ANNEX F DISTRICT SEEDLING FARM

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Table of Contents

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F.1 Zegereni Farm

1.1 Input for Zegereni Farm

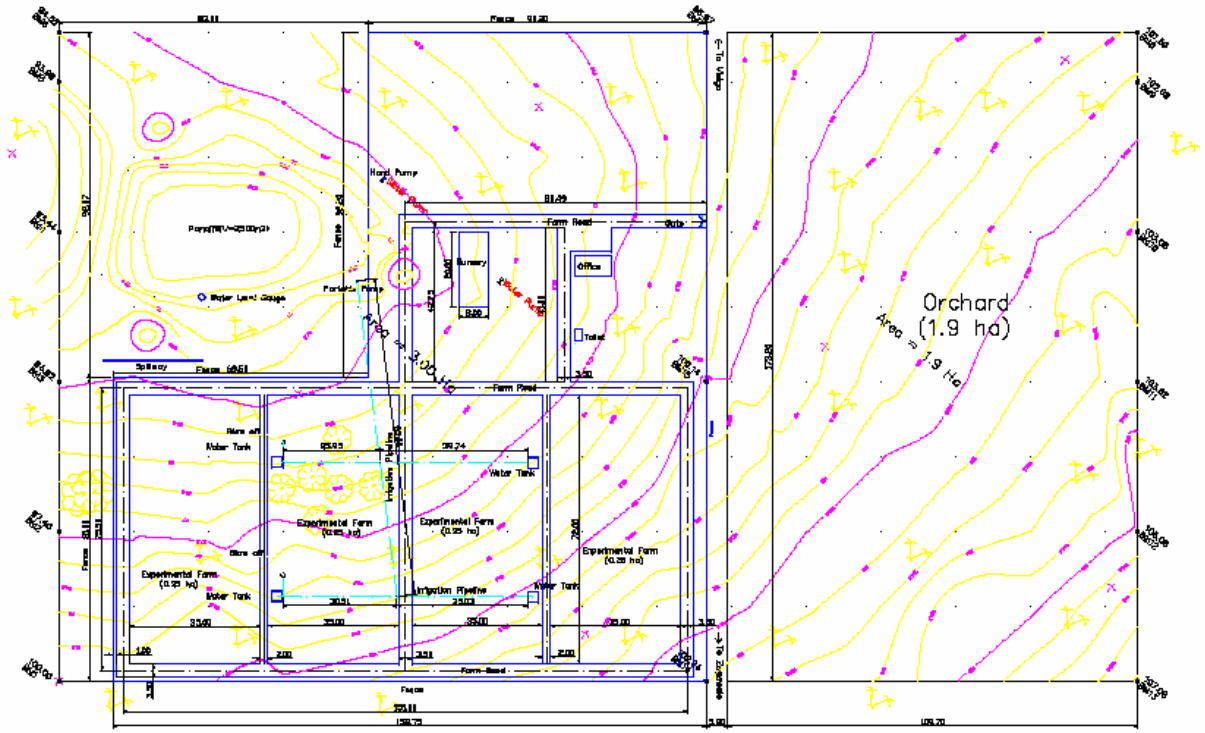
The major facilities of Zegereni seedling farm are shown on the table below.

Major Facilities Constructed for Zegereni Seedling Farm

Item	Dimension	
Farm Area	Total Area	4.6 ha
	Orchard	1.9 ha
	Experimental Farm	1.0 ha
	Others	1.7 ha
Bush house	20 m * 8 m = 160 m^2	
Pipeline	Pipeline	216 m
	Tank	4.7 m^3 * 4
Office	Floor	10 m * 5.6 m = 56 m^2
	Office, Watchman's room, Dormitory, Store room, Toilet (separated)	
Pond	Volume	2,500 m^3
	Area	2,500 m^2



Seedling Nursery (left), Office (centre), Pond (right)



Layout of Zegereni Seedling Farm

Major equipments installed are listed in the following table.

