MINISTRY OF AGRICULTURE MECHANISATION AND IRRIGATION DEVELOPMENT

DEPARTMENT OF RESEARCH AND SPECIALIST SERVICES

ABRIDGED TECHNICAL REPORT 2009-2010

Produced by the Head of Institute
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I would like to thank all members of the Horticultural Research Institute for their unwavering support towards realizing our mandate.

Table of Contents

0.0 INTRODUCTION

0.1 THE INSTITUTE

Horticultural Research Institute (HRI) is one of the 15 research institutes in the Department of Research and Specialist Services of the Ministry of Agriculture, Mechanization and Irrigation Development and it consists of two research centers as follows:

Horticultural Research Centre (HRC) located within Grasslands Research Station on the 10 km peg before Marondera town in the direction of Harare. The Horticultural Research Centre is in the Highveld according to local geographical classification, and its latitude 18^{o} 11′, longitude 31^{o} 28′ E, and altitude 1630m. Average day-length is 13.2 hours in summer to 11.1 hours in winter. Rainfall averages 873 mm per year, temperature mean maximum are form 19.5^{o}C (July) to 24.6^{o}C (January). Hot summer is between September and December with October being the hottest month of the year with maximum temperatures above 30^{o}C.HRC is ideal for research and production of deciduous fruit trees, flowers, and vegetables(traditional and exotic). The cool weather conditions at HRC limits work on tropical and subtropical fruits.

Nyanga Experimental Station (NES) is located in the Eastern Highlands in the Nyanga National Park- 15 kilometres away from Nyanga town on an 18^{o} south latitude and 33^{o} East longitude. The Station is at an altitude of 1800 metres above sea level, falling within Natural Region 1-experiencing the highest precipitation in Zimbabwe, with an average rainfall of 1200 mm per annum. Summer mean maximum temperature of 17^{o} C and a yearly mean minimum temperature of 15^{o} C. Frost is very prevalent in this area, and the soils are deep clay loam with a pH range of 5.5 – 6.0 ($CaCl_2$).

INSTITUTIONAL MISSION

To carry out research for the generation of knowledge and relevant technology that is appropriate to Zimbabwe's diverse climate and dissemination of quality services that will effectively improve horticultural production, increase income generation and improve household nutritional levels.

INSTITUTIONAL VISION

To be a reliable source of horticultural technologies and information applicable to both large and smallholder farmers for the production of quality produce acceptable on domestic and international markets.

INSTITUTIONAL MANDATE:

To research and disseminate production information, planting material and appropriate technologies on vegetables, deciduous, tropical, subtropical nut and fruit trees, flowers, herbs, spices, root and tuber crops as well as their post- harvest.

O.2 MANAGEMENT STAFF FOR 1ST JANUARY 2009–31ST DECEMBER 2010

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	Mr B. Gokoma
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1. RESEARCH TRIALS REPORTS

1.1 Onion Cultivar Evaluation Trial

Introduction

Onion (*Allium cepa* L.*)* belongs to the Alliaceae family which includes crops such as garlic, chives, leeks and shallots. Edible alliums are some of man's most ancient cultivated crops, which evolved from wild species that grow in the mountainous regions of Central Asia. In Zimbabwe, onion is a popular vegetable that is grown in almost all provinces of the country owing to its high adaptability, stretching from the Northern temperate regions to the highlands in the tropics. Many varieties have been developed according to their day length requirements that are suited to these areas. Onion requires **l**ong days for bulb initiation and enlargement, but the critical day length is relatively short, at less than 12 hours for traditional tropical cultivars, or for the earliest Mediterranean cultivars (Messiaen, *et al*., 2004).

Generally, the varieties grown in Zimbabwe such as Texas Grano, fall into the short day length group that needs 12 hours day length to initiate bulb formation. It is therefore the aim of this experiment to evaluate the Chinese variety Jinqui No 2, against local standard varieties.

Materials and Method

The trial was established at the Horticultural Research Centre, Marondera in March 2009. The Chinese variety Jinqui No 2 was evaluated against 2 commonly grown varieties in Zimbabwe-Texas grano and Red Pinoy (Yali). Nursery beds measuring $15m^2$ were established for each variety and a basal fertilizer of 450 kg/ha Compound S was applied. The seed was sown through drilling in rows 15cm apart. Topdressing with ammonium nitrate fertilizer was applied 3 weeks after emergence at a rate of $35g/m^2$. Transplanting was done 6 weeks from emergence, and the plots used measured 3m x 0.9m, with 4 rows per plot. The trial was established as a Randomized Complete Block Design with 3 replicates. A basal fertiliser application of 600kg/ha Compound S was applied at planting and topdressing was done 3 weeks later using ammonium nitrate at a rate of 100 kg/ha. Disease and insect pest control were done as the need arose. Harvesting was done 6 months from planting and the following data was collected: Bulb polar diameter, bulb equatorial

diameter, shape index, plant height, number of bolted plants per plot and yield. Data analysis was done using Genstat statistical package.

Results

Individual bulb weight and the polar diameter did not show any statistical significant differences, unlike equatorial diameter, plant height, number of bolted plants and total yield which showed significant statistical differences between varieties (Table 1).

Table 1: Treatment effects on growth parameters

Treatments	Bulb Weight	Equatorial Diameter	Polar Diameter	Plant Height	Number Bolted	Yield/t/ha
Texas Grano	142.7	57.2[a]	54.8	54.4[a]	9.67[a]	32[a]
Jinqui No 2	97.8	47.23[b]	45.5	49.87[b]	0[b]	12[b]
Rep Pinoy	108.4	54.8[c]	42.7	47.33[c]	52.33[c]	18[b]
Significance	NS	**	NS	**	**	**
% CV	20.8	2.7	10.3	5.17	7.9	15.2
Lsd	48.33	3.20	11.15	4.5	3.7	7.12

** Signficant at 5%

NS Not significantly different

Texas Grano had the highest yield of 32 t/ha, followed by Red Pinoy with 18 t/ha and Jinqui No 2 had the least yield of 12 t/ha. The low yield for Jinqui No 2 could be partly explained by the fact that it succumbed to thrips attack, and showed signs of serious wilting with the leaves taking on a silvery appearance, unlike other two varieties which were tolerant to this problem.

Jinqui No 2 did not show any signs of bolting while the other two varieties showed varying levels of bolting with Red Pinoy showing the highest incidence of bolting. This could be because onion cultivars from temperate regions require temperatures below 10^{o}C to initiate flowering while tropical varieties require several nights below 15^{o}C (Messiaen, et al., 2004). This temperature difference could be the reason why bolting was observed in Texas Grano and Red Pinoy and not in Jinqui no 2.

