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Research Article

Effects of Intra-row Spacing and Ridge Height on the Yield and Yield Related Traits of Sweet Potato (*Ipomea batatas* L.) in the West Hararghe Zone, Eastern Ethiopia

*Gezahegn Assefa, Dereje Deresa and Dagne Assefa

Mechara Agricultural Research Center, P.O. Box 19, Mechara West Hararghe Zone, Ethiopia.
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***Corresponding author:** Gezahegn Assefa
Mechara Agricultural Research Center, P.O. Box 19, Mechara West Hararghe Zone, Ethiopia.
E_mail: gezeassefa@gmail.com
Mobile: +251-913941522/0915566277

Abstract

Ridge height and inadequate plant spacing are two of the primary problems affecting sweet potato productivity in the West Hararghe Zone of the Oromia region. To address this issue, a field experiment was conducted in the Habro district and Mechara on-station in 2022 and 2023 to determine the optimum ridge height and intra-row spacing for sweet potato production in the study area. An experiment was conducted with three ridge height levels (15, 30, and 45 cm), and three intra-row spacing levels (20, 30, and 40 cm) were laid out using a randomized complete block design (RCBD) with three replications. From the analysis of the results, the number of vines, the total number of roots per plant, and the unmarketable root yield were influenced by the main effects of ridge height and intra-row spacing, but the unmarketable root number per plant was not significantly ($p < 0.05$) influenced by either of these factors. The interaction effect of ridge height and intra-row spacing significantly ($p < 0.05$) influenced the root length, diameter, marketability, and total root yield. The highest root length (20.6 cm) was recorded from the combination of 15-cm ridge height and 30-cm intra-row spacing, but it was statistically on par with 30-cm ridge height with 40-cm intra-row spacing. The highest marketable root yield (28.71 t ha^{-1}) and total root yield (30.06 t ha^{-1}) were obtained with 30 cm ridge height and 20 cm spacing between plants. The result of the partial budget analysis revealed that the maximum net benefit of Birr 461,530 ha^{-1} with an acceptable marginal rate of return of 401.36% was obtained from a combination of 20-cm intra-row spacing with 30-cm ridge height. Therefore, 30-cm ridge height with 20-cm inter-row spacing was recommended for sweet potato production in the study area with similar agroecology.

Keywords: *Ridge height, intra-row, marginal rate, root length, root diameter.*

Introduction

Sweet potatoes [*Ipomoea batatas* (L.) Lam] are one of the most important food crops in the world, especially in developing countries, where they are grown as a staple food crop and have adapted to a wide range of environmental conditions [1; 2]. In Ethiopia, sweet potato is grown by small farmers as one of the food security crops [3] sweet potatoes covered over 15,988,384.91 hectares with a production of over 9,137,852.52 million tons in the 2014/15 crop season [4]. Sweet potatoes are an integral part of the cropping system in the east, south, and southwest of the country [4].

Sweet potatoes are considered a life jacket in their primary growing regions because they can provide some yield when other grain and legume crops fail due to drought and other weather-related limitations. In addition, the sweet potato tolerates various soils, even slightly acidic soils; it provides satisfactory returns [5].

In eastern Ethiopia, the sweet potato is a widely grown root crop under rainfed conditions in most lowland areas. Despite its popularity, the largest production of sweet potatoes is not supported by improved production practices, such as optimal ridge height and inter-row spacing. Maintaining adequate spacing between plants and rows is essential to minimize nutrient competition. This is crucial for achieving maximum yield on each plot. Furthermore, sufficient spacing enables farmers to maintain an optimal plant population and avoid both over- and under-population on a given plot, which can negatively impact yield and root quality. Research has shown that increasing plant spacing can lead to higher yields per plant. However, most farmers in Eastern Africa grow sweet potatoes at wide and random spacing due to the common intercropping system. In contrast, closer spacing may be preferred for sweet potatoes to maximize tuber yield. Studies have found that an increase in plant population can result in higher total yields per unit area. Specifically, 30 cm intra-row spacing has been shown to provide the maximum root yield in different locations.

