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Yam Production with or without Trellisingi

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Abstract

A 72 m^2 area in Don Martin Marundan, Mati, Davao Oriental was planted to pre-treated and pre-sprouted yam setts arranged in a randomized complete block design to compare the tuber yield and costs when yams are grown with or without trellis. On a 6 m^2 area, mean tuber yields of non-trellised and trellised (single strand and double strands of tie wire tied on posts 6 m apart) were not significantly different. With computed tuber yields per hectare however, differences of up to 54 tons may easily be translated to profits. Bulbil yields represented from 16 to 27% of the total yield (tubers + bulbils). Cost and return analysis gave 13.7 and 24.9 % differences in profits when plants were trellised and yam tuber price per kilogram was pegged at P7.5C

Keywords: yam production, *Dioscorea alata*, cost and benefit analysis, trellising, staking

Introduction

Yam (Dioscorea alata) or ubi is considered a high value crop. Yam tubers are used in the preparation of a variety of food delicacies although it is sometimes used as substitute for rice and com. It has also been processed into ubi powder that is a more stable product compared to the more perishable tuber. There is a good prospect in commercial yam production. One may easily obtain yields of 20 metric tons or more with improved cultural practices (Pido and Pepito, 1987).

Yam production is labor-intensive and requires considerable inputs in the form of planting materials and stakes (Villanueva, 1986). As a consequence, the cost of yam in the market increases as labor becomes scarcer and more expensive and as prices of inputs increase. Conventional stakes have become costly as forests from which these are obtained have been put to other use (i.e., agricultural).

By growth habit, yams are climbers and need support to expose their leaves to sunlight. When shoots start to emerge, a stake is provided for every hill. Stakes may be split bamboos, plastic twine, piled palm leaves (Villanueva, 1986) or trellises (Onwueme, 1978; Nwosu, 1975).

In Nigeria, West Africa, farmers plant their yams among the stubble of the previous season's sorghum crop. Each stand of the stubble is bent over to join up with the next plant in the row, which in turn joins with the next. Thus, a continuous low trellis is formed for the yam plants to twine on.

A more elaborate and durable trellis system IS used in West Indies. Two stout poles are placed at both ends of each row after which a metal wire is strung between the poles at a height of 2 m above the ground. Intermediate poles are conveniently placed in between the row for additional support for the wire. Above each strand, a piece of string is hung down from the wire. When the plant emerges, it twines by means of the string until it reaches the wire (Onwueme, 1978).

The trial was set-up at Don Martin Marundan in Mati, Davao Oriental. This study was done to compare tuber yields and costs with or without trellising.

Materials and Methods

Setts weighing 125 to 150 g were soaked in Dithane M - 45 for 3 min, airdried and allowed to sprout in ambient room conditions. The area measuring 72 m was plowed twice. Ridges at 1m apart were made. Sprouted setts were planted in April 2000 in prepared rows at a depth of 15 cm. Setts were spaced at 60 cm between hills. The study was laid out in randomized complete block design. Each treatment was replicated four times. There were three treatments with nine setts per treatment. Mulching was done to conserve moisture and reduce cost of weeding. Triple 14 was applied once. The yam plants were hilled-up at 2 to 3 months after planting. Trellising was done right after planting. Training of vines was done on the first two months. The treatments were as follows:

1 - modified trellis, two strands of #16 tie wire tied on wood posts
2 - trellis method, single strand of #16 tie wire tied on wood posts
3 - no trellis

The wood posts were located on each end of the plot. Sticks were conveniently placed at 0.6 m apart within the row for additional support for the wire. The yarn tubers were harvested eight months after planting. Care was exercised in harvesting to minimize cuts and bruises. Data gathered included % survival, tuber/bulbil yield and the costs and returns of production.

Results and Discussion

Percentage of survival. The percentage of survival of the yam setts was not siY1ificantly different at over 83% (Table 1). This survival percentage is considered acceptable.

Mean yield per hill and yield range. The range of yam tuber weights on a per hill basis is shown in Table 2. Mean tuber yields per hill was high at over 1.80 kg. The tuber yield per hill was significantly different due to the high variability of the tuber weights obtained. The léast tuber weight per hill was at 0.25 kg and the greatest weight at 7.74 kg. Soil and other inert material attached to each tuber was carefully removed prior to weighing of the tuber. The observed yields greatly differed from Bayot's (1994) findings as he reported mean yields per tuber of less than 1 kg. This

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was despite the application of sufficient fertilizers. Though these results are in contrast with that reported by Bayot (1994), Pido and Pepito (1987) reported yields from any recommended yam variety may greatly vary from 10 to 57 tons per hectare.

