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Research Article

Optimization of Groundnut Crop Management Practicesin Somali Regional State, Eastern Ethiopia

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Abstract

To study the response of groundnut to different crop management practice six different crop management practices tested in three districts namely Godey, Gursum and Erer of Eastern Ethiopia. Treatments wereT_1 (Spacing 60 x 30 cm, P @ 80 kg/ha and twice weeding @ 15th and 30th DAE), T_2 (75 x 20 cm, P@ 60 kg/ha three times mechanical weeding), T_3 (Spacing 45 x 15 cm, 50 and 85 kg/ha twice weeding, T_4(Spacing at 75 x 30 cm, N and P applied @ the rate of 46 and 90 kg/ha respectively and hand weeding once @ 25th DAE), T_5 (Spacing 30 ×10 cm, FYM @ 12 ton/ha, N and P applied @ the rate of 25 and 46 kg/ha respectively and mechanical weeding @ 28 DAE). T_6(Spacing 30x 15cm, N and P applied at the rate of 80 and 130 kg/ha respectively, twice weeding and earthling up). Then the treatments were arranged in RCBD. Analysis of variance showed that there were statistically significant differences between each treatment across the locations on growth and seed yield of groundnut at ($p<0.05$). Maximum seed yield was obtained from T_6 followed by T_5 and T_3. Wider spacing and minimum use of P without N fertilizer at (T_1 and T_2) resulted in significantly low seed yield. T_5 resulted in robust plant growth however; it resulted in reduced yield and yield components compared toT_6. Groundnut seed yield was remarkably influenced by proper combinations of crop management components as specified in T_6. Therefore, T_6 can be recommended as an integrated crop management practice for groundnut to current study areas and other similar lowland districts of eastern Ethiopia.

Keywords

Groundnut, Crop Management, Practices, Optimization

1. Introduction

Groundnut (*Arachish ypogaea*L.) is the fourth most important oilseed crop in the world. It is used as oilseed, food and animal feed all over the world. It is relatively recent to Ethiopia and it was introduced to Ethiopia in the early 1920s from Eritrea to Hararghe by the Italian travelers [1].

Groundnut is an important lowland oilseed crop in Ethiopia [2]. According to central statistical agency [3] it is the second lowland oil crops following sesame both in terms of area and in production. The area under groundnut production increased from about 12,600 ha in 1993 to 84,237.01 ha in 2019 with estimated annual production of more than 157,000 tones [3, 4]. Despite its importance and steady increase in production area yield of groundnut in Ethiopia ranges 750-1790 kg/ha and it is still far below the world average [5].

Ethiopia has high potential for groundnut production [1]. Particularly eastern lowland districts of Somali regional state

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believed to have great potential for groundnut production. Regardless of the potential of Ethiopia in general and Somali region in particular production and productivity of groundnut is very low [5, 6]. In fact, there have been some efforts to improve groundnut productivity in Ethiopia however; the yield improvement was not satisfactory as compared to world average.

Many factors are responsible for the low groundnut yield in Ethiopia ranging from backward way of cultivation up to shortages of input and improved technologies. In general low groundnut yield is mainly due to the problems associated with poor crop management practices [6, 7]. Therefore, efforts should be made to improve cropping practices to enhance groundnut production and productivity through integrated crop management approaches.

Mostly crop management research studies on various crop involves levels of a single or at best a few, factors keeping other possible yield-determining factors constant [8]. Therefore, combining different components of agronomic practices in an integrated approach will make the application very simple and effective. An integrated crop management approach involving proper integration of multiple crop management components in to single package. Several recent studies have reported greater yield improvement with integrated crop management compared with testing individual factors. [9] indicated that crop yield potential can be increased through the use of appropriate combinations of agronomic practices. Similarly. [10] argued that testing single component of management practices independently may not capture the impact a holistic package would have on enhancing rice grain yield. [11] stressed the effectiveness of holistic or integrated approach instead of focusing on independent components crop management practice.