The Hill Planting Method for Growing Sweet Potatoes The hill planting method is the most commonly recommended approach for growing sweet potatoes. Many farmers believe that using very high ridges and close plant spacing leads to high yields. However, research suggests that this may not be the case. Research by [6] indicates that small- to medium-sized ridges that are easy to produce can also yield well, provided that fertility is present. It is essential to ensure that the ridges are high enough to prevent water logging, as noted by [7]. The ideal ridge height and planting angle can significantly affect the final root yield. For example, a ridge height of 30 cm and a harvest date of 5 months after planting sweet potatoes can help control sweet potato weevils in the Bako area, as suggested by[8]. Studies have shown that the ridge height and planting angle can impact the final root yield. Specifically, 40-cm wide ridges have been found to produce the highest yield, as reported by [9]. Another study by [10] found that a ridge height of 36 cm results in a higher yield. Optimizing spacing or plant populations has two main benefits. Firstly, it reduces competition between plants for essential growth factors such as nutrients, light, and moisture. Secondly, the high ridge provides ample loose, fertile soil for root and tuber development. However, sweet potato farmers in Ethiopia, particularly in the West Hararghe zone, often use methods with variable ridge height and row spacing.

The current situation in the West Hararghe area and sweet potato-growing regions reveals a shortage of research findings, particularly concerning ridge height and row spacing. Consequently, information on intra-row spacing and ridge height of sweet potatoes for crop improvement aimed at high root yield and quality in the existing agro-ecology is insufficient. The optimal height of the ridge is dependent on the soil type and the specific cultivar being grown. Moreover, no studies have been conducted to evaluate sweet potatoes with suitable management practices such as intra-row spacing and high ridges that enable growers to select the best-performing variety in the study area. Given these gaps in sweet potato production and productivity, this study was conducted to identify and recommend the optimum ridge height and intra-row spacing for sweet potato root production in the Western Hararghe Zone.

Materials and methods

Description of the Study Area

The experiment was conducted in the Mechara onstation and Habro districts in 2022 and 2023 under rainfall conditions. The McARC research site is located approximately 434 km away from Addis Ababa. It has the following coordinates: 8°34' North latitude and 40.20 East longitude. The site is situated at an elevation of 1760 meters above sea level. The area has a warm climate, with distinct temperature variations throughout the year. The average annual maximum temperature is 31.8°C, while the average annual minimum temperature is 14°C. The mean annual rainfall in the area is 1100 mm. The Daro Labu District, on the other hand, has a different geographical and climatic profile. The area is characterized by mostly flat and undulating land features. The rainfall patterns in this district are erratic, making it difficult to predict the onset of rainfall. The distribution and amount of rainfall are also quite irregular. The soil at the experimental site is well-drained and slightly acidic. It is classified as Nit soil, which is suitable for various agricultural activities.

Table 1. Description of the Study Area

Districts	Altitude	Latitude	Longitude	Av. ^{0}C	Av. RF
Habro	1741	8° 39' 59.99" N	41°12′0′ E	19.97	945
Mechara onstation	1760	8^0. 61'.503''N	40^0. 32` 201''E	16	963

Description of the experimental materials and design

The experiment employed the Hawassa-83 sweet potato variety, which is well-suited to its local environment. It involved the evaluation of three distinct spacings within rows (20, 30, and 40 cm) and three different ridge heights (20, 30, and 40 cm). The experimental design consisted of 27 unique plots, each representing one of nine different treatment combinations, and was replicated three times.

Preparation of the ridge height and planting material

The experimental plots were prepared by ploughing the soil to a depth of 30 cm using an ox-drawn plough. Following this, the ridges were prepared according to the specific treatments applied. Each plot had a fixed size of 3 meters in length and 4 meters in width. The spacing between plots was 1 meter, while within plots, the spacing between individual areas was 50 cm. The height of the ridges varied depending on the specific treatment being applied. Vines were cut into

30-cm long pieces and planted across all treatments, with two-thirds of their length buried in the soil. This ensured that an equal number of nodes were buried in the soil.