Conclusion

Jinqui No 2 can be economically grown under Zimbabwean conditions although the yields are rather low. There is a need to repeat the evaluation as there is a possibility that the yield difference could be due to the severe impact of thrips attack.

1.2 Effect of planting date on the flowering and seed production of onion

Introduction

Bulb onion (*Allium cepa*) originated from Central Asia where some of its relatives can still be found growing in the wild. Bulb onion is grown in all countries in Tropical Africa. Important production areas are Senegal, Mali, Burkina Faso, Ghana, Niger, Nigeria, Sudan, Ethiopia, Kenya, Tanzania, Uganda, Zambia and Zimbabwe (Messian et al, 2004)

In the lowlands between 10^{o}N and 10^{o}S shallots replace onions because the temperature is too high for vernalization and the climate too humid for seed production. Mediterranean cultivars require temperatures below 10^{o}C and several nights below 15^{o}C , yet tropical onions and tropical shallots require temperatures below 18^{o}C (Messiaen et al, 2004). Vernalization can be applied to growing plants or to bulbs in storage provided the plants have more than 6-7 leaves or the bulbs are more than 2.5 cm in diameter. In Africa, short day cultivars are grown with a critical day length of 12 hours.

Currently, Zimbabwe is facing a major shortage of onion seed as the country relies on imports from South Africa. The seed that is available is expensive as it is available in limited quantities. There are very few countries in tropical Africa where satisfactory seed production is done as the climatic conditions are not conducive. In Zimbabwe, onion seed could be successfully grown in the areas around Marondera and Nyanga (Eastern Highlands) which experience low enough temperatures for vernalization to be achieved. Local seed production could benefit both farmers and consumers as farmers are failing to meet the market demand for the crop. Local demand for onion is currently being boosted by imports from South Africa. Research done at the Horticulture Research Centre showed that seed production is possible at Marondera. The object of the trial is to determine optimum planting dates for the successful production of onion seed in the Highveld of Zimbabwe.

Materials and method

The trial was established in 2008 using 3 planting dates- thus 28 February, 12 March and 27 March. Texas Grano a brown onion variety was used in this trial. Seed sown on an area of $15m^2$ was used for each planting date (treatment). Compound S was applied as a basal fertilizer at 450kg/ha and worked into the soil. Rows 15cm apart were marked and the seed was sown by drilling in the rows. Topdressing of seedlings was done 3 weeks after emergence using a rate of $35g/m^2$ ammonium nitrate fertilizer.

Transplanting of each treatment was done 6 weeks from emergence and the seedlings were transplanted into plots 3m x 0.9m ($2.7m^2$). Each plot had 4 rows and the spacing used was 30cm x 5cm. A basal fertiliser of 600kg/ha Compound S was applied. The trial was laid out in a Randomized complete block design with 3 replicates. The bulbs were harvested at maturity when 50% of the tops had collapsed for each treatment. Grading of the bulbs was then done discarding all large bulbs that were above 10cm in diameter. The rest were stored in a ventilated onion shed for 5 months before being replanted in 2009. No diseases attacked the crop in the field but as routine fungal sprays were done fortnightly to prevent fungal diseases. The only pests observed were thrips and these were controlled using Dimethoate and Dedevap.

During storage, 40% of bulbs were lost due to rotting. Replanting of bulbs was done in April when the bulbs began to sprout. The bulbs were planted in plots measuring 2m x 2.7m and the spacing used was 90cm x 20cm. A basal fertilizer application of 1000kg/ha Compound S was applied and topdressing was done once using a rate of 200kg/ha.

The plants received routine fungal and insecticide sprays to prevent the occurrence of diseases and insect pests. Seed harvesting began on 12 November 2009 and continued for two weeks. However, the heads had not dried completely but as the rains had begun they had to be removed. Approximately 30cm of flower stalk was harvested with the flower heads so that the seed could continue to mature after harvesting. The flower heads were then spread out in the sun for further drying. The seed was then cleaned and weighed using laboratory scale.

Results

All the bulbs from the first treatment planted on 28 February 2008 bolted and produced seed in the first season, while the other two planting dates did not bolt. Therefore, the bulbs replanted in the second season were those from two treatments only. The seed yields obtained are shown in the Table 2 below.

Table 2: Effect of planting dates on onion seed yields

Planting dates	Seed weight kg/ha
28 February 2008	119[b]
12 March 2008	588[a]
27 March 2008	422[a]
Significance	**
% CV	18.9
Lsd	181.3

Quantity of seed produced from the different planting dates differed markedly. The second planting date, 12 March 2008 gave the highest seed yield, and the lowest seed yield was obtained from the crop sown in February. The seed quality from February planting was also poorer when compared to seed produced in March.

The onions sown in March produced more flower umbels per unit area while the February planting date produced the least flower umbels per unit area. However, on statistical analysis the number of flower umbels did not show any significant difference. There was no evidence of a yield advantage due to increased number of umbels, consequently more work needs to be done with attention directed to umbel size rather number of umbels per plant.

1.3 Onion Seed Trial

Introduction

Conventionally, onion seed is produced over a two year period- with the first season dedicated to onion bulb productions which are replanted in the second season after being exposed to cold temperatures (vernalised). Vernalisation can be effected at seedling stage or to stored bulbs. Onion seed - variety Texas grano was produced at HRC in one season in 2008, through manipulation of plating dates for the onions to get adequate exposure to cold temperatures. After successfully raising onion seed within a year -it is now the objective of this trial to determine if the yield performance of this seed is comparable to that of seed produced over two seasons.

Materials and Method

The nursery for this trial was established during end of March 2009 at HRC. Beds measuring x 7m x1m were prepared, and a basal fertilizer of 450 kg/ha compound S was applied and worked into the soil. Rows 15cm apart were marked and the seed was sown by drilling in the rows. Topdressing of seedlings was done 3 weeks from emergence using a rate of 350g/m^2 ammonium nitrate fertilizer. Seed emergence was hampered by low soil temperatures and subsequent growth of the seedlings was also slow due to the low temperatures experienced at the time. Transplanting was done on 8 June 2009. A basal fertilizer application of 600kg/ha compound D was applied in the rows. Plots measuring 4 rows x 2m were marked and the spacing used was 7cm x 40cm. Topdressing was done 3 weeks later using a rate of 200kg/ha. The major insect pest observed was thrips and were controlled using Dedevap and Dimethoate applied at 30grams/ 15 I of water and 15 ml/ 15 l of water respectively. No diseases were observed as routine fungal sprays were carried out monthly. Harvesting was done from a net plot of two inner rows and this was done 5 months from transplanting when 50% of the crop had collapsed. The parameters measured were weight, bulb polar diameter and bulb equatorial diameter which were used to calculate the bulb index.