Table 1. Mean percentage of survival of yam setts as influenced by trellising

Treatment	Survival (%)
Double strand trellis	94.45a
Single strand trellis	83.35a
No trellis	88.90a

Means with common letters are not significantly different using DMRT at P=0.05

Table 2. Mean yield per hill and yield range as influenced by trellising

Treatment	Mean Yield (kg/hill)	Yield Range (kg/hill)
Double strand trellis	2.42ab	0.25-7.74
Single strand trellis	2.71a	0.79-5.14
No trellis	1.84b	0.40-5.10

Means with common letters are not significantly different using DMRT at P=0.05

Tuber profile. The percentage of tubers classified according to tuber weight per hill show that majority (over 55 %) of tubers harvested in each of the treatments had weights ranging from 1.01 to 3.0 kg/hill. Similarly, in all treatments, 8.8 up to 16.7% of the tubers harvested weighed 4.0 kg and more (Table 3). The tuber profile data gives an indication of the potential yields from yam setts weighing 150 g.

Tuber yield. Table 4 shows that the tuber yield per 6m^2 did not vary among treatments. When yield on a per hectare basis is however computed, yield differences tended to be big and profits substantial. On a per hectare basis, a difference of 4.36 and 5.40 t/ ha relative to double and single strand trellises, respectively, may potentially be lost when yam plants are not trellised. Bayot (1994) estimated a P 10,000.00 difference between trellised and non-trellised yam plants. This difference is equivalent to 30.49% reduction in production cost when trellising is done away with. This was 30.42% less in terms of net benefit/ ha. However, the marginal rate of return was 228 % and 246%, respectively, for trellised and non-trellised yam plants indicating economic feasibility of the practice.

Table 3. Percentage of tubers according to weight as influenced by trellising

	% Tubers per Tuber Weight Range in kg					
Treatment	<1.00	1.01-2.00	2.01-3.00	3.01-4.00	4.01-5.00	>5.01
Double strand	14.71	32.35	23.53	20.59	5.88	2.94
Single strand	6.67	13.31	43.33	20.00	6.67	10.00
No trellis	25.00	37.50	18.75	9.38	3.13	6.25

Table 4. Tuber yield as influenced by trellising

Treatment	Tuber Yield ($kg/6m^2$)	Computed Tuber Yield (t/ha)[x]	Yield Difference (t/ha)[y]
Double strand trellis	20.34 a	27.12	4.36
Single strand trellis	21.12 a	28.12	5.40
No trellis	17.07 a	22.76	-

Means with common letters are not significantly different using DMRT at P=0.05
[x] Computed using actual tuber yield data ($kg/6m^2$)and 8,000 m^2 effective area
[y] Relative to the non-trellised treatment

In Baybay, Leyte, Villanueva (1986) reported yields of 17.77, 10.19 and 24.26 t/ha, respectively, from yam plants either un-staked, staked with plastic twine or with bamboo. This is equivalent to a difference of 6.49 t/ha between un-staked plants and those staked with bamboo. On the other hand, •the use of plastic twine even gave lower yields than. The un-staked plants. Villanueva (1986) showed that non-staking of yam plants may compare or even give better yields than staking, a form of trellising.

Bulbil yield. Table 5 shows that the estimated bulbil yield varied between the two trellis treatments but not between the single strand trellis and no trellised; and double strand trellis and non-trellised yam plants. Since some of the vegetative plant parts were not strictly confined in the allotted 6-meter square area, the bulbil yield is labeled as an estimate. Bulbils are above ground structures growing on leaf axils. Bulbils have the same characteristics as the tuber and may therefore serve as alternative planting materials. The bulbil yields however show that about 15.99 to 27.36% of the total yield (tubers and bulbils) is contributed by bulbils. The results are in contrast to the findings of Bayot (1994) that VU-2 yam plants that were not staked produced more bulbils than those staked. Bayot (1994) did not however indicate the planting distance that was used in his study.

Table 5. Bulbil yield as influenced by trellising

Treatment	Bulbil Yield ($kg/6m^2$)	% Bulbil Yield Relative to Total Yield
Double strand trellis	6.08 a	23.01
Single strand trellis	4.02 b	15.99
No trellis	4.67 ab	27.36

Bulbil yield means with common letters are not significantly different using DMRT at P=0.05

Costs and returns. Table 6 shows the cost and returns of growing tubers with and without trellising. After pegging a 10% postharvest loss (due to weight loss, disease,

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mechanical damage and the like) effective production resulted in tuber yields of over 20 tons per hectare. Not included were the returns for the bulbil yields. In the Philippines, each of the recommended yam varieties have potential yields ranging from 10 to 57 tons per hectare (Pido and Pepito, 1987). Table 6 shows that yam production is indeed profitable, using trellises in yam production give corresponding increases in yields that can be translated to increases in profits. Bulbil yield was not included in the returns as it is not yet a commonly marketed commodity as the tuber. Bulbils may have potential as planting materials.

When yam tuber price was pegged at P7.50/kg, gain differences of P11,797.00 and P21,373.00 for double and single strand trellis, respectively, were noted as additional economic benefits for yam trellising. These were equivalent to a difference in profits of 13.7 to 24.9% for plants provided with double and single strand trellises, respectively. The margin of returns from yam plants may be reduced depending on price of planting material, high incidence of pests and diseases in the field and high postharvest wastage.