Data Collection Measurements

The data collected from the sampled plants included several yield and yield-related parameters. The parameters were recorded from five randomly selected plants from the inner rows of each plot, while the peripheral rows were left intact. The recorded data consisted of the following: Standing count at one and a half months: This refers to the number of days it takes for 95% of the plants to mature from the day of planting. Days to 95% maturity: This is another term for the number of days it takes for 95% of the plants to mature from the day of planting. Physical measurements of the plants were also taken, including: Vine length (cm): The length of the above-ground part of the plant from the soil surface to the uppermost growth. Root length (cm): The average length of 10 randomly selected roots from each plot at each harvest, measured using a calliper- Root diameter (cm): The width of the root body at the center of each fruit. Root weight (g): The weight of 10 individual roots from each plot. Yield data was also collected, including: - Marketable yield (t ha^{-1}): The weight of the roots that were determined to be marketable at harvest, after sorting out the roots. Unmarketable yield (t ha^{-1}): The weight of the roots that were determined to be diseased or discolored and were sorted out. Total yield of roots (t ha^{-1}): The total weight of all the roots, including both marketable and unmarketable roots.

Partial budget Analysis

The economic analysis was carried out by using the methodology described in [11], in which prevailing market prices for inputs at planting and for outputs at harvesting were used. All costs and benefits were calculated on a basis in Birr. The concepts used in the partial budget analysis were the mean marketable root yield of each treatment, the gross benefit (GB) ha^{-1} (the mean marketable root yield for each treatment), and the field price of fertilizers (cost of ridge made, vine, and cost of root yield transportation to the nearer market).

Gross average root yield (tons ha^{-1}) (AvY): AvY was an average yield of each treatment. **Adjustable marketable root yield** = (**root yield** x 0.1) is the average marketable root yield adjusted downward by 10% to reflect the difference between the experimental yield and yield of farmers (CIMMYT, 1988).

AjY = AvY - (AvY - 0.1)

Gross field benefit (GFB): GFB was computed by multiplying the field/farm gate price that farmers receive for the sweet potato when they sell it by adjusted marketable root yield.

GFB = AjY x field/farm gate price for the crop.

Total variable cost (TVC): Total cost was the cost of ridge made, vines seed and root yield transportation. The costs of other inputs and production practices, such as land preparation, planting, earthing up, weeding, top killing, and harvesting, were considered the same or are insignificant among treatments. **Net Income (NI) or Net Benefit (NB): was** calculated as the amount of money left when the total variable costs for inputs (TVC) are deducted from the gross field benefit.

(GFB). NB = GFB - TVC.

The marginal rate of return (MRR %): was calculated by dividing the change in net benefit (ΔNB)by change in total variable cost (TVC)

$$\mathrm{MRR}(\%) = \frac{(\text{Change of Net Benefit}(\Delta\text{NB})}{\text{Change of Total Variable Cost }((\Delta TC)} \text{ x } 100$$

Where: ΔNI = change in Net benefit; ΔTVC= change in Total Variable Cost

Dominance Analysis (identification and elimination of inferior treatments) is also used to eliminate those treatments that involve higher cost but do not generate higher benefit. Any treatment that has a higher TVC but with net benefits that are less than or equal to the preceding treatment (with lower TVC but higher net benefit) is a dominated treatment (marked as "D"). Identification of a candidate recommendation was from among the non-dominated treatments. This was the treatment that gave the highest net benefit and a marginal rate of return greater than the minimum considered acceptable to farmers (>1 or 100%).

Data Analysis

Analysis of variance (ANOVA) was calculated for all data collected using Genstat, 18^{th} edition. Treatment means were separated using the fishery's proprietary least significant difference (LSD) method with a 5% probability level for statistically different means.

Results and Discussion
Analysis of the Variance

The analysis of the results showed that a significant (P < 0.05) difference was found between the main effect of ridge height and intra-row distance on the number of vines, total number of marketable individual roots, root diameter, and unmarketable yield (Table 2). In another way, the effect of the interaction of ridge height and intra-row spacing on root length and diameter, marketable root yield, and total root yield was observed. These two factors may affect soil drainage, aeration, and plant nutrients.