Results

Table 3: Varietal effects on yield, bulb weight and bulb index

Treatments	Yield (t/ha)	Bulb weight	Bulb index
HRC Texas grano	26.67[a]	127.1[a]	0.949[a]
Texas grano	25.94[a]	127.1[a]	0.886[a]
Yali	9.68[b]	52.8[b]	0.700[b]
Significance	**	**	**
% CV	2.3	6.0	2.6
Lsd	5.984	15.89	0.112

Yali and Texas grano produced significantly different yields, while the Texas grano produced at HRC and that purchased from the shop did not show significant yield differences. Average bulb index showed significant differences between Yali and Texas grano, but not between the two Texas Granos (Table 3).

1.4 High Density Low Chill Apple Management Trial.

Introduction

The apple (*Malus domestica* L) is a pome fruit developed from an inferior ovary, derived from the ovary wall and the floral tube, which is composed of the basal parts of the petals, sepals and stamens. The fleshy mesocarp constitutes the main edible portion (Teskey and Shoemaker 1972).

Hypothetically, high density planting designs should increase yield per hectare if individual tree yield should not decline significantly due to increased competition for light, water and nutrients. Since semi dwarfing and dwarfing rootstocks reduce vegetative vigour and canopy size, close spacing should be more successful than putting the same trees at low density plantings. Archbold(1987) found out that there is a cumulative production efficiency of apples grafted on the rootstock MM106 even at higher densities.

This trial sought to evaluate the performance of four Israeli cultivars under high density planting conditions, which are Anna, Elah, Maayan and Michal. These are low chill varieties, i.e. those varieties that do not require many chilling hours (exposure to temperatures below 7.2^{o}C) and they can crop well at warmer temperatures without applying any dormancy breaking chemicals. For most apple cultivars like Golden delicious and Granny Smith, above 1000 chilling hours during winter are necessary to ensure natural flower and leaf bud development and the subsequent attainment of full cropping potential (Middleton 1986). Anna requires 300 chilling hours of exposure to temperatures below 7.2^{o}C (winter chilling) in order for bud break to occur. Michal,Maayan and Elah however, have slightly higher chilling requirements than that of Anna which are 450, 450 and 425 respectively, (Andersen and Crocker,2000).

Materials and methods

The trial was planted in September 2005 at Horticultural Research Centre, Hunyani block 5 B at an altitude of 1600m, Natural region IIa in a sandy loam soil. The trees were planted at five different spacings which were 4x 1.5m, 4 x 1.75m, 4 x 2.0m (Standard) 4 x 2.25m and 4 x 2.50 the treatments which were arranged in a Randomised Complete Block Design (RCBD) replicated four times.

The following management programme was observed:

- Post- harvest fertiliser was applied in March at rate of 200g/tree compound J (N.P.K. 15.5.20). This was spread around the tree canopy and slightly worked into the soil.
- All the trees were trained and pruned to a central leader system in June removing diseased, dead and dry branches. Lime sulphur (active ingredient: polysulphides 24.8%) was sprayed at rate of 750ml/15 litres of water to control white and brown scale during the same period.
- The trees were irrigated at three-week intervals with 20mm of water using flood irrigation, as from May to July, and were irrigated at the same rate once every week as from August until the rains started.
- Ammonium nitrate was applied after six weeks post bud burst using a rate of 75g/tree.

Apples started flowering during the third week of July and full bloom was reached 10 days later.

lebaycid (active ingredient: fenthion) was sprayed at a rate of 10ml/15 litres of water for the control of fruit fly. A ten-day spray interval until ten days before harvesting was followed, and weeding was done whenever it was found necessary.

The trees were allowed to come to cropping two years after planting, however, some trees could not produce any fruit since they were still immature.

Fruit thinning which entailed removal of very small and physiologically deformed fruits was done in September, leaving three fruits per cluster.

The fruits were harvested from the third week of November and were graded into marketable and unmarketable, weighed. Harvesting period stretched from November to January 2009, with fresh weights recorded at each harvest.

Results and Discussion

Table 4: Effect of planting density on yields of different varieties

Tree density Ha^{-1}	Mean Marketable Yield (t/ha)			
	Ellah	Anah	Mayaan	Michal
1666	0.12a	1.675b	2.414d	1.574bc
1429	0.16a	0.376a	0.923b	0.715b
1250	0.247a	0.573abd	1.792be	1.218c
1111	0.751ab	0.283ad	1.198bf	0.672bg
1000	0.218a	0.932bd	1.526cf	0.044d

LSD: treatment 0.5612 Cultivar 0.502 treatments vs cultivar 1.1225

CV 47.7%

Means in the same column followed by the same letter are not significantly different at 0.05

Means in the same row followed by the same letter are not significantly different at 0.05

The "crowding" effect of high planting density is still to show effect. As can be seen from the data above, trees of Mayaan are giving the highest yield at the highest density of 1666 trees hectare than other cultivars in other treatments. Maayan has shown early precocity with most trees of this cultivar now giving higher yields and better fruit quality across treatments. Annah and Michal are also giving significantly higher yields at higher plant density than in lower density plantings. This can be attributed to the vigorous growth of these fruit trees. Michal gave significantly lower yields than any other cultivar at lower plant density.

Conclusion

It can be concluded that Mayaan is the highest yielder than any other cultivar at higher plant density, yet Elah is least yielder across all the tree densities.

1.5 Apple Cultivar Evaluation Trial Report

Introduction

The apple (*Malus domestica*) is a pome fruit developed from an inferior ovary, derived from the ovary wall and the floral tube, which is composed of the basal parts of the petals, sepals and stamens. The fleshy mesocarp constitutes the main edible portion (Teskey and Shoemaker 1972). Growers are interested in apples varities with superior eating quality, higher yields, better adaptation to local climatic conditions, more appropriate ripening dates ,and pests and disease tolerance in order to satisfy for local and foreign markets, and this could be achieved through introduction of promising cultivars from abroad and select the best and demonstrate their superiority.

Cultivars are continuously sourced from various parts of the world mainly from the United Kingdom and some through South Africa. This trial sought to evaluate the performance of 11 apple cultivars. The object of the experiment was to identify apple cultivars with high yield potential and excellent fruit quality under local conditions.

Materials and methods

The trial was planted in 2006 at Hunyani block. The trees were planted at spacing of 4 x 2m and are arranged in a Randomised Complete Block Design (RCBD) replicated four times. The 11 cultivars planted are Annah, Mutsu,Ella, Golden Delicious, Gala, Schwim, Drankenstein, Top Red, Mayaan and Michal. A post harvest fertiliser was applied in March 2006 at rate of 200g Compound S per tree. This was spread around the tree canopy and slightly worked into the soil. All cultural practices applied are as per HRC guidelines.