Major Equipments Installed for Zegereni Seedling Farm

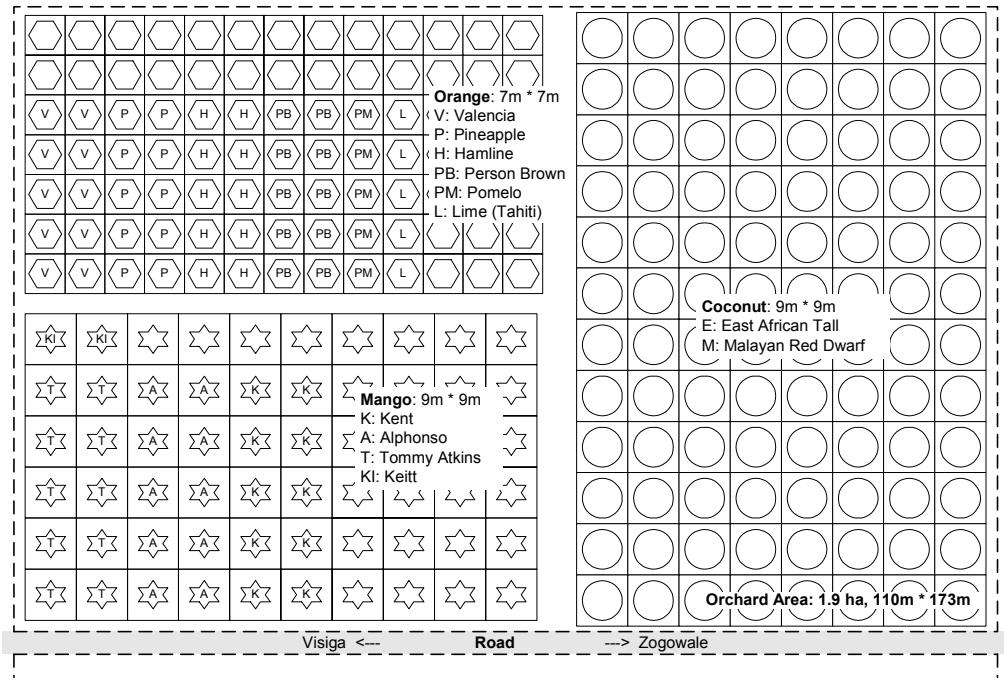
Item	Nos	Remarks
Computer	1 set	With printer, etc. For both of Input Credit and Seedling Farm
Copy machine	1 unit	For both of Input Credit and Seedling Farm
Fax	1 unit	For both of Input Credit and Seedling Farm
Pick-up truck	1 unit	2,800 cc diesel engine, Single cabin
Engine Pump	1 unit	3.5 HP, 600 lit/min, 30 m
Refrigerator	1 unit	290 litre capacity
Sprayer, motorized	1 unit	10 litre capacity, 3.5 HP engine
Sprayer, knapsack	2 units	15 litre capacity
Weighing scale	2 units	50 kg and 10 kg capacity
Farming tools	1 set	Hoes, shovels, folks, watering cans, secateurs, etc.
Office equipment	1 set	Desks, chairs, beds, stationeries, etc.
Experimental tools	1 set	Rain gauge, thermometer, pH meter, soil test kit, measuring tapes, etc.

In the orchard area, the mother trees will be planted to supply good scions for future seedling production, as illustrated below. For this purpose, good fruit seedlings were procured at Sokoine University of Agriculture (SUA) in Morogoro in February 2002. They were planted in the orchard area during the long rainy season as shown in the following figure. The seedlings procured were;

Mango: Keitt (2), Tommy Atkins (10), Alphonso (10), and Kent (10)

Citrus: Valencia (10), Pineapple (10), Hamlin (10), Parson Brown (10)

In June 2002, additional seedlings of citrus were introduced from SUA. They are 5 of Pomelo and 5 of Lime (Tahiti).



