVAS H., JAYAPRAKASH R.*, REVANNA R., VIDYASHREE S.M. AND SATHEESHA N.

Zonal Agricultural and Horticultural Research Station, Brahmavar, Udupi, 576213, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga, 577412, Karnataka, India

*Corresponding Author: Email - jjayaprakashr@gmail.com

Received: July 03, 2023; Revised: July 26, 2023; Accepted: July 28, 2023; Published: July 30, 2023

Abstract: Performance evaluation of KSNUAHS designed power tiller operated groundnut seed drill was conducted in farmers fields of Udupi district of coastal Karnataka in comparison with existing practices (manual sowing, bullock drawn seed drill and tractor drawn seed drill) for sowing of groundnut during the Rabi season of 2021 and 2022. The overall field performance of KSNUAHS designed power tiller operated groundnut seed drill was quite satisfactory. Sowing using KSNUAHS designed power tiller operated groundnut seed drill was done in four rows with row spacing of 30 cm and seed to seed distance obtained in a row was 15 cm. The seed rate was found to be 87.50 kg/ha with field capacity of 1.60 ha/day and field efficiency of 85%.

Keywords: Groundnut, Field capacity, sowing, seed rate

Citation: Shankar M., *et al.*, (2023) Performance Evaluation of KSNUAHS Designed Power Tiller Operated Groundnut Seed Drill at Farmers Field of Udupi District of Coastal Karnataka. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 15, Issue 7, pp.- 12458-12460.

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Academic Editor / Reviewer: Ashok Kumar, R. M. Bhuva

Introduction

Groundnut is cultivated in an area of 16.17 lakhs ha with the production of 5.63 lakh tons in Karnataka with an average productivity of 366 kg/acre (Package of Practice, 2016). Groundnut was grown in small packets of Udupi district during the Rabi season using available moisture in soil, the average productivity of groundnut in Udupi district is more than the national average. The average rainfall of Udupi district is 3800 mm. The soils in the district are mostly red and laterite with acidic in reaction, low in CEC, base saturation and water holding capacity, besides deficient in phosphorus, potassium, calcium, zinc and boron. It is recommended that the optimum time period for sowing of groundnut is during November and December immediately at the end of the rainy season. On the other hand, country wide tractor and power tillers are replacing the pair of bullocks. Besides high cost, the tractors have certain limitations especially for crop cultivation on small /medium land holdings, hilly areas, orchards and forestry. The large size and more turning radius of tractors restrict their utility in small land holdings, hilly areas etc. Power tillers can find a place on these farms provided matching equipment is made available to perform the operations similar to the four-wheel tractors. The light weight tillers have great potential for various operations in hill agriculture, small rice fields, inter culture and rice transplanting especially on small farms. Yet, they are mainly utilized for tillage and soil preparation rather than the versatile operations. At present, animal drawn and tractor drawn ground nut seed drills are available in most parts of the country. Most of the farmers in the Udupi district of Coastal Karnataka use bullock drawn single row seed drill having wooden bowl with holes under the bottom. Main disadvantage with these local seed drills are that uniform seed to seed distance is not maintained and more seed rate (150-180 kg/ha) than the recommended quantity used (100 kg/ha) due to manual dropping of seed [1]. An attempt was made at Zonal agriculture and horticulture research station, Brahmavar to design and develop power tiller operated groundnut seed drill that can suit small land holdings and to save energy, time, cost, labour and drudgery in groundnut production. To know the feasibility of KSNUAHS designed power tiller operated groundnut seed drill has been used to evaluate its performance at farmer's field and compare with existing practices [2-5].

Materials and Methods

Laboratory Testing

The KSNUAHS designed power tiller operated groundnut seed drill (specifications given in Table 1) fabricated in the Agricultural Engineering Workshop, Zonal Agricultural and Horticultural Research Station, Brahmavar, Udupi was tested in the laboratory by following standard method [2] for seed rate calibration before taking to actual field conditions. TMV-2 variety (bold seed) of groundnut seeds was selected for the study. The seed from the hopper was passed through the seed control valve and collected at U trough. Then the seed will be lifted by the disc and dropped into the ports where the seed travels by gravity and sown depth and distance. KSNUAHS designed power tiller operated groundnut seed drill was tested to check the regularity of flow and damage. The flow was regular and it was observed that less than 0.50 % of seed was broken due to rotation of plastic fibre rotary disc. However, the seed germination was found above 95%. The seed drill was calibrated for recommended quantity of seed per hectare *i.e.*, 100 kg/ha.

Field Testing

The required data were collected from the experiments conducted in the farmers fields at Uppunda, Tekkate and Kome village of Udupi district, which is 22 km from Zonal Agricultural and horticultural Research Station, Brahmavar. The field was prepared using Tractor drawn cultivator and secondary tillage using tractor drawn rotovator which inturn helps in levelling of land for sowing. Following four types of sowing methods were used for sowing of groundnut and plot size for each treatment was 2000 m².