Results

No results as yet- flowers were removed in an attempt to prepare fruit trees for a bigger crop next season.

1.6 Delayed Sweet Potato Vine Planting Trial

Introduction

There is controversy about the effect of delayed planting of harvested vines on sweet potato yield. Some farmers claim that keeping vines for some time before planting result in increased yield. Yet, some farmers claim that delayed planting of harvested sweet potato vines compromises sweet potato yield. There has been no scientific enquiry to these different practices. If delayed planting could give the same yield as planting immediately after harvesting vines, then it could be economic and could be a window for reducing work overload. In addition, if there are funerals, holidays when planting could not be done immediately then farmers could safely keep their vines until they can do the planting without loss of yield. As a result the objective of the trial was to evaluate the effect(s) of delayed planting of sweet potato vines on sweet potato yield

Hypothesis

$H_{o:}$ There are no yield differences as a result of delayed vine planting.

H_1: There are yield differences as a result of delayed vine planting.

Materials and Methods

Site description

The trial was conducted at Horticulture Research Centre on a sandy loam soil. The area receives about 700 to 1000mm per annum. The average temperature for the area is 25-27^{o}C.

Land preparation

Ploughing was done on the 13th of January 2009 using a tractor drawn disc plough, and this was aimed at burying plant residues, hence achieving a fine tilth. This also avails more soil for ridge making.

Ridge making

Ridges 3m long and 30cm high were made using a ridger.

Experimental design

The trial was laid down in a randomized complete block design with three treatments replicated three times. The trial was set as a 3x3 factorial experiment in a randomized complete block design. Factor one was the different varieties namely Chingovha, Germany 2 and Mozambique White and the second factor being time of vine storage. Treatments were randomly assigned to marked plots using random numbers, and plot size was 3m x 2 ridges with an inter row spacing of 90cm. Sweet potato vines were either immediately planted after harvest, stored for a day or and stored for five days at room temperature.

Planting

Vines 30cm long were obtained from a healthy plant, and were vertically planted in moist soil, burying approximately 2/3 of the vine length in the soil.

Irrigation

Irrigation was done to field capacity and this was reached after 4hrs.

Fertilizer application

Compound D fertilizer was applied 4wks later because it was not available at planting. A hole was created besides the sweet potato plant in order to accommodate the fertilizer, and this was followed by a 4 –hour irrigation.

Weeding

Both hand and hoe weeding were done on the 6th of March 2009 and a second weeding was done on the 8th of April2009.

Top dressing

Top dressing with ammonium nitrate was done at a rate of 120kgs / ha on the 7th of March 2009.

Harvesting

Harvesting was done using hoes on the 6th of July 2009. Fresh weights of marketable, unmarketable, total yields were taken immediately after harvesting using a digital scale.

Table 6: Effect of delayed vine planting on sweet potato total yield

Treatment	Total yield (grams)
Planted immediately after harvest	7 069[a]
Delayed by one day	6 603[a]
Planted after 5 days after harvest	5 603[a]

There was no evidence of a significant interaction between variety and planting time.

Neither was any evidence of a statistical yield difference as a result of delayed planting on total yield (Table 6).

Table 7: Effect of time of planting after harvesting vines on marketable yield

Treatment	Marketable mean yield (gm)
Planted immediately after harvest	3 981
Delayed by one day	3 428
Planted after 5 days from harvest	1 897

Delayed planting by a day and planting immediately after harvesting did not result in significant difference in marketable yield of sweet potato. However, delaying vine planting by 5 days showed significant yield reduction compared with the other two treatments. Delayed planting did not influence the level of unmarketable sweet potato (Table 7).

Discussion

There is a threshold of time of delayed planting of harvested vines. Sweet potato marketable yield seemed to drop with increased period of delay. Delaying planting up to 5 days could be economically costly if the results are to go by.

1.7 Effect of different planting methods on sweet potato yields

Introduction

Sweet potato (*Ipomea batatas*) is a very strategic crop in Zimbabwe, and the crop has been elevated to a staple food together with Irish potato. Sweet potato is regarded as poor man's crop, though it is not limited to resource poor farmers. However, a number of farmers adopt a number of planting methods when it comes to sweet potato production; some small holder farmers use ring method, some use horizontal and others use vertical method. There is controversy into yield benefits associated with each method. In Zimbabwe, there has been no such research in this area- hence the objective of this trial was to test effects of different planting methods on sweet potato yield.

M**aterials and Methods**

Site description

The trial was conducted at Horticulture Research Centre on a sandy loam soil. The area receives about 700 to 1000mm per annum. The average temperature for the area is 25-27^{o}C.

Experimental design

The trial was laid down in a randomized complete block design with three treatments replicated three times. Treatments were as follows, treatment 1-vertical method, 2 –horizontal method and 3- Ring method. Treatments were randomly assigned to marked plots and plot size was 5m x 2 rigdes with an interrow spacing of 90cm.

Land preparation

Ploughing was done on the 13th of January 2009 using a tractor drawn disc plough. Ploughing was done in order to bury plant residues, and have a fine tilth such that more soil is available to make ridges.

Ridge making

Two ridges which were 5m long and 30cm high were made using a ridger and this constituted a plot.

Planting

Planting was done on the 2nd of February 2009. Vines 30cm long were obtained from healthy plants. Vines were either vertically, horizontally or ring planted in moist soil, burying about 2/3 of the vine was buried in the soil. In row spacing was 30cmwhile inter row was 90cm.

Irrigation

Water was applied after planting for 4hrs.

Fertilizer application

Compound D fertilizer at a rate of 200kg/ha was applied 4weeks later because it was not available at planting. Holes were created besides the sweet potato plant, in order to accommodate the fertiliser. This was followed by irrigation to field capacity.

Weeding

Both hand and hoe weeding were done on the 16th of March 2009 and second weeding was on the 15th of April 2009.

Top dressing

Top dressing with Ammonium nitrate was done at a rate of 120kgs / ha on the 23rd of March 2009.

Harvesting

Harvesting was done by hoes on the 6th of July 2009. Fresh weights of marketable, unmarketable, total yields were taken immediately after harvesting using a digital scale.

Results

The vertical method had significantly higher number of roots per plant as compared with ring method .However there was no evidence of a significant different in number of roots per plant between vertical and horizontal method .

Table 8: Effect of planting method on marketable yield per plant

Treatment	Mean Marketable yield(kg)
Vertical	5.47
Horizontal	6.48
Ring method	6.22

Total yield differed significantly with planting method .Ring method registered significantly higher mean total yield than horizontal and vertical method. Horizontal method also significantly out yielded vertical method on mean total yield per plant (Table9).