General Layout of Zegereni Orchard Area

1.2 Zegereni Farm Operation Unit

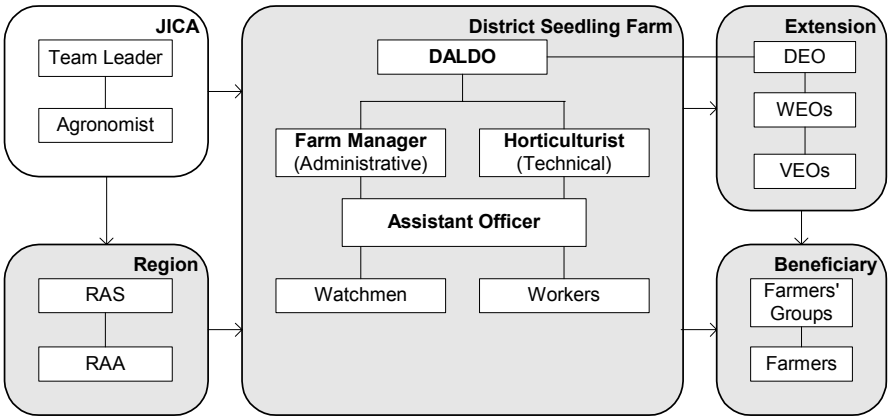
The operation unit of the seedling farm was established in Kibaha district agricultural office for the initial operation. The key persons who are the Farm Manager and Horticulturist were nominated and assigned the farm operation. The Farm Manager, Mr. F. F. Mangowi has been manager for the past 5 years. The Horticulturist, Mr. Ahmed Mohamed is the District Subject Matter Specialist of Horticulture and has a lot of experiences of seedling production at the former Kwa Mfipa farm that belonged to Ministry of Agriculture, and later the Kibaha District Council.

Other staffs were arranged as follows.

Driver: 1 person was recruited after interviews. A temporary driver drives the vehicle initially and has started work in 20/02/2002.

Watchmen: 3 persons were employed in January 2002 and have worked for 8 hours a day in tern.

Casual workers: A number of workers were employed for land clearing, field preparation and so on.



Organisation Chart of District Seedling Farm

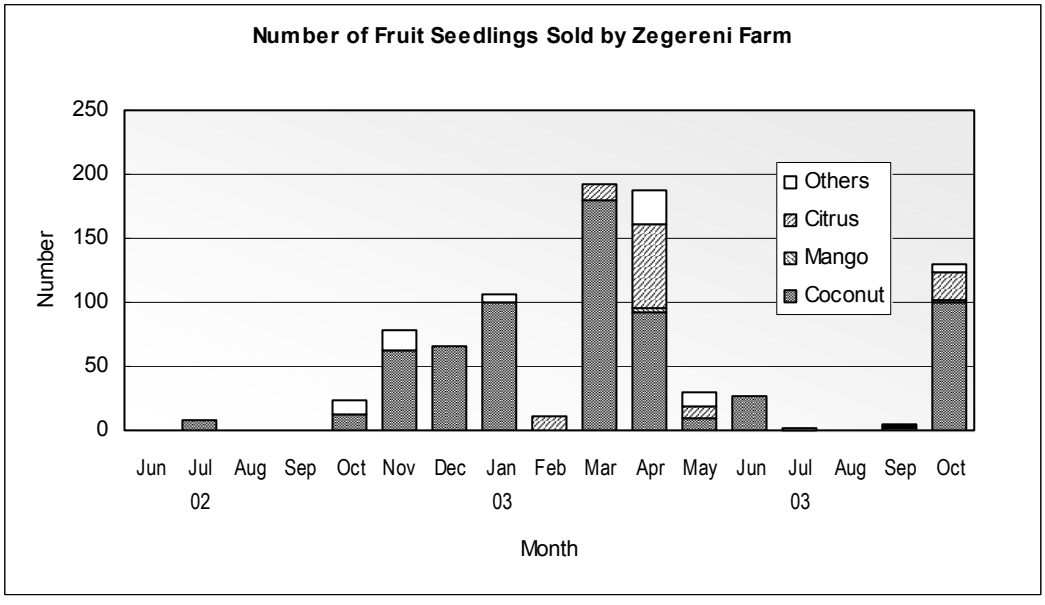
1.3 Fruit Seedling Production and Distribution at Zegereni

(1) Fruit Seedling Production and Distribution at Zegereni

The distribution of fruit seedlings from Zegereni farm has been much smaller than the target so far. The total number of the distributed seedlings is still 860, of which coconuts are dominant and followed by citrus, as shown in the following table. The other fruit seedlings include avocado, papaya, custard apple, and so on. The following chart shows the monthly sales of fruit seedlings by kind.

Total Number of Improved Seedlings Distributed up to October 2003

	Total	Coconut	Mango	Citrus	Others
Number of Seedlings Distributed	**860**	654	8	121	77



Nearly 2,000 coconut seedlings were prepared successfully for the 2002 short rain season. However, the scarce rainfall of the season and 2003 long rain season caused many unsold seedlings in the field. As for mango, the potting soils gave damage to seedlings. The use of fertile forest soils, instead of

Zegereni soil with cattle manure, makes the seedlings vital now. The production of mango seedlings will increase significantly for distribution in the next long rain season. The farm have prepared 1,250 mango and 3,000 of citrus rootstocks for distribution in next year.