Information on proper agronomic practice for maximum grain yield are limited for groundnut grown under eastern lowland areas of Ethiopia. Despite works on varietal improvements and some other works on agronomic factors, there is insufficient information on how to integrate several components. Therefore, the objective of the study was to investigate the response of groundnut to different crop management practices under three agro ecologies of Somali regional state of Ethiopia.

2. Material and Method

2.1. Description of Study Area

The field experiments were conducted during 2022cropping season in three districts located in Somali regional state of eastern Ethiopia. General characteristics of experimental sites described in Table **1** below.

Table 1. *General characteristics of study locations.*

Soil characteristics		**Study locations/Districts**		
		Godey	**Erer**	**Gursum**
Geo lactation	Long	43.56.55	41:22:00	42:47:00
	Lat	5.94	9:33	9:20
Mean [℃] Temperature		31	24.8	20.82
RF. mm		325	890	588
Elevation m.a.s.l		289	1180	1446
Soil pH		7.45	8.1	7.72
Total nitrogen (N)%		0.13	0.19	0.73
Available Phosphorus (AP)(ppm)		10	5.65	8.18
Available Potassium (AK) (ppm)		729.3		3.5
Organiccarbon%		0.92	0.78	0.52
Exchangeable sodiummeq/100g		5.79	2.1	0.01
CECeq/100g		46.6	23.4	21. 25
Soil texture		clay loam	sandy clayloams	Sandy loam

Sources: [12, 13, 14, 15]

2.2. Treatment and Experimental Design

Filed experiment consisted of six different groundnut crop management treatment were evaluated in three districts namely in Godey, Gursum and Erer locations. The detail of each crop management practice treatments were indicated in the Table 2. Groundnut seed variety *Babile-3* was used for the study and planting and plot management was performed according to the requirement of each treatment. Each plot had 3x3.2m and there was 1.5 and 1 m between block and plots respectively. The experiment was carried out in RCBD with three replication.

Table 2. *Treatment detail.*

Code	Treatment detail
T_1	Spacing 60 x30cm between row and between plants respectively, Papplied at the rate 80 kg/ha and weeding was performed at twice 1st mechanical weeding at 15tDAE and 2nd hand weeding at 30 DAE.
T_2	Spacing 75 x 20 cm between row and between plants respectively, Papplied at the rate of 60 kg/ha. Three times mechanical weeding at 15, 30 and 45DAE.
T_3	Spacing 45 x 15 cm between row and between plants respectively. N and P applied at the rate of 50 and 85 kg/ha; twice weeding *i.e.*1sthand weeding at 15 DAE and 2nd mechanical weeding at 45 DAE.
T_4	Spacing at 75 x 30 cm between row and between plants respectively, N and P applied at rate of 46 and 90 kg/ha respectively and hand weeding performed at 25thDAE.
T_5	Spacing 30 × 10 cm, between row and between plants respectively. FYM incorporated at the rate of 12 ton/ha 30 days before sowing. N and P applied at the rate of 25 and 46 kg/ha respectively and mechanical weeding done at 28DAE.
T_6	Spacing30x 15cm between row and between plants respectively, N and P applied at the rate of 80and 130 kg/ha respectively at planting and twice weeding *i.e.* firs hand weeding at 15 DAE, 2ndmechanical weeding and earthing up at35 DAE.

DAE; days after emergence

2.3. Method of Data Collection and Analysis

2.3.1. Crop Phonology and Growth Parameters Measurement

Days to emergence and days to 50% flowering were recorded when 50% plants in the plots emerged and started producing flowers respectively. Days to 75%physiological maturity was determined when about75% plant pods showed dark discoloration (indicating maturity) and foliage turned to yellow. Number of primary branches per plant was taken at 75% maturity of groundnut from 10 plants per plot and number of primary branches was counted directly.

2.3.2. Yield Components and Yield

Yield components such as number of pods per plant was recorded after randomly taking ten plants per plot pods manual counted. Number of seeds per pod and100 seeds weight were determined by randomly taking ten plants per plot seed per pod manually counted 100 seed weight was measured after randomly taking 100 seeds per plot and weighed in sensitive balance. Dry pod yield was measured after harvesting and sun drying the whole pods from each plots and weighted at plot level and converted to kilograms per hectare. Shelling percentage was recorded by taking samples of about 200 g mature pods per net plot manually separating the seeds from the pods and was determined as:

$$\text{Shelling \%} = \frac{\text{Weight of shelled x 100}}{\text{Total pod weight}}$$

Grain yield (kg/ha): It was determined as shelling percentage multiplied by dry pod yield and was adjusted to moisture content of 10%.