Table 9: Effect of planting method on total yield per plant

Treatment	Total yield
Vertical	8.75
Horizontal	9.85
Ring method	11.01

There was no evidence of significance difference in unmarketable yield.

Table 10: Effect of planting method on unmarketable yield

Treatment	Unmarketable yield (kg)
Vertical	3.28
Horizontal	3.36
Ring	4.78

Discussion and conclusion

Farmers who use ring method are rational-there is evidence that this method can outperform other methods especially the vertical method .The supremacy of ring and horizontal method could be explained in part by an increased number of nodes within the ground –sweet potato storage roots are formed from nodes .Vertical method tends to reduce number of nodes within the soil. However, vertical method registered greatest number of roots and a small proportion of roots developed into edible roots.

1.8 Tomato Cultivar Evaluation Trial

Introduction

One of HRI's functions is to evaluate performance of newly introduced vegetable cultivars under local conditions. Of late the Institute received 5 tomato lines from AVRDC, Tanzania under the Vegetable Breeding and Seed System program- aimed at the promotion, production and consumption of indigenous and exotic vegetables worldwide.

The tomato cultivar evaluation trial was carried out at the Horticultural Research Centre in Marondera- during the summer period (July- Dec) 2009. The objective of the trial was to test the tomato lines for adaptability under local conditions.

Materials and Methods

A total of seven tomato lines were sown in speedling trays on the 1st of July 2009.The seeds were five introduced lines from AVRDC/ vBSS and two local cultivars Tejus and Rodade. The sowing media was composed of pine bark, vlei soil and manure in the ratio 1:1:1.

The trial area was ploughed and disced using tractor drawn implements a week before transplanting. Transplanting was done on the 10th of September 2009, and the experiment was laid down in Randomized Complete Block Design with two replicates. Each plot measured $9.6m^2$ with rows spaced at 0.8m and inter rows spacing of 0.5m. This resulted in 24 plants per plot. Cattle manure was applied at 19.20 kg per plot, 80g per planting station and 17.28 g worked in after planting.

The prescribed basal fertilizer 120:90:90 was achieved by mixing straight fertilizers, Single Super Phosphate (420g/plant), Sulphate of Potash (168g/plant) and Ammonium Nitrate (AN) (336g/plant). Fenverelate was drenched (12ml/15l water) a day after transplanting to prevent cut worms. Top dressing was done with Ammonium Nitrate observing an application rate of 8g/planting station (for 1st application) and 4g per planting station on the second application.

A preventative spray of Dithane M45 was applied at 30g/15 l of water at weekly intervals to guard against blights. Carbaryl was applied at 40g/15l water to control bollworms that had already started to bore into the fruits. Calcium Nitrate at 300g/15l of water was applied as from 13 November 2009 and weekly to prevent blossom end rot (BER).

Data collection

The following parameters were measured:

1. Date of 50% emergency,
2. Date of 1st flowering,
3. Date of 50% flowers,
4. Plant height at 50% flowering
5. Yield (marketable and unmarketable).

Results and Discussion

The results indicate that the lines from AVRDC take fewer days to germinate and emerge as compared to the local varieties Tejas and Rodade. The earliest varieties took 17 days (TOMG0948, TOMG0951, TOMG0950, and TOMG0953) and latest variety Tejas took 26 days (to 50% emergence. There was no significant difference ($p>0.05$) to days to first flowering and 50% flowering for all the cultivars since they differed with a day. The number of days to last harvesting also showed no significant difference ($p>0.05$) for all the varieties as shown in table 3. The results indicate that the performance of the vBSS cultivars had no significant difference in yield parameters as compared to the local cultivars. There was no significant difference for plant height, marketable, unmarketable and total yield (Table 3)

Although local cultivar, Tejus had the highest harvesting frequency, it was out performed by TOMG0953 in terms of total yield (Figure 1). Rodade , a local cultivar had the lowest total yield of 42.07 tonnes per hectare as compared to the introduced varieties. The proportion of unmarketable yield was unexceptionally high due to blights and rots experienced during the wet growing season. This could be explained by the high percentage coefficient of variation. Effort has to be made to control blights on time since high unmarketable values have a huge negative impact on economic returns.

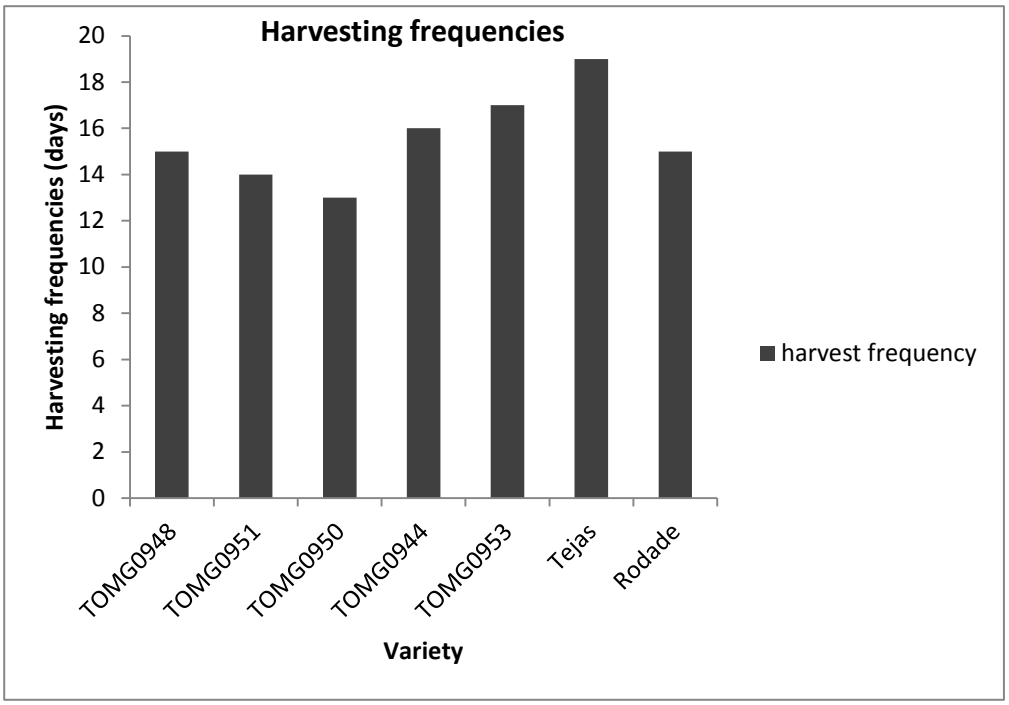

Figure 1: Harvesting frequencies for the different tomato varieties

Table 11: Mean days to 50% emergency, first flower, 50% flowering and last harvest for seven tomato cultivars