1.4 First Vegetable Cropping Tests at Zegereni

(1) Objective

- To observe the effectiveness of the fertiliser and insecticides on Tomato, Okra and Eggplant.
- To compare the profitability of the varieties of them.

(2) Methodology

1) Duration

- From February 2002 to July/August 2002

2) Crop

The vegetables for the first trial were tomatoes, okra and eggplant that were very familiar crops in the region and seem to grow in the season. Two representative varieties of crops were tested, as shown in the following table.

Characteristics of Varieties Used for Experiments

Crop	Variety	Characteristics
Tomato*	1) Roma VF (Holland)	Very popular variety in the region. The crop is oval-shaped.
	2) Marglobe (Denmark)	The crop is round-shaped.
Okra	1) Clemson Spineless (Denmark)	The most popular variety in the region.
	2) Pusa Sawani (Arusha)	The recommendable variety in highland in the country. The seed is produced in Arusha region.
Eggplant	1) Black Beauty* (Denmark)	The most popular variety in the region. The crop is round-shaped and medium size. It is high market value in the country.
	2) Florida High Bush (Local)	Higher market value known as "chocolate" type. As the seeds were not available in market, the seeds were extracted from local products.

Note: Other varieties of Tomato are Money-maker (New Zealand), Island Red (New Zealand) and Large Fukuju (Japan). They were planted in a small area under Fertiliser-4 condition because quantity of the seeds was little.
Other seed of Black Beauty from Arusha was planted as production purpose.

General Design of Crop Adaptability Test in Zegereni Farm

Item	Tomato	Okra	Eggplant
Variety	2 varieties	2 varieties	2 varieties
Fertiliser	4 levels	4 levels	4 levels
Insecticide	3 kinds	3 kinds	3 kinds
Repetition	2 repetitions	2 repetitions	2 repetitions
Total number of ridges	48 ridges	48 ridges	48 ridges
Ridge arrangement	Randomised complete block design	Randomised complete block design	Randomised complete block design
Ridge size	Length: 10 m Width: 1.2 m	Length: 10 m Width: 1.2 m	Length: 10 m Width: 1.8 m
Spacing	90 cm * 60 cm	90 cm * 60 cm	150 cm * 120 cm
Number of plants	32 plants/ridge	32 plants/ridge	16 plants/ridge

3) Treatment

- 4 fertiliser levels
- 3 kinds of insecticide, i.e., Cyhalothrin (Karate), Deltamethlin (Decis) and Endosulphan (Thionex)

Fertiliser Level in Experiment

Fertiliser Level	Chicken Manure	CAN	NPK 20-10-10
Fertiliser-1 (Low level)	50 bag/ha	50 kg/ha	100 kg/ha
Fertiliser-2 (Middle level)	100 bag/ha	100 kg/ha	200 kg/ha
Fertiliser-3 (High level)	150 bag/ha	150 kg/ha	300 kg/ha
Fertiliser-4 (Highest level)	200 bag/ha	200 kg/ha	400 kg/ha

Note: Fertiliser level 3 is almost equivalent to the recommended level for Input Credit in Viziwaziwa.