Table 2. Analysis of variance for the mean square of growth and yield traits of sweet potato in Mechara and Habro district, West Hararghe Zone

SOV	Df	VL (cm)	VN	MrkRP	Umrk RP	Tmrk RP	RL (cm)	RD (cm)	RWt (g)	UnmRy (t ha-1)	MrkRy (t ha-1)	TRy (t ha^{-1})
Block	2	356.28	0.03	0.42	0.03	0.08	5.11	0.28	400	0.06	13.36	14.57
RH	2	342.57*	3.21**	0.54*	0.18	1.812*	1.74	11.88**	10493*	0.23*	42.21**	36.47**
Yr	1	29970**	154.5*	6.70**	2.25Ns	0.66Ns	65.64**	348.78*	123Ns	1.18Ns	3155.8*	3279.4*
Loc	1	1291.3**	2.7Ns	2.70*	4.813*	2.09Ns	105.2**	1544.4*	216**	16.97**	2413.6**	2025.8**
IRS	2	49.17	2.14**	0.37	0.2	2.77**	0.34	8.26**	3773	0.92**	8.422	12.4
RH*IRS	4	100.09	0.21	0.24	0.1	0.18	4.27*	3.40*	2238	0.128	18.51*	16.48*
Error	28	38.78	0.29	0.13	0.15	0.34	1.159	0.55	1348	0.06	3.72	3.47

RH, Ridge Height, IRS, Intra row spacing, VN=vine length, VN = vine number, MrkRP, marketable root per plant, UnmrkRP, unmarketable root per plant, TmrRP, total number of root per plant, RWt, root weight, RD, root diameter. RL, Root length, Unmrky=Unmarketeble yield, MrkRy, = Marketable yield, TRy=Total root yield.

Yield and yield related traits
Root Related yield

The main effect of ridge height and intra row spacing was significantly (P≤0.05) influenced on marketable root yield, unmarketable root yield and total root yield in Mechara on station, while, except total number of roots per plant was influenced by ridge height (Table 3). The maximum unmarketable root yield (2.21 t ha^{-1}) was recorded from 15 cm ridge height and followed by 30 cm ridge height with 2.12 t ha^{-1}. while high ridge resulted in minimum number of non-marketable tubers (1.59). This could be due to inefficient utilization of water, light, space and nutrients in densely populated plants in close spacing. The finding is the same with that of [11;12] and who reported decrease in tuber weight per plant with increase in plant density.

Similarly, In Habro, the highest mean unmarketable root yield was obtained from 45 cm ridge height. This differences of inter row spacing on plant height might be due to competition for sunlight radiation for which dense population are more competent for sunlight than sparse populated plants). In Mechara, the highest mean marketable 18.13 t ha^{-1}) and total root yield (19.84 t ha^{-1}) was recorded from 30 cm ridge height followed by 15 cm ridge height with marketable root yield (14.66) and total yield (16.88). closer spacing generally increasing total, marketable yield, and average tuber weight. Narrower spacing (20–30 cm) usually produces higher total yields by maximizing plant population, while wider spacing (40 cm) often produces larger, individual tubers but lower total yield [12]. This finding is in line with those of [13]. For instance, the highest yield (34 tha^{-1}) was recorded from 20 x 80 cm spacing [14].

Table 3: The main effect of Intra row spacing and Ridge height on yield and yield related trats of sweet potato in Mechara and Habro district, West Hararghe Zone

	Location									
	Mechara					Habro				
RH(cm)	**NTRP**	**UnmrkRP**	**Unmrky (t ha^{-1})**	**Mrky (t ha-^{1})**	**Tty (t ha^{-1})**	**NTRP**	**UnmrkRP**	**Unmrky (t ha^{-1})**	**Mrky (tha^{-1})**	**Tty tha^{-1})**
15	5.16	1.57	2.21a	14.66b	16.88b	5a	1.52	0.41	30.92	31.33
30	4.55	1.04	2.12a	18.13a	19.84a	3.89b	1.23	0.3	33.67	33.97
45	5.29	1.57	1.59b	14.42b	16.54b	4.44ab	1.15	0.36	34.46	34.82
LSD	0.834	0.7	0.51	17.2	15.3	0.83	0.49	0.41	2.6	4.31
IRS(cm)										
20	5.75a	1.98a	2.61a	17.12a	19.85a	4.97	17.32	0.38	33.18	33.56
30	4.51b	0.93b	1.73b	16.66a	18.24a	4.26	17.82	0.33	32.68	33.01
40	4.74b	1.26b	1.58b	13.44b	15.17b	4.08	17.9	0.36	33.2	33.56
Mean	5	1.39	1.98	15.74	17.76	5	1.31	0.36	33.1	33.33
CV	16.7	37	26.1	17.2	15.3	16.7	35.2	41.8	13.9	13.1
LSD	0.83	0.7	0.51	2.7	2.71	0.83	0.46	0.41	2.7	4.37

Means within a column followed by the same letter(s) are not significantly different at p ≤ 5%, according to the least significant difference (LSD) test, RH= ridge height (cm), IRS = intra row spacing NTRP=number of total root per plant, Mrky = marketable yield, VL, vine length, VN, vine number, UnmrkRP = unmarketable root per plant, Unmrky(t ha^{-1}) = unmarketable yield, Tty=total yield(t ha^{-1}).