Variety	Days to 50% emergency	Days to 1st flower	Days to 50% flower	Days to last harvesting
TOMG 0948	17	58	96	169
TOMG 0951	17	59	95	167
TOMG 0950	17	58	93	166
TOMG0944	18	59	50	167
TOMG0953	17	58	96	167
Tejas	26	58	95	168
Rodade	19	58	96	167
Significance	**ns**	**ns**	**ns**	**ns**
SE	**0.848**	**0.97**	**6.43**	**0.43**
% CV	**16.95**	**0.625**	**27.18**	**0.96**

ns: no significant difference CV: coefficient of variation

Table1 2: Mean yields and mean height of seven tomato cultivars

Variety	Height (cm)	Marketable (t/ha)	Unmarketable (t/ha)	Total yield (t/ha)
TOMG 0948	19.00	31.13	14.10	45.23
TOMG 0951	18.00	33.73	15.70	49.44
TOMG 0950	18.50	33.07	24.95	58.00
TOMG0944	19.50	30.76	14.18	44.94
TOMG0953	19.50	31.70	67.50	99.21
Tejas	23.00	46.43	11.55	57.99
Rodade	18.50	28.71	13.36	42.07
Significance	**ns**	**ns**	**ns**	**ns**
SE	**0.685**	**2.227**	**6.965**	**7.691**
% CV	**13.19**	**24.76**	**113.07**	**50.75**

ns: no significant difference CV: coefficient of variation

Conclusion

The lines can give a good yield under local conditions and farmers can count them as possible alternatives.

1.7 Effect of nitrogen application timing on cabbage head

Introduction

There is an augment that better cabbage heads are obtainable when nitrogen is applied early during cabbage development in order to supply adequate nitrogen for protein synthesis, hence better leaf growth. It is reported that the first leaves which form the frame require adequate nitrogen in order to set a bigger frame before the formation of subsequent leaves which later form the head.

There is also controversy in the amount of nitrogen to be applied if it is to realise economic yield. Current commercial nitrogen rates for hybrid cabbage is 150-200 kg/ha, yet some farmers are currently applying 35-40 kg/ha. Reduced nitrogen rates are less likely to result in heavy leaching losses and environmental pollution.

. In Zimbabwe nitrogen is usually supplied either as ammonium nitrate or urea. The use of urea horticultural crops is not very popular mainly because it volatilize and its scarcity on local market. Most farmers prefer ammonium nitrate than urea as it provides a faster and more obvious response in crop growth.

Therefore, the trial was aimed at comparing the effects of the two nitrogen sources and their scheduling on cabbage production.

Hypothesis

H_o: The nitrogen source does not have an effect on head size in cabbage

H_1: Head size is affected by nitrogen source

H_o: Time of topdressing application does not have an effect on cabbage head size.

H_1: Time of topdressing application will affect the head size of cabbage

Methodology

A trial was established in August 2010 at the Horticultural Research Centre (HRC) with an object of comparing the effects of ammonium nitrate and urea as topdressing at different times after transplanting on cabbage head size. Land preparation was done in the first week of August and this involved ploughing and discing of the field.

A basal fertiliser of 500kg/ha Compound C was applied and the nitrogen supplied was subtracted from the topdressing applications. The seedlings were transplanted on 16 August 2010 and this was followed by drenching the planting stations with carbaryl to control cutworm. Topdressing treatments were started two weeks from transplanting and the treatments used are as listed below

1. 100kg N/ha (290kg AN/ha) 3 weeks after transplanting and 3 weeks thereafter
2. 100 kg/ha (217kg urea/ha) 3 weeks after planting and 3 weeks thereafter
3. Apply 200kg/ha N (580 kg AN/ha) using ammonium nitrate at 14, 28 and 35 days after transplanting
4. Apply 200kg/ha N (435 kg urea/ha) using urea at 14, 28 and 35 days after transplanting
5. Apply 200kg/ha N using ammonium nitrate at 21, 35 and 49 days after transplanting
6. Apply 200kg/ha N using urea at 21, 35 and 49 days after transplanting.

Weeding and irrigation were done as and when required. No major pests attacked the crop in the early stages, but towards maturity there was a serious outbreak of diamond back moth that damaged the outward appearance of the cabbages.

Harvesting was done in the first week of December- 103 days after transplanting. Data was collected on head length, head width and head weight of the sampled cabbages and subjected to analysis of variance using Gens tat programme.

Results

There were no significant differences between treatments.

However, treatment 3 which applied nitrogen at 14, 28 and 35 days using ammonium nitrate had highest yield with larger heads than from other treatments. Except for the case when topdressing was done twice at 3 week- interval, otherwise use of ammonium nitrate registered bigger heads than when urea was used.

The results seem to suggest than higher nitrogen rates are not beneficial and ammonium nitrate is a better source of nitrogen than urea. However there is need to repeat the experiment before conclusive statements are made.

Table 15: Treatment effects on cabbage head length, head width, head index and total yield

Treatment	Head Length cm	Head Width cm	Head Index	Total yield t/ha
1	19.44	20.01	0.98	188.51
2	17.99	19.28	0.93	200.49
3	19.61	20.10	0.98	214.29
4	18.80	19.36	0.97	191.40
5	18.63	19.33	0.96	196.82
6	17.70	19.03	0.93	179.97
Significance	**ns**	**ns**	**ns**	**ns**
% CV	**6.52**	**3.60**	**3.67**	**11.57**

ns: no significant difference CV: coefficient of variation

1.8 Potato urea deep placement trial

Introduction

Potato (*Solanum tuberosum*) is the fourth most important world crop after rice, maize and wheat. It contains high levels of carbohydrate and significant amounts of vitamin B and C and other minerals. Moreover, potato is used in many Industries such as French fries, chips, starch and alcohol production (Abdel, 2006). As such potato production is increasing in Zimbabwe. There are also many fertilisers in the market that can be used as top dressing for potato and farmers would want to establish adequate levels for economic yields and sustainable productivity. Urea is a dry fertiliser with 46% Nitrogen. Its use in vegetable production is debated as it is known to volatilise into the atmosphere creating the fear that it may in turn result in reduced yields. It has been proven that placing the urea in the soil and covering it with soil will reduce the volatilisation of urea as a result this trial was set with the objective to determine the effects of urea deep placement on potato yield and size.