4) Scale

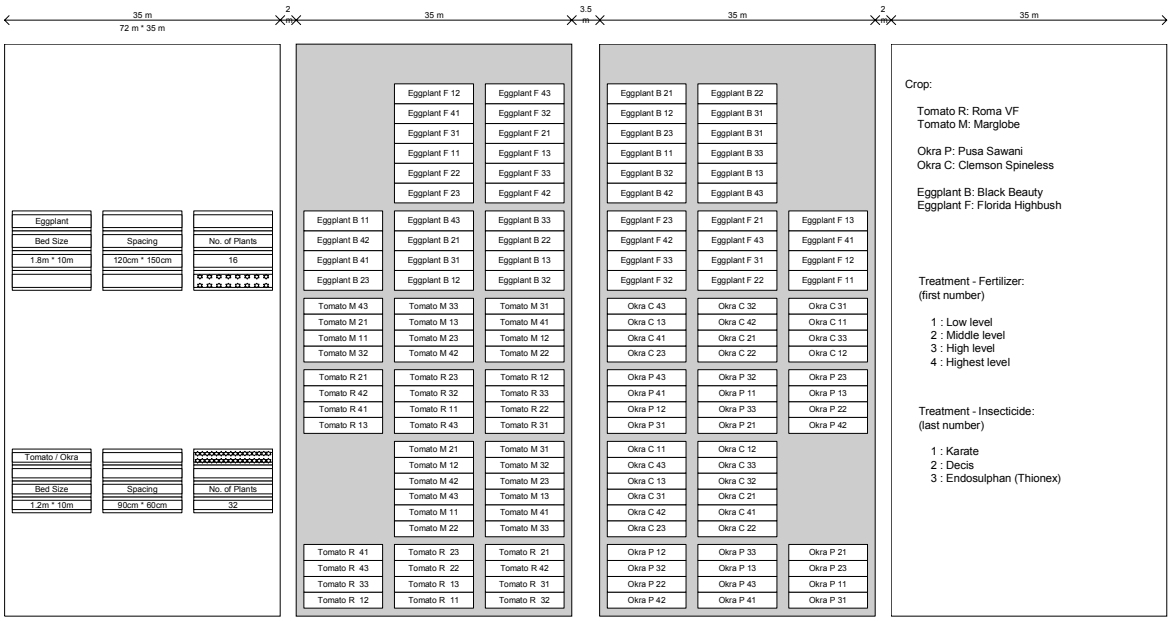
- 10 m length rides
- Standard spacing of plats

Scale of Ridges in Experiment

Item	Tomato	Okra	Eggplant
Ridge size	Length: 10 m Width: 1.2 m	Length: 10 m Width: 1.2 m	Length: 10 m Width: 1.8 m
Spacing	90 cm * 60 cm	90 cm * 60 cm	150 cm * 120 cm
Number of plants	32 plants/ridge	32 plants/ridge	16 plants/ridge

5) Field Arrangement

- 72 treatment (3 crops * 2 varieties * 4 fertiliser levels * 3 insecticides)
- 144 ridges (72 treatments * 2 replications)
- Randomised complete block design



General Layout of Zegereni Vegetable Area

Field Preparation (left, centre), Nursery Preparation (right) - February 2002

(3) Process

1) Sowing/Transplanting

- Tomato: sown in the nursery bed in the middle of February 2002, then transplanted in March 2002
- Okra: sown directly in the ridges in the middle of March 2002
- Eggplant: sown in the nursery bed in the end of February 2002, then transplanted in March 2002

2) Crop Management

- Watering
- Weeding
- Spraying

3) Harvest

- Tomato: harvested from the end of June 2002, and it (the middle of July 2002) is middle stage of harvest.

- Okra: harvested from the end of May 2002, and it is last stage of harvest.
- Eggplant: harvested from the beginning of June 2002, and it is middle to late stage of harvest.

Tomato (left), Okra (centre), Eggplant (right) - Beginning of June 2002

- Harvesting day: 3 times a week (Monday, Wednesday, Friday)
- Measuring: number of picked crops were counted by ridge

(4) Results

1) Harvesting Record

The following table gives the number of harvested fruits in average of two replications for a standard 10-m ridge.

Harvesting Record of Tomato (Roma VF) (Unit: kg/10m-ridge)

	Karate	Decis	Thionex	**Total**
Low Fertiliser	1,288	1,011	1,143	**1,147**
Middle Fertiliser	1,367	1,117	1,453	**1,312**
High Fertiliser	928	811	1,099	**946**
Highest Fertiliser	993	1,260	1,077	**1,110**
Total	**1,144**	**1,050**	**1,193**	**1,129**

Harvesting Record of Tomato (Marglobe) (Unit: kg/10m-ridge)

	Karate	Decis	Thionex	**Total**
Low Fertiliser	152	117	64	**111**
Middle Fertiliser	170	215	172	**186**
High Fertiliser	228	211	131	**190**
Highest Fertiliser	164	171	154	**163**
Total	**178**	**178**	**130**	**162**

Harvesting Record of Okra (Pusa Sawani) (Unit: kg/10m-ridge)

	Karate	Decis	Thionex	**Total**
Low Fertiliser	760	842	816	**806**
Middle Fertiliser	530	720	1002	**750**
High Fertiliser	530	785	1012	**775**
Highest Fertiliser	689	813	819	**773**
Total	**627**	**790**	**912**	**776**

Harvesting Record of Okra (Clemson Spineless) (Unit: kg/10m-ridge)