2.3.3. Methods of Data Analysis

Data on yield and yield components were collected from the field and subjected for analysis of variance using R version 3.2.4, 2016 [16]. Significant differences among mean values were compared using list significant test (LSD) at $p<0.05$.

3. Result and Discussion

3.1. Crop Phonology and Growth Parameters

The results indicated that different combinations crop

management practice did not affect phenological parameters of groundnut including days to 50% emergence (DTo 50%E), days to 50% flowering (DTo50%F) and days to 75% maturity (DTo75%M). The result in table 3 also revealed that there was no difference on crop phenology due to treatment across locations observed.

Table 3. *Crop phonology.*

	Locations								
	Godey			Gursum			Erer		
Treatment	**DT50%E**	**DT50%F**	**DTM**	**DT50%E**	**DT50%F**	**DTM**	**DT50%E**	**DT5%F**	**DTM**
T_1	13.37^{ns}	40.44^{a}	135.00^{a}	14.22^{ns}	39.07^{a}	145.00^{ns}	14.05^{ns}	41.40^{ns}	142.33^{ns}
T_2	13.17^{ns}	39.78^{a}	135.00^{a}	13.84^{ns}	40.41^{a}	144.00^{ns}	13.81^{ns}	40.74^{ns}	142.33^{ns}
T_3	13.33^{ns}	36.22^{a}	135.00^{a}	13.67^{ns}	40.26^{a}	147.00^{ns}	12.63^{ns}	40.92^{ns}	142.33^{ns}
T_4	13.96^{ns}	38.78^{a}	135.00^{a}	13.81^{ns}	40.44^{a}	145.00^{ns}	13.03^{ns}	40.22^{ns}	142.33^{ns}
T_5	13.6^{ns}	44.78^{b}	139.66^{b}	13.25^{ns}	42.45^{b}	147.00^{ns}	13.58^{ns}	41.78^{ns}	142.00^{ns}
T_6	13.6^{ns}	39.81^{a}	135.00^{a}	13.74^{ns}	40.47^{a}	143.00^{ns}	13.74^{ns}	41.80^{ns}	142.00^{ns}
LSD	ns	1.7297	ns	ns	1.57	ns	ns	ns	ns
CV	14.18	16.16	22.24	17.14	10.77	12.16	9.74	11.13	19.84

DT50%E=days to 50% emergence; DT50%F= days to 50% flowering; DTM days to maturity. Means with the same letter in each column are not significantly different at p <0.05. LSD=Least Significant Difference (P≤0.05); CV=Coefficient of Variation; ns=Non Significant

Table 4. *Analysis of variance (ANOVA) yield and yield related traits of groundnut in 2022 main cropping season.*

SV	**df**	**DTE**	**DTF**	**DTM**	**NPrBr**	**NPG/P**	**NP/P**	**NS/P**	**HSW**	**TPD**	**SLP**	**SDY**
Block	2	1.70^{ns}	2.07^{ns}	0.27^{ns}	0.59^{ns}	21.04^{ns}	2.476^{ns}	0.07^{ns}	205.267	134620	132.86ns	272550^{ns}
Treatment	2	6.53^{**}	8.29^{**}	22.51^{*}	39.33^{**}	133.32^{**}	235.501^{**}	0.38^{*}	125.012^{**}	1286083^{**}.	43.11ns	1418171^{**}
Location	5	3.98^{*}	42.60^{**}	29.12^{**}	4.21^{**}	327.33^{**}	404.803^{*}	0.05^{ns}	313.212^{**}	407264^{**}	0.39ns	19579^{ns}
Trt*Loc	10	1.13^{ns}	2.71^{*}	6.97^{***}	2.38^{*}	15.08^{*}	14.750^{*}	0.07^{ns}	3.700	46987^{*}.	2.46ns	9099^{ns}