Hypotheses

H_O: There is no significant difference on potato yield when using different urea placement methods

H_1: There is a significant difference on potato yield when using different urea placement methods

Method

The trial was established at Horticulture Research Centre in Marondera following a maize crop. Plant residues were slashed and removed from the field and ploughing, discing and row marking was done before drenching with Nemacur in the opened light irrigated furrows at a rate of 85g/ha on the 7th of October. Amethyst variety was planted the following day with Compound S dribbled in the opened furrows and seed potato placed 30 cm apart and furrows 90cm apart. Top dressing was done 3 weeks after emergence using 10g of urea. Earthing up was done a week after top dressing. Irrigation was determined by observing 7 day cycle keeping the soil moist.

Complete randomised block design was used in the experiment with three replications. There were nine plots each measuring 8.2 m^2.

Three treatments used in the experiments were as follows:

- 1: Side dressing
- 2: Dolloping at 2cm
- 3: Dolloping at 5cm

Data was collected on number of tubers per plot, large and small, marketable and unmarketable potatoes. The trial was harvested on the 21st of February and SPSS was used for data analysis.

Results and Discussion

There was no evidence of significant statistical difference between treatments. However, dolloping at 5cm produced the highest number of large tubbers 10.7 per plant. Dolloping at 2cm depth with 9.58 tubbers per plant was second highest in yield. Dolloping at 2cm and 5cm produced higher means of marketable tubers - 17.06 and 14.85 tonnes per hectare respectively better than placing urea on soil surface (12.2 t/ha) (Table 16). Thus suggesting that deep placement of urea promotes bigger potato tubers than surface application. However, more work needs to be done in this area.

Table 16: Effect of fertiliser on potato yield

Treatment	Average number of potatoes /plot	Large tubers/plot	Small tubers /plot	Marketable yield (t/ha)	Unmarketable yield(t/ha)	Total yield (t/ha)
Side dressing	229	7.73	4.47	12.20	12.47	24.67
Dollop at 2cm	215	9.58	7.49	17.06	7.96	25.02
Dollop at 5cm	210	10.47	4.38	14.85	9.70	24.56
Significance	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**
% CV	**19.3**	**47.7**	**37.98**	**37.44**	**33.02**	**23.11**

ns: no significant difference CV: coefficient of variation

1.9 Bean variety trial

Introduction

Fine bean is a hardy plant that is Native to South America. It is an annual which forms a dwarf bushy plant that grows to a height of about 50cm. It belongs to the leguminoceae family and improves soil fertility through nitrogen fixation which occurs in the root nodules of the plant through a symbiotic relationship with the bacterium *Bacillus radiciola.* Fine bean is grown for its tender, relatively fibreless pods which are eaten when the seeds are still immature. New fine bean varieties developed on the market which include star 2000 and 2053 were recently introduced in the country. The varieties are adaptable green bean suitable for processing and fresh market. Green bean varieties can be consumed as a salad or snack because of its fineness (Mitchel *et al*. 1994). The bean varieties are rust resistant which leads to fewer sprays (Starke Aryes). The trial was established with an aim of evaluating two bean varieties (Star 2053 andStar 2000) when grown under different plant spacing.

Hypothesis

H_0: There is no significant difference in the mean yield, pod length and diameter of the two varieties.

H_1: There is a difference in the mean yield, pod length and diameter of the two bean varieties.

Materials and Methods

The trial was conducted at HRC Marondera in February 2010 and was laid out in a Randomised Complete Block Design. Gross and net plot measured 3.75 m^2 and $2m^2$ respectively. Compound S fertiliser was applied at the rate of 15g/station and planning was done on 2 February 2010 observing three different spacing(s). Top dressing was done on 26 February 2010 and on 18 March using Ammonium nitrate at 100kg/ha. The crop was weeded three times.

Treatments:

Spacing	Treatment
5*60 cm	Star 2000
5*60 cm	Star 2053
5* 45 cm	Star 2000
5*45 cm	Star 2053
10*50 cm	Star 2000
10*50 cm	Star 2053

Karate at 30 ml/15 l of water was drenched using a knapsack sprayer as a preventative measure against cutworms. Bean rust and halo blight were controlled using copper oxychloride at a rate of 30g/15l of water. Harvesting of the trial was done once on 14 April 2010 when the green beans were still fresh and marketable on a net plot of $2m^2$. The total yield, pod length and pod diameter were collected for each treatment and these were analysed using Genstat Statistical package.

Results and Discussion

There were significant differences observed between the mean yields of the two varieties. Star 2053 achieved higher mean yield than Star 2000. This is in line with Charter Seeds (Starke Aryes) fact sheet that stressed the higher yielding capacity of Star 2053 due to the varieties thick pods as compared to the thin pods of Star 2000. Pod diameter also showed some significant differences. No significant differences were observed between the number of pods per plant and pod length of the two varieties. There was no evidence of an interactive effect between variety and plant spacing on yield, pod length, diameter and number of pods per plant. Although Star 2053 achieved higher yields, most of the pods were uneven and not straight as required by the market-so this variety requires thorough grading before packaging. Star 2000 had even pods that are long and straight that are more marketable.

Table 17: Effect of variety on bean yield, pod length and diameter per plant

Variety	Yield(g)	Pod length(cm)	Pod diameter (cm)	Pod number per plant
Star 2000	1471	13.43	4.81	20.7
Star 2053	2320	13.51	6.71	19.2
LSD	**290.6**	**0.624**	**0.774**	**4.73**
SED	**130.4**	**0.280**	**0.348**	**2.12**
Significance 5%	*****	**ns**	*****	**Ns**

* Significant ns: not significant

Conclusion

Star 2053 had a higher yielding capacity than Star 2000 as drawn from the results. The results indicate that Star 2053 maybe recommended for bulk selling for local market whereas Star 2000 can be ideal for export due to its high quality and reduced weight.

2. 0 NURSERY REPORTS

2.1 Fruit Tree Nursery

Introduction

The fruit tree nursery's core function is to propagate planting material for station trials and for sale to the farmers. It also carries out research on the most economic ways of propagating fruit trees. The main propagating method used is through asexual reproduction. Asexually produced trees are true to type and have a shorter juvenile period. The fruit tree Nursery avails the following fruit trees to the farmers, apples, peaches, pears, plums, guavas, figs, grapes and apricots. Only guavas are propagated sexually (from seed). Work for the season under review focused mainly on the propagation of fruit trees for sale to the farmers.

Methodology

Planting hardwood cuttings

Mariana and MM106 hardwood cuttings obtained from mother stocks are rooted yearly, and grafted in the following year. Mother stocks are pruned heavily annually so that they form new young shoots. One-year-old fully mature shoots, 30-40cm for Marianna and 15-20cm long for MM106 are taken for rooting in June.

Seradix B3, a rooting hormone with 8% Indole Butyric Acid (IBA) is used to promote the rooting of these cuttings. The bases of the cuttings are dipped, and the excess shaken off, in Seradix B3 and are carefully placed in trenches. Care is taken not to bruise the bark of the cutting since this may result in reduced root development. Cuttings are then covered with soil and irrigation follows. Weeding and irrigation are the major cultural practices that are undertaken.