Table 6. Cost and return anâlyses for a one hectare yam farm with or without trellising

Costs	Double strand trellis		Single strand trellis		No trellising
	No. of man-days/man-animal days	Cost (P)		Cost (P)	Cost (P)
Labor					
Sett preparation and pre-sprouting	14 md	1,120.00		1,120.00	1,120.00
Watering of setts	3.7 md	296.00		296.00	296.00
Hauling of setts	2mad	300.00		300.00	300.00
Hauling of water (for watering of setts)	1.5mad	225.00		225.00	225.00
Land preparation					
Plowing	7mad	1,050.00		1,050.00	1,050.00
Raking	4mad	600.00		600.00	600.00
Harrowing	10mad	1,500.00		1,500.00	1,500.00
Ridging	2mad	300.00		300.00	300.00
Lay-outing	8md	640.00		640.00	640.00
Planting, gathering of posts, trellis construction	150 md	12,000.00	140 md	11,200.00	26 md 2,080.00
Irrigation	100 mad	15,000.00		15,000.00	15,000.00
Weeding	70md	5,600.00		5,600.00	5,600.00
Training vine	2md	160.00		160.00	160.00
Replanting	1md	80.00		80.00	80.00
Spraying	3md	240.00		240.00	240.00
Fertilizer application	7md	560.00		560.00	560.00
Covering exposed tubers	2md	160.00		160.00	160.00
Harvesting	83mad	6,640.00		6,640.00	6,640.00
Hauling	3.2mad	480.00		480.00	480.00
Sorting/curing	10 md	800.00		800.00	800.00
Removal of trellis	32 md	2,560.00	28md	2,240.00	-
Sub-total		**50,311.00**		**49,191.00**	**37,831.00**

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Table 6. (continuation)

Materials	Quantity	Cost (P)		Cost (P)	Cost (P)
Planting material (150g/sett)	2,000kg at P10.00/kg	20,000.00		20,000.00	20,000.00
Fertilizer					
14-14-14	225 kg at P8.00/kg	1,800.00		1,800.00	1,800.00
0-18-0	75 kg at P8.00/kg	600.00		600.00	600.00
0-0-60	100 kg at P 8.00/kg	800.00		800.00	800.00
(Container) *Bukag*	20 pc at P75.00/pc	1,500.00		1,500.00	1,500.00
Nails	6 kg at P28.00/kg	168.00	4 kg	112.00	-
Tie wire #16	165 kg at P30.00/kg	4,950.00	110 kg	3,300.00	-
Fungicide		1,200.00		1,200.00	1,200.00
Plastic twine	1 kg	35.00		35.00	-
Sub-total		**31,053.00**		**29,347.00**	**25,900.00**
Tools					
Bolo	6 pc	900.00		900.00	900.00
Whetstone	1 pc	240.00		240.00	240.00
Sprayer	1 unit	2,800.00		2,800.00	2,800.00
Shovel	2 pc	400.00		400.00	400.00
Sub-total		**4,340.00**		**4,340.00**	**4,340.00**
Grand Total		**85,704.00**		**82,878.00**	**68,071.00**
Returns					
Yield (kg/ha)		**27,120.00**		**28,120.00**	**22,760.00**
10% postharvest losses (kg)		2,712.00		2,812.00	2,276.00
Effective yield (kg/ha)		24,408.00		25,308.00	20,484.00
Tuber sales at P5.00/kg (P)		122,040.00		126,540.00	102,420.00
Profit (P)		**36,336.00**		**43,662.00**	**34,349.00**
Tuber sales at P7.50/kg		183,060.00		189,810.00	153,630.00
Profit (P)		**97,356.00**		**106,932.00**	**85,559.00**
Increase in profits (at P7.50/ kg of tubers) relative to non-trellising		**11,797.00**		**21,373.00**	-

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Summary and Conclusions

A 72 sq. m. area in Don Martin Marundan, Mati, Davao Oriental was planted to yam setts in April 2000. The yam plants were subjected to three treatments (double strand trellis, single strand trellis and no trellis).

Results show that sett survival was over 83%. Mean yield per hill was higher in trellised plants (single or double). Tuber yield per hill varied widely from a low of 0.25 kg to a high of 7.74 kg. Majority (over 55%) of tubers harvested in all treatments had weights ranging from 1.01 to 3.0 kg/hill. Over 8.5 up to 16.7% of the tubers harvested weighed 4.0 kg and more. Tuber yield of trellised and non-trellised plants from an area of 6 rn2 did not vary but bulbil yield did. Bulbil yield accounted for about 16 to 27% of the total yield. The computed tuber yield per hectare reached up to 27.12 to 28.12 tons when plants were trellised as against 22.76 tons obtained from non-trellised plants. Differences of about PI 1,797.00 and P21,373.00 for double and single strand trellis, respectively, were noted in benefits when yam plants were trellised. These were equivalent to a difference in profits of 13.7 to 24.9% for plants provided with either double or single strand trellises as compared with those without trellises.

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