SV; Source of variations, Trt.*Loc.; treatment* Location, df; degree of freedom, DT50%E; days to 50% emergence, D50%F; days to 50% flowering, DTM; days to 90% physiological maturity, NPrBr; number of primary branch/plant; NPG/P; number of pegs/plant, NS/P; number of seed/pod, NP/P; number of pods/plant, HSW; hundred seed weight, TPD; total dry pod yield kg/ha, SLP; shelling percentage, SDY; seed yield kg/ha

Groundnut didn't significantly responded to different combinations crop management practices across three locations and within the locations as well. This might be due the fact that these crop Phenological parameters totally influenced mainly by plants genetic makeup rather than crop management treatments. It showed that as long as minimum growth requirement is available the plant can geminate, flower and mature on its natural durations. Current result on the effect of agronomic practices on crop phenology corroborates with [6, 15, 17].

3.2. Effect of Different Agronomic Practices on Yield and Yield Components

3.2.1. Number of Primary Branch (*NPrBr*)

The result on the effect of agronomic practice on number of primary branch per plant (*NPrBr*) presented in Table 5. The result revealed that primary branch production of groundnut significantly at (p<0.05) affected by different combinations of crop management practices. The result indicted that highest

primary branches per plant was recorded from T_6 followed by $T_5$and T_3. The rest of treatments *i.e.* T_1, T_2 and T_4 were produced lower *NPrBr* compared to T_6, T_5 and T_3 as well.

The increase in *NPrB* at T_5 and T_6 could be resulted due to availability of N and P along with combination other essential crop management practices including optimum spacing and weed removal. Current finding corroborates with [17, 18] who reported that, spacing at 30×15 cm, twice weeding and fertilizer application resulted in highest number of branches per plant. At T_1 and T_2 despite wider spacing due to limited availability of N fertilizer might have resulted in lower number of branches compared to T_6, T_5 and T_3. Thisshows that in real field condition groundnut require substantial amount of N and P fertilizer along with twice weed removal at least at 21 to 42 days after planting for its vegetative growth [19-22].

3.2.2. Number of Peg Per Plant (*NPG/P)*

The result on the effect of crop management on number of peg per plant presented in Table 5 according to the result crop management practice significantly affected *NPG/P* at ($p<0.05$). The highest *NPG/P* was recorded from T_3 followed by T_6 and T_5. The lowest *NPG/P* was recorded from T_2, T_4 and T1 respectively regardless of locations.

In current study groundnut significantly responded to combinations of crop management practices in *NPG/P* parameter. The result revealed that the response is high onT_6whereplant spacing at 30 x 15 cm, N and P fertilizers applied at the rate of 80and 130 kg/ha respectively and weeded two times. At T_6 *NPG/P* increased by 22.21% compared to wider spaced, weeded twice and only P fertilizer received plots such as T_1 and T_2. Similarly *NPG/P* obtained T_6 was also greater than T_5 by about 18% on average across three locations. Therefore this increase in *NPG/P* at T_6 could be resulted from proper combination of main crop management practice such as spacing, appropriate level of N and P application and correct weed removal. Similar result reported that groundnuts significantly responds when it spaced at 30x20 cm [23] weeded at least 2-3 times [24] and N fertilizer applied at above 80 kg/ha [25].