Treatments

- T1 = Traditional/Manual Sowing (Control).
- T2 = Animal drawn Groundnut seed drill.
- T3 = UAHS designed Power tiller operated Groundnut seed drill.
- T4 = Tractor drawn Groundnut seed drill.

Table-1 Technical specification KSNUAHS designed Power Tiller operated Groundnut seed drill.

SN	Details	Description
1	Type of implement	Power Tiller operated Groundnut seed drill
2	i) Make/Model	UAHS Power Tiller operated Groundnut seed drill
3	Over all dimensions of seed drill (L X W X H)	480 X 1065 X 1250 mm Tyne spacing 150 – 300 mm. adjustable
4	Total Weight	56.00 kg.
5	Source of draft power	VST power Tiller 13 hp.
6	Details of soil working parts	
i)	No. of Tynes & Tyne material	4 nos. & Forged Steel
ii)	Width & Thickness of Tyne	50.80 mm & 5.00 mm
iii)	Total Working width	1200mm
iv)	No. of rows	4
v)	Row to row spacing	300 mm
7	Metering mechanism	Ground wheel driven type
8	Seed box capacity	
9	Type of material	Mild steel
10	Method of fixing	By pin

Table-2 Comparative performance evaluation of KSNUAHS designed Power tiller operated Groundnut seed drill over existing Groundnut seed drills at Farmers Field.

SN	Parameters	Treatments			
		T1	T2	T3	T4
1	Kind of field	Low land	Low land	Low land	Low land
2	Type & character of soil	Sandy loam	Sandy loam	Sandy loam	Sandy loam
3	Source of draft power	Manual	Bullock	13 hp Power tiller	Tractor
4	Make, model, type, and output of engine	Traditional	Animal Drawn GN Seed drill	KSNUAHS designed GN Seed drill, VST 13 hp Power tiller	Tafe, 1035, 35 hp Tractor Drawn GN Seed drill
5	Type of fuel	-	-	Diesel	Diesel
6	Actual area covered for testing, m ²	2000	2000	2000	2000
7	Skill of operator	Good	Good	Good	Good
8	Effective field capacity, acre/day	1.1	2.45	4.12	5.99
9	Effective width, (cm)	90	90	90	90
10	Effective depth (cm)	3.00	5.00	5.00	7.00
11	Seed rate (kg/acre)	60.00	35.00	35.00	40.00
12	No. of rows	1	4	4	9
13	Row to row distance(cm)	15-30	30	30	22.5
14	Plant to plant distance(cm)	May-14	15	15	13
15	Fuel consumption (Lt/hr)	-	-	0.8	3.6
16	Wages of operator / labour (Rs./day)	600+500	600+500	500	750
17	No. of operator / labours required	1*+2	1*+1	1*	1*
18	Cost of Operation Rs. /Acre	1454.54	448.97	256.49	548.44



Fig-1 Crop stand - KSNUAHS designed Power tiller operated GN seed drill



Fig-2 Crop stand - Tractor drawn GN seed drill

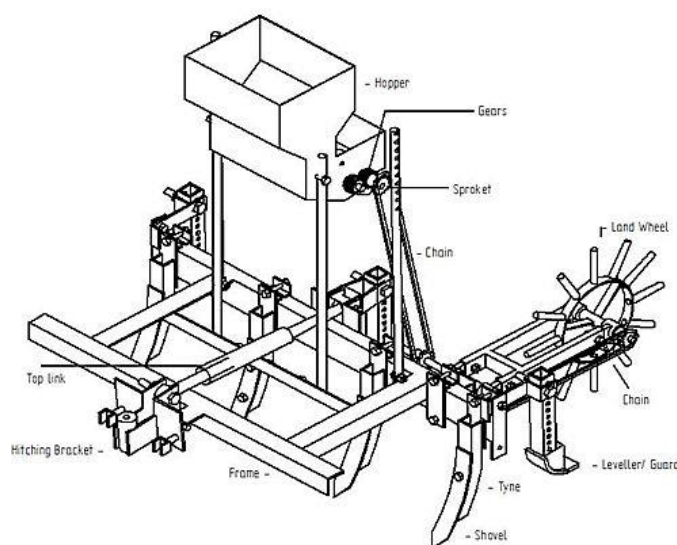


Fig-3 Line diagram of KSNUAHS designed power tiller operated groundnut seed drill

The field performance of the KSNUAHS designed power tiller operated groundnut seed drill in terms of seed to seed spacing in a row, depth of sowing, seed rate, field capacity, field efficiency, number of labours and man-h/ha for sowing was evaluated by following the standard procedures. The quantity of diesel filled and time of sowing were recorded to determine the fuel consumption per hour and in litres per hectare. Similar parameters were taken into consideration for tractor drawn seed drill and bullock drawn local seed drills also. One more pair of bullocks attached with a blade for furrow closing was used after seed sowing by bullock drawn seed drill. After germination, plant population per square metre at 15 DAS, final plant population per square metre at the time of harvesting and pod yield were noted as crop data for all the treatments.