Propagating by grafting

Apples and apricots are solely propagated by grafting when they are still dormant in July. The apple cultivars that were grafted are Annah, Ellah, Mayaan and Drankestein, these are low chill apple varieties. Four plums, Rosearli, Shiro and Songold and two apricots; Palstein and Cape bebeco were grafted using Cleft, whip and tonguee methods. Apples were grafted on one-year-old rooted MM 106 in July and will be ready for uprooting in 2010. Apricots and some cultivars of plums such as Rosearli were grafted on one-year-old rooted Marianna rootstocks. They will be ready for planting after one year. The rootstock used was more than a pencil thick in diameter. Care was taken to make sure the cambium of the rootstock and scion were in "intimate" contact for successful union and budding tape was used to tie and seal the union.

Water was then applied using sprinklers whenever necessary. Hand weeding and desuckering (removing rootstock shootings) was also done whenever it was required. Desuckering reduces competition between the grafted scion shoots and the rootstock suckers.

Propagating by straight cuttings

Grapes, plums, peaches and figs are propagated by straight cuttings. The grape cultivars that were propagated are mainly table grapes. These are Himrod, Giant Isabella, Muscat, Seneca, Malawi, Thompson Seedless, Golden City and Pirobella. The amount propagated is usually based on demand registered by farmers. The plums that were propagated using straight cuttings are Santa Rosa, Red Beaut, Gulf gold and Reubenell, while with peaches, these were Oomsarel, Moreira, Prof Black and Van Dyke.

The one year old, mature disease and pest free cuttings were collected from the Mother stock plants and dipped in Copper oxychloride overnight. This is done so as to disinfect the cuttings before they are rooted. They were then dipped in the rooting hormone Seradix B3, the excess shaken off and then rooted in sandy beds in June. After 14 weeks, they are expected to have

rooted and will be potted, and then placed on benches. The potting media is composed of vlei soil, Single Super Phospate (SSP) and Muriate of Potash (MOP).

Table 13: Number of fruit trees propagated in 2009

Type of Fruit Tree	**Number Propagated 2009**
Plums	2000
Peach	100
Grapes	3000
Nectarines	100
MM106	200
Mulbery	300
Figs	200
Total	**5800**

Figs and guavas are not usually required in large quantities hence they were not propagated this year.

Table 14: Number of trees sold from January 2009 to December 2009.

Type of fruit tree	Number sold
Plums	1100
Peach	70
Grapes	1400
Nectarines	50
Mulberry	240
Total	**2860**

Conclusion

The major limitation to the amount and quality of the fruit trees produced is lack of a shade cloth and planting pockets. Installing a shade cloth at the nursery will help to enhance the quality and the number of fruit trees that can be produced at the Horticultural Research Centre.

Training courses

The Institute trained 20 World Vision staff and managed to raise US$1 350. The Institute also trained 20 Women University in Africa students on Horticulture.

Fruit Tree Multiplication Program

A total of 13 000 fruit trees were raised by the Institute. The Horticultural Research Centre produced 5000 and Nyanga Experiment Station produced 8000 fruit trees.

Sweet potato viral elimination

Four sweet potato varieties namely Chingova, Mozambique white, Brondal, and Germany 2 were freed of viral infection. This exercise was done by Tobacco Research Board. This is aimed at supplying farmers with high quality planting material which can give economic returns.

Vegetable Seed Production

The Institute produced 20 kg tsunga seed, 5 kg sugarloaf, 1 kg onion and garlic is estimated at 1 500 kg while carrot seed is approximated at 1.5 kg, and 175 kgs of Sugar bean.

HRC also produced 15 000 strawberry runners or plantlets.

A hectare of sweet potato vines which can give at least 3 000 x 50 kg bags volume-wise was established at the Horticultural Research Centre.

The Horticultural Research Centre sourced 210 kg of (Irish potato) seed potato. The aim is to increase the area of this premium crop hence increased cash flow. The seed potato was multiplied and it is about to reach horticultural maturity.

3. PUBLICATIONS

1. The Horticultural Research Institute produced 7 publications in 2009.
2. The effect of irrigation on synchronization of Coffee (Coffee Arabica L) flowering and berry ripening at Chipinge, Zimbabwe was published by Elsevier Ltd and authored by Chingwara V.

3. The effect of bioregulators ,(Giberellic acid and ethephon) on synchronization of coffee (Coffee Arabica L) flowering and berry ripening at Chipinge, Zimbabwe is in the process of being published by Acta and authored by Chingwara V.

4. Nyarumbu Trish published a booklet on guidance to tomato production in Zimbabwe.
5. Muusha Linda published an informative booklet on vegetable seed production.
6. Madambovora published a booklet of fruit germplasm found at Nyanga Experiment Station
7. Gokoma B is about to publish a booklet on deciduous germplasm found at the Centre.
8. Nyaruwata C is in the process of publishing Vegetable nursery management manual.

4. COLLABORATIVE RESEARCH

Trial	Crop	Collaborator
Seed to seed Carrot production	Carrot	Pristine
Sugarloaf seed production	Sugarloaf	Pristine
Possibility of Multiplying Irish Potato under Marondera conditions	Irish Potato	Agricultural Research Council (ARC) Zimbabwe
Evaluation of new lines of Tomato and Pepper	Tomato	Asian Vegetable Research Development Centre (Tanzania)

5. INTERNATIONAL VISITORS

Visitor	Area of Interest
Brazilian ambassador to South Africa & Zimbabwe & Delegation	An appreciation of the Zimbabwean horticultural Industry.
Chinese Delegation	To appraise themselves on Zimbabwean horticultural industry.
FAO Representative	Follow up on Dr. Kasele's work on cassava and an appreciation of Institutional capacity.

6. **AGRICULTURAL REVOLVING FUND**

The Institute raised a total of US$5 895 from its projects during the 2008 -2009 season. The Horticultural Research Centre contributed US$4 895 and Nyanga Experiment Station raised US$1 000. Fruit trees and sweet potato vines continued to be cash cows

7. PLANTING MATERIAL AVAILED TO FARMERS IN 2010 FROM HRC

Item	Quantity	Unit price ($)	Total income ($)
Fruit trees	2715	2 /3	3579
Sweet potato vines	350 x 30kg bags	5	1750
Strawberry runners	3350	0.10	335
Tsunga seed	870 g	0.30/g	29
Carrot seed	90 g	0.30/g	3
Covo seed	900 g	0.30/g	30
Chembere dzagumana seed	150 g	0.30/g	5

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