Table 5. *Yield and yield components.*

	Locations								
	Godey			**Gursum**			**Erer**		
Treatments	**NPrBr**	**NPG/P**	**NP/P**	**NPrBr**	**NPG/P**	**NP/P**	**NPrBr**	**NPG/P**	**NP/P**
T_1	11.16^{a}	40.77^{a}	29.08^{a}	12.19^{a}	45.53^{a}	37.74^{a}	12.86^{a}	43.59^{a}	33.35^{a}
T_2	11.93^{a}	39.95^{b}	29.15^{a}	13.22^{ab}	45.70^{a}	34.98^{a}	13.88^{ab}	44.36^{a}	33.68^{a}
T_3	13.06^{b}	50.91^{c}	43.57^{b}	14.2^{8b}	58.90^{b}	45.13^{b}	14.61^{b}	52.24^{b}	40.45^{b}
T_4	11.93^{a}	39.45^{b}	31.35^{a}	12.66^{a}	44.77^{a}	39.02^{c}	12.66^{a}	42.12^{a}	33.35^{a}
T_5	14.40^{bc}	43.59^{cd}	37.19^{bc}	16.46^{c}	46.07^{a}	38.53^{acd}	17.08^{c}	48.07^{c}	35.19^{ab}
T_6	13.97^{b}	52.34^{ce}	44.94^{d}	14.21^{b}	59.81^{c}	47.27^{e}	14.21^{b}	53.04^{b}	42.44^{b}
$LSD_{0.05}$	2.12	2.307	5.86	1.1924	3.65	4.39	1.61	2.83	5.1862
CV	10.21	17.12	8.82	6.17	19.84	9.32	12.14	21.29	7.16

NPrBr=number of primary branches per plant; NPG/P= number of peg per plant; NP/P=number of pod per plant. Means with the same letter in each column are not significantly different at $p < 0.05$. LSD=Least Significant Difference ($P \leq 0.05$); CV=Coefficient of Variation; ns=Non Significant

3.2.3. Number of Pod Per Plant (*NP/P*)

Crop management practices significantly affected number of pod per plant *(NP/P)* at $p<0.05$. The result on *(NP/P*) in Table 3 revealed that maximum *(NP/P)* was recorded from T_3 followed by T_6 table 5. NP/P increased at T_3 and T_6 by 36.5% as compared toT_1 and T_2, T_4 and increased by 20% as compared to T_5. The result of NP/P obtained at Gursum location little bit greater than both Godey and Erer location.

Optimum intra row spacing, application of N fertilizer and twice weeding might contributed to significant increase in *NP/P* recorded at T_3 and T_6. The result of this study corroborate with previous reports on effect of spacing, N fertilizer application and weed removal [17, 23, 24]. On T_1 and T_2 despite there was wider spacing; since N fertilizer was not included on both treatments they registered low *NP/P*. This contradicts with [22] who reported that widest spacing gave the highest percentage pod formation, while the least per-

centage pod formation was found in the closest spacing. The close intra row distance along with reduced N fertilizer application and single hand weeding might be responsible for reduced NP/P at T_4. This result agrees with [23] how reported the lowest number of NP/P obtained at narrow intra row spacing below 15 cm and once weeding [17].

3.2.4. Number of Seed Per Pod (*NS/P*) and 100 Seed Weight (*HSW*)

The results in Table 6 revealed that there was a significant difference between treatments on the number of seed per pod, 100 seed weight at ($p< 0.05$). It indicated that, average highest number of seed per pod was recorded from T_6 followed by T_3 (Table 6). The lowest *NS/P* was receded from T1, T2, T5 and T4 respectively. At T_6*NS/P* increased by27.41% on average as compared to T1, T2, T5 and T4. The treatments also affected *HSW* parameter. Groundnut treated with relatively better crop management practices at T_6 and T_3 had resulted in significantly higher weight of 100 seeds at ($p< 0.05$) (Table 6). *HSW* recorded from T_6 followed by T_3 was higher than all other treatments. On average the lowest *HSW* was recorded fromT_1, T_2, T_5 and T_4respectively. At T_6*HSW* increased by almost 30% compared to T_1 and T_2 and increase by 20% as compared to T_4 and T_5.

Groundnut significantly responded to different combinations of crop management practices on *NS/P* and *HSW*. More pronounced result of *NS/P* and *HSW* was recorded from T_6 and T_3. An integrated effect of intra row spacing, good supplementation of N and P fertilizer along with twice weeding might contributed for better *NS/P* and *HSW* at T_6 andT_3. This corroborates with [21] who reported that, the increasing nitrogen levels increased number of pod per plant, weight of pods, and number of seeds per plant of groundnut. The result also agrees with [19-25] who reported groundnut significantly responded to weeding at 3 and 6 WAP and application of 45 kg P/ha. At T_1 and T_2 the result obtained on *NS/P* and *HSW* was low despite their wider inter and intra row spacing. This contradicts with [26] who reported increased *NS/P* and *HSW* at wider spacing. This indicates that groundnut responds not only for plant population but also other growth factors such as nutrient and weed management. Moreover in closed spacing if the crop is supplied with important nutrients like N and P and appropriate weeding it can avoid competition as the same time produces remarkable results.