The combined analysis result, the main effects of ridge height and row spacing significantly ($p \leq 0.05$) influenced the vine number, total root number per plant, and unmarketable root yield (Table 4). The highest vine number (6.63) was recorded at a 40-cm intra row spacing, while the lowest was at a 20-cm intra row spacing. A different study also found that wider spacing allowed plants to maximize assimilates and partition reserve food in roots, while closer spacing limited photosynthesis and competition for growth factors. This suggests that increased density may lead to decreased nutrient availability and tuber weight. Rise in plant density likely led to heightened competition among and within plants, ultimately reducing the availability of nutrients per plant and resulting in a decrease in tuber weight [15].

On the similar trend, the highest unmarketable yield stemmed from ridge height of 15 cm and intra-row spacing of 20 cm. This could be attributed to the fact that at high planting densities, greater yields of smaller storage roots were generated as a result of higher plant competition and also resulted in the production of more undersized storage roots [16]. Other scholar observed that the number of unmarketable storage roots increased at closer plant spacings [17]. Similarly, at population density of 50,000 to 100,000 plants ha^{-1}, the total fresh tuber yield rose from 50 t ha^{-1} [18].

Table 4: Main effect of Intra-row spacing and Ridge height on yield and yield-related traits sweet potato in Mechara station and Habro district, West Hararghe Zone

RH (cm)	VL (cm)	VN	MrkRP	UnmrkRP	TNRP	RWt(g)	Unmrky(tha^{-1})
15	107.5a	5.89b	3.75a	1.08	5.08a	237.7b	1.31a
30	95.4b	5.6b	3.27b	0.81	4.22b	288.5a	1.01b
45	99.5b	6.75a	3.44ab	1.02	4.87a	302.7a	1.24ab
LSD	5.76	0.63	0.21	NS	0.52	25.9	0.25
IRS (cm)							
20	99.4	5.71b	3.717	1.13	5.36a	256.9	1.55a
30	99.5	5.91b	3.433	0.83	4.39b	274.3	0.96b
40	103.5	6.63a	3.322	0.94	4.42b	297.7	1.05b
Mean	100.2	6	3.49	0.97	4.72	276.3	1.19
CV	6.22	9	10	30.5	12.3	13.3	21.2
LSD	NS	0.54	NS	NS	0.58	NS	0.25

Means within a column followed by the same letter(s) are not significantly different at p ≤ 5%, according to the least significant difference (LSD) test, RH= ridge height (cm), IRS = intra row spacing, RWt = root weight (g), VL, vine length, VN, vine number, MrkRP = marketable root per plant, UnmrkRP = unmarketable root per plant, UnmrkY(t ha^{-1}) = unmarketable yield

Analysis of variance showed that the interaction between ridge height and intra-row spacing had a significant ($p \leq 0.05$) influenced on root length, diameter, marketable root yield, and total root yield (Table 5). The longest root (20.67cm) was recorded from 20 cm intra row spacing with 45 cm ridge height, However, it was statistically comparable to the combination of a 15 cm ridge height and 30 cm intra-row produced the longest root length (20.6 cm). In contrast, the shortest root length (17.52 cm) and lowest diameter (8.02 cm) were obtained with a ridge height of 15 cm and an intra-row spacing of 20 cm.

The maximum marketable and total root yield (28.71 t ha^{-1} and 30.06 t ha^{-1}) was recorded combined 30 cm ridge height with 20 cm intra-row spacing followed by ridge height of 45 cm and intra-row spacing of 30 cm (25.53 t ha^{-1} and 26.32 t ha^{-1}). According to this finding, a population of 50,000 plants per hectare is advised for increased root yield [16]. Furthermore, [18] found that plants grown on ridges had a substantially higher marketable fresh tuberous root weight than plants grown on flat and sunken seedbeds. This result was confirmed by previous reports [15] who reported highest yield (32.4 t ha^{-1}) was recorded at closer spacing (20 x 80 cm) and the lowest marketable yield (23.06 t ha^{-1}) at wider spacing (40 x 70 cm).