Results and Discussion

The field performance of the KSNUAHS designed power tiller operated groundnut seed drill was quite satisfactory in comparison to existing methods of ground nut sowing and results are shown in Table 2. The average row to row distance obtained in case of KSNUAHS designed power tiller operated groundnut seed drill was 300 mm and in case of tractor operated seed drill and bullock drawn local seed drill, it was 250 mm and 300 mm respectively. Similarly, seed rate observed in case of KSNUAHS designed power tiller operated groundnut seed drill was 35 kg/ acre and in case of tractor operated seed drill and traditional practice (Manual), it was 40 and 60 kg/acre respectively. Well-designed seed metering mechanism in KSNUAHS designed power tiller operated groundnut seed drill also provided for width (plant to plant distance) and depth adjustment, apart from making the equipment more versatile to use the drill for other crops with change in metering rollers.

Manual dropping of seed in case of local seed drills is the reason for not obtaining the recommended seed spacing and seed rate. Therefore, it was found that 20-25 kg of groundnut seed per acre could be saved without wastage by selecting KSNUAHS designed power tiller operated groundnut seed drill for sowing in comparison to local seed drills. On an average, in all the locations of the study area the field capacity of KSNUAHS, designed power tiller operated groundnut seed drill and Tractor drawn seed drill was found to be 4.12 and 5.99 acre per day respectively, while the field capacity of animal drawn groundnut seed drill and Traditional sowing was found to be 2.45 and 1.10 acre per day respectively. The cost of operation using KSNUAHS designed power tiller operated groundnut seed drill and tractor drawn seed drill was found to be Rs. 256 and Rs. 548 per acre respectively, whereas the cost of operation in Animal Drawn groundnut seed drill and Traditional sowing is about Rs 449 and Rs. 1455 per acre respectively. In the new design flexibilities were also provided for width (plant to plant distance) and depth adjustment, apart from making the equipment more versatile to use as a cultivator. Therefore KSNUAHS, designed power tiller operated groundnut seed drill proves to be viable and more economical for groundnut sowing especially for the coastal Karnataka farmers, since large numbers of farmers are having small land holdings and rely more on power tillers. The reason for less man-h/acre required for sowing in case of KSNUAHS designed power tiller operated groundnut seed drill was the reduced labour requirement and in case of local seed drills, two or more number of labours required for dropping of seed increased the man-h/acre for sowing. Even though initial plant population per square meter was more in case of crop sown with KSNUAHS designed power tiller operated seed drill as shown in Figure1, the plant population per square meter was more in large fields but in small fields it is not as expected specially due to turning loss in tractor drawn seed drills in small field which is presented in Figure 2. KSNUAHS designed power tiller operated groundnut seed drill is more advantageous than tractor operated seed drill as the seed drill unit is mounted behind the power tiller and in front of the operator which makes it easier for monitoring the seed dropping and clogging whereas in tractor operated seed drill the seed drill unit is mounted behind the tractor and driver seat and the seed flow monitoring is not possible. This is one of the reason the seed rate in KSNUAHS designed power tiller operated groundnut seed drill is lesser than the tractor operated seed drill.

Conclusion

Recommended seed to seed spacing in a row can be achieved by using the KSNUAHS designed power tiller operated groundnut seed drill for sowing. Wastage of seed can be avoided and number of labours can be reduced, thereby cost of sowing can be decreased. Recommended plant population per square meter can be maintained. On an average at all the above locations, it was observed that the field capacity of KSNUAHS designed Power tiller operated Groundnut seed drill and tractor drawn Groundnut seed drill were found to be 4.12 and 6.00 acre per day respectively, whereas Traditional method/ sowing by hand and bullock drawn Groundnut seed drill were found to be 1.00 and 2.45 acre per day respectively. The cost of operation using KSNUAHS designed Power tiller operated Groundnut seed drill was found to be lesser than all other methods of sowing and is recorded to be Rs. 256 per acre, whereas the cost of operation in traditional /Hand sowing and animal drawn Groundnut seed drill was found to be

Rs. 1455 and Rs. 449 per acre. Further the cost of operation using tractor drawn Groundnut seed drill was found to be Rs. 548 per acre. The seed rate is also higher in case of tractor drawn seed drill and other local seed drills. Both tractor operated local seed drill and bullock drawn local seed drill did not give recommended output values for sowing of groundnut crop.

Application of research: Study of performance evaluation of KSNUAHS designed power tiller operated groundnut seed drill

Research Category: Mechanical sowing

Acknowledgement / Funding: Authors are thankful to Zonal Agricultural and Horticultural Research Station, Brahmavar, Udipi, 576213, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga, 577412, Karnataka, India

****Principal Investigator or Chairperson of research: Dr Shankar M**

University: Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga, 577412, Karnataka, India.

Research project name or number: Research station study

Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: Uppunda, Tekkatte and Kome village of Udipi district, Karnataka

Cultivar / Variety / Breed name: Groundnut TMV-2

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

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