3.2.5. Shelling Percentage (SLP)

Analysis of variance revealed that different combinations crop management practices *i.e.* spacing, fertilizer application and frequency of weed removal on shelling % was significant at ($p <0.05$). The result in Table 4 revealed that the highest value of shelling% was recorded from T_6 followed by T_3 while the lowest was recorded from T_1, T_5, T_2 and T_4 respectively. At T_6 shelling% was increased by about 6.11, 8.05, 10.51, 12.43% as compared to T_1, T_5, T_2 and T_4 respectively.

The result in Table 6 clearly indicated that groundnut significantly responded to different combinations of crop management practices. Parameters such as number of seed per pod and seed weight mainly contributed for shelling percentage parameter of the groundnut. The increment observed on T_6 compared to other treatment could be due to the contribution of increased application N and P fertilize along with twice weeding. Moreover, at T_6 the effect of closed spacing was minimized by the application of N and P fertilizer and frequent weeding this helped the crop to produce better shelling%. In current study wider spaced (T_1 and T_2) but with no or relatively small quantity of N and P fertilizer application and single or twice weeding did not increased shelling.

3.2.6. Total Pod (TPD) and Seed Yield (SDY)

The result in Table 6 reviled total dry pod yield of groundnut significantly affected by different combinations of crop management practices at $p < 0.05$. Hence the highest total dry pod yield was recorded from T_6 followed by T_3 andT_5. On the other hand, T_1, T_2 and T_4 comparatively resulted in lesser amount of total dry pod yield. Dry pod yield of groundnut increased by around 43.41% compared to T_1 and T_2. Similarly, T_6 increased pod yield by 36.47 and 26.17% as compared to T_4 and T_5. More over T_6 showed considerable increment in dry pod yield which dry pod increased by 20% as compared to T_3.

Significantly higher dry pod and seed yield recorded at T_6 which could be attribute to best combinations of spacing, weeding frequency and N and P fertilizer application. Current finding is in agreement with [19] who reported twice weeding at 3 and 6 WAP plus 45 kg P/h increased pod yield of groundnut. Increase in pod yield of groundnut due to P and N fertilizer application also reported. Increase in the values of yield attributes in groundnut were observed with increasing the N level up to 45-60 Kg kg/ha [25].

Total pod and seed yield showed reduction due to reduced plant population at 60 x 30 cm and 75 x 20 cm spacing compared to relatively close spaced treatments such as T_6. The result contradicts with [27] who reported greatest increased yield and yield components when groundnut spaced at 75 x 25 cm and 70 x 25 cm. In current study low yield at wider spaced plots defiantly resulted from low application rate of fertilizer mainly N fertilizer and low plan population per unit of area. Therefore, wider spacing and frequent weeding alone may not be enough to get maximum yield of groundnut indicting the requirement of proper combinations of growth factors. The combined effect of adequate growth resources and optimum plant population per unit area along with early weed removal lead the crop to produce better yield and yield components [18, 22, 28]. Similar reports are also available on the advantage of proper combinations of agronomic practices on groundnut and other crops [23, 28, 21].