Table 5: Interaction effect of Intra-row spacing and Ridge height on yield and yield-related traits of sweet potato in Mechara station and Habro district, West Hararghe Zone

RH (cm)	IRS (cm)	RL (cm)	RD (cm)	Mrky (t ha^{-1})	Tty (t ha^{-1})
15	20	17.52b	8.02c	19.7c	21.44b
	30	20.6a	11.79ab	22.21bc	23.37b
	40	19.47a	10.79b	22.13bc	23.18b
30	20	20.13a	12.09ab	28.71a	30.06a
	30	19.13ab	11.84ab	23.93abc	24.86ab
	40	19.83a	12.47ab	24.4abc	25.14ab
45	20	20.67a	11.17b	24.37abc	25.95ab
	30	19.73a	12.29ab	25.53ab	26.32ab
	40	19.82a	13.27a	20.76bc	22.11b
Mean		9.45	11.53	23.53	24.71
CV		5.5	6.4	8.2	7.5
LSD		1.86	0.74	1.92	3.21

Means within a column followed by the same letter(s) are not significantly different at $p \leq 5\%$, according to LSD (Least Significance Difference) test, RH=Ridge height (cm), IRS=Intra row spacing, RL = Root length (cm), RD=Root diameter (cm), Mrky=Marketable root yield (t ha^{-1}), Tty = Total root yield (t ha^{-1})

Partial Budget Analysis

The partial budget analysis revealed that the maximum net benefit of Eth Birr 461,530 ha^{-1} was obtained from a combination of 20 cm intra-row spacing with 30 cm ridge height, which had an acceptable marginal rate of return (MRR) of 401.36 % (Table 6). The spacing and ridge height had a positive impact over the control. The MRR of intra-row spacing with ridge height for root production was above 100%, but the highest MRR was achieved with 20 cm intra-row spacing and 30 cm ridge height. If the marginal rate of return is greater than the minimum rate of return based on a change from one treatment to another, a recommendation is identified. Therefore, the 20-cm Intra-row spacing with 30-cm ridge height meets the farmers' minimum rate of return and is the best recommendation to maximize their net benefit.

Table 6: Partial budget analysis of the effect of Intra-row spacing and Ridge height on the yield and yield-related traits of sweet potato in the West Hararghe Zone

RH (cm)	IRS (cm)	MRKY t ha^{-1}	Adj yield t ha^{-1}	Total V. cost (Birr)	G. Benefit (Birr)	N. benefit (Birr)	MRR %
15	40	22.13	19.917	0	398340	398340	0
30	40	24.4	21.96	30250	439200	408950	35.07
45	40	20.76	18.684	35500	373680	338180	D
15	30	22.21	19.989	37533	399780	362247	D
30	30	23.93	21.537	38583	430740	392157	D
45	30	25.53	22.977	43833	459540	415707	49.75
15	20	19.7	17.73	54200	354600	300400	D
30	20	28.71	25.839	55250	516780	461530	401.36
45	20	24.37	21.933	60500	438660	378160	D

Where, labor cost = 210 birr /person, price of one vine cutting =1 Birr and price of root yield = 1 kg = 20 Birr, MRR (%) = marginal rate of return and D = dominant treatment.

Conclusion and Recommendation

The number of vines, total number of roots per plant, and the yield of non-marketable roots were significantly influenced by ridge height and row spacing. However, the main effect did not influence the number of unmarketable roots per plant. Ridge height was used to influence the highest vine length (107.5 cm), the marketable number per plant (3.75), and the total number of roots per plant (5.08), as well as the unmarketable root yield (1.31 t ha-1), which was influenced by the 15-cm ridge height and the 20-cm intra-row spacing. The interaction effect of ridge height and intra-row spacing was influenced on root length and diameter, marketable and total root yield. The longest root yield (20.67 cm) was recorded for the 45-cm ridge height with 20-cm intra-row spacing. Maximum marketable root yield (28.71 t ha^{-1}) and total root yield (30.06 t ha^{-1}) were recorded at 30 cm ridge height and 20 cm intra-row spacing. The highest net benefit (461,530 Birr) and acceptable range of MRR (401.36%) were obtained from 20 cm intra row spacing with 30cm ridge height. Therefore, combination of 30 cm ridge height with 20 cm inter-row spacing was recommended for sweet potato production in the study area with similar agroecology.

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Reference
1. Lebot, V. (2010). Sweet potato. In J. E. Bradshaw (Ed.), *Root and tuber crops* (pp. 97–125). New York, USA: Springer Science Business Media.
2. Wang, Z., Li, J., Luo, Z., Huang, L., Chen, X., Fang, B., Li, Y., Chen, J., & Zhang, X. (2011). Characterization and development of EST-derived SSR markers in cultivated sweet potato (*Ipomoea batatas*). *BMC Plant Biology, 11*, 131–139.
3. Gurmu, F. (2019). Sweet potato research and development in Ethiopia: A comprehensive review. *Journal of Agricultural and Crop Research, 7*(7), 106–118.
4. Central Statistical Agency (CSA). (2022). *Crop production forecast sample survey (2010/11, 2003 E.C.): Report on area and crop production forecast for major grain crops (private peasant holdings, Meher season)*. Addis Ababa, Ethiopia.
5. Chipangura, B., & Jackson, J. (2003). *Sweet potato for high yield in Zimbabwe* (pp. 5–12). Harare: Farming World.
6. Dhliwayo, P., & Chiunzi, P. D. (2004). *A guide to profitable sweet potato production* (pp. 3–9). Harare: Biotechnology Trust of Zimbabwe.
7. Gomes, G. (1999). *Sweet potato growth characteristics* (1st ed., pp. 4–7). New York: Academic Press.
8. Negera, A., Takele, F., & Wondimu, T. (2017). Evaluation of integrated management practices of sweet potato weevil (*Cylas puncticollis*) in Bako, Western Ethiopia. *Journal of Natural Sciences Research, 7*(8).
9. Edmond, J. B., & Ammerman, G. R. (1950). Cooperative studies on the effect of ridge height, nitrogen supply and time of harvest on yield and flesh colour of Porto Rico sweet potato. U.S. Department of Agriculture Circular 832.
10. Parwada, C., Gadzirayi, C. T., & Sithole, A. B. (2011). Effect of ridge height and planting orientation on sweet potato (*Ipomoea batatas*) production. *Journal of Agricultural Biotechnology and Sustainable Development, 3*(4), 72–76.
11. CIMMYT. (1988). *From agronomic data to recommendations for farmers: A handbook for economics education*. International Maize and Wheat Improvement Center.
12. Edmond, J. B. (2001). *Sweet potatoes* (p. 13). New Delhi: AVI Publishing Company.
13. Roghayyeh, Z. M., Shahzad, J. S., Majid, K., & Roza, G. G. (2010). Quantitative and qualitative yield of potato tuber by use of nitrogen and plant density. *American-Eurasian Journal of Agricultural & Environmental Sciences, 9*(3), 310–318.
14. Farooque, A. M., Rahim, M. A., & Maruf, M. G. (1983). Effect of planting methods and spacing on the growth and yield of sweet potato. *Bangladesh Horticulture, 11*(1), 11–14.
15. Abdissa, T., Chali, A., Tolessa, K., Tadesse, F., & Awasa, G. (2011). Yield and yield components of sweet potato influenced by plant density in Adami Tulu, Ethiopia. *American Journal of Experimental Agriculture, 1*(2), 40.
16. Assay, R. (2015). Growth and yield response of sweet potato (*Ipomoea batatas*) varieties to planting methods and row spacing at Lolita Sod, Southern Ethiopia (Thesis). Haramaya University, College of Agriculture and Natural Sciences.
17. Ahmed, M., Dechassa, N., & Abebie, B. (2012). Effect of planting methods and vine harvesting on shoot and tuberous root yields of sweet potato (*Ipomoea batatas*) in the Afar region of Ethiopia. *African Journal of Agricultural Research, 7*(7), 1129–1141. https://doi.org/10.5897/AJAR11.894

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