Table 1. *Yield and yield components.*

Treat-ments	Locations														
	Godey					Gursum					Erer				
	NS/P	HSW	TPD	SLP	SDY	NS/P	HSW	TPD	SLP	SDY	NS/P	HSW	TPD	SLP	SDY
T_1	1.3^{a}	42.7^{a}	2881.2^{a}	58.9^{a}	1689.4^{a}	1.5^{a}	55.0^{a}	3181.4^{a}	56.7^{a}	1745.0^{a}	1.44^{a}	49.8^{a}	3028.1^{a}	56.4^{a}	1886.3^{a}
T_2	1.3^{a}	45.3^{ab}	2908.5^{a}	56.2^{a}	1610.6^{a}	1.2^{a}	54.6^{a}	3107.4^{a}	56.3^{a}	1715.6^{a}	1.44^{a}	50.0^{ab}	3004.1^{a}	56.9^{a}	1972.6^{ab}
T_3	1.8^{b}	55.8^{c}	4136.1^{b}	60.7^{b}	2524.6^{b}	1.8^{b}	58.3^{b}	4431.0^{b}	62.0^{b}	2753.6^{b}	1.86^{c}	56.2^{c}	4097.7^{b}	61.0^{b}	2595.6^{c}
T_4	1.5^{cd}	48.7^{d}	3178.4^{c}	55.3^{c}	1745.1^{a}	1.6^{c}	54.9^{a}	3328.1^{a}	56.1	2279.8^{a}	1.58^{ab}	49.2^{a}	3339.6^{c}	58.5^{a}	2078.0^{ab}
T_5	1.6^{d}	47.3^{dc}	3694.1^{d}	57.7^{a}	2206.4^{bc}	1.7^{bd}	53.3^{c}	4043.2^{c}	59.8^{cb}	2491.7^{c}	1.72^{d}	51.1^{bd}	3419.6^{c}	58.8^{b}	2426.5^{d}
T_6	1.8^{b}	59.8^{e}	5003.7^{e}	62.8^{c}	2769.2^{c}	1.9^{e}	63.8^{bc}	5260.4^{c}	65.7^{d}	3272.3^{c}	1.91^{cd}	59.5^{e}	4858.4^{d}	63.2^{b}	3096.9^{e}
LSD	0.21	2.25	381.53	2.24	274.34	0.11	1.84	483.51	2.81	341.46	0. 14	1.781	224.45	2.48	159.44
CV	8.85	8.11	13.14	22.8	20.17	12.14	9.24	16.13	18.85	10.12	7.81	9.19	10.11	20.14	9.18

NS/P= Number of seed per pod; HSW=hundred seed weight; TPD= total pod yield; SLP=shelling parentage; SDY= seed yield. Means with the same letter in each column are not significantly different at p <0.05. LSD=Least Significant Difference (p≤0.05); CV=Coefficient of Variation; ns=Non Significant

4. Conclusion and Recommendations

Current study revealed that, groundnut responds substantially for proper combination of important crop management practices such as spacing, weeding frequency, N and P fertilizer applications. The highest number of pods as well as weights of pods and total seed yield was achieved in T_6. Therefore, it can be concluded that the groundnut seed yield was remarkably influenced by proper integration of crop management practices as specified in T_6. Hence, T_6 can be recommended as best crop management practice for groundnut to current study areas and other similar lowland districts of eastern Ethiopia. However, further study may be needed to more optimize and integrate crop management practices in more suitable and feasible manner.

Abbreviations

CV	Coefficient of Variation
df	Degree of Freedom
DT50%E	Days to 50% Emergence
D50%F	Days to 50% Flowering
DTM	Days to 90% Physiological Maturity
HSW	Hundred Seed Weight
LSD	Least Significant Difference
ns	Non Significant
NPrBr	Number of Primary Branches Per Plant
NPG/P	Number of Peg Per Plant
NP/P	Number of Pod Per Plant
Locat	Location
HSW	Hundred Seed Weight
NS/P	Number of Seed Per Pod
SLP	Shelling Percentage
SDY	Seed Yield kg/ha
SoRPARI	Somali Region Pastoral and Agro Pastoral Research Institute
SV	Source of Variations
TPD	Total Dry Pod Yield
SLP	Shelling Parentage
SDY	Seed Yield
Trt.	Treatment
WAP	Weeks After Planting

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Author Contributions

Tadeos Shiferaw is the sole author. The author read and approved the final manuscript.

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Data Availability Statement

The author want to declare that he can submit the data at whatever time based on your request. The data used for the current study are available from the corresponding author on reasonable request.

Conflicts of Interest

The author declares no conflicts of interest.

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Biography

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