	Karate	Decis	Thionex	**Total**
Low Fertiliser	729	898	959	**862**
Middle Fertiliser	668	886	893	**815**
High Fertiliser	978	991	518	**832**
Highest Fertiliser	857	842	304	**667**
Total	**808**	**904**	**671**	**794**

Harvesting Record of Eggplant (Black Beauty) (Unit: kg/10m-ridge)

	Karate	Decis	Thionex	**Total**
Low Fertiliser	245	213	240	**232**
Middle Fertiliser	274	283	269	**275**
High Fertiliser	278	221	281	**260**
Highest Fertiliser	281	295	309	**295**
Total	**269**	**253**	**275**	**265**

Harvesting Record of Eggplant (Florida Highbush) (Unit: kg/10m-ridge)

	Karate	Decis	Thionex	**Total**
Low Fertiliser	647	621	465	**578**
Middle Fertiliser	673	679	651	**668**
High Fertiliser	759	576	839	**725**
Highest Fertiliser	591	523	636	**583**
Total	**667**	**600**	**648**	**638**

2) Estimate of Yield Rate of Crops

The harvested fruits were counted their number, but not weighed at the farm. Therefore, the yield rates of the crops were only estimated on the assumption of unit weight of fruits, as shown below.

Estimate of Yield Rate and Unit Weight of Crops

Crop	Number of fruits	Area (m^2)	Range of Weight Est. (g/piece)	Range of Yield Est. (ton/acre)
Tomato (Roma VF)	1,129	200	30 - 50	**6.8 - 11.3**
Tomato (Marglobe)	162	200	50 - 200	**1.6 - 6.5**
Okra (Pusa Sawani)	776	200	20 - 50	**3.1 - 7.8**
Okra (Clemson Spineless)	794	200	20 - 50	**3.2 - 7.9**
Eggplant (Black Beauty)	265	260	100- 200	**4.1 - 8.2**
Eggplant (Florida Highbush)	638	260	50 - 100	**4.9 - 9.8**

3) Effect of Fertiliser, Insecticide and Their Interaction

There could not be statistically significant difference among fertiliser levels, kinds of insecticides and their interaction, as a result of the analysis of variance (ANOVA). The tables of ANOVA show that all computed values of F are smaller than critical values of F. The variances in the test were too big to provide the effect of fertiliser, difference of insecticides.

1.5 Soil Survey for Zegereni Orchard Area

(1) Introduction

The mangoes in Zegereni farm did not grow well, while other fruits could grow well in the same environment. The mango seedlings died after grafting or transplanting in the orchard area. To examine

the reason, the soil survey was carried out. The purpose of the soil survey is to identify the suitability of the soils for the fruit trees in the area. The soil survey and investigation was carried out by the Central Water, Laboratory Maji Ubungo, Dar es Salaam.

On 6th August 2003, the soil survey team visited the farm for a reconnaissance survey in order to check the topographical field condition so that proper sampling sites can be located for analysis. On 7th August, the field work commenced. Two master pits were dug in the farm from which two soil samples were collected from each master pit for laboratory chemical tests. In addition one soil sample was taken from the forest garden yard in Kilvuya village where young fruit seedlings are grown in nursery before they are transplanted to the farm.

Topography and potential land use

The physiography of the land is undulating with long slopes from the elevated upland. Larger part of the surrounding land is fallow with bushes and tall thorny trees, tall old coconut trees and cashew trees.

Geology and soils formation

Geologically, the area is sandy at the surface part of the soil to sandy loam in the sub soil part of the profile. Generally the soils can be described as light textured derived from colluvial sand material deposits. In low lying and depressional areas sandy clay soils are found at greater depths in the soil profile.

Soil structure and drainage

Generally the surface soils in the farm area consists of weak crumbs structure, slightly hard when dry, which gradually changes to soft and friable structure as one goes deeper into the sub-soil horizons. The drainage condition in the farm can be described as highly porous throughout the soil profile. The particle size distribution tests conducted in the laboratory, confirms textural class as sand soils. However the coarse texture here is very favourable in terms of drainage and no limitations are anticipated in this respect.

(2) Soil Survey Method

The soil physical characteristics of the soil were described in site during the field work. They include topography, depth of sampling, soil colour, soil texture, moisture content and consistence, effects of wetting, structure of soil, cracks and presence of roots and mineral salts, presence of Lime ($CaCo_3$).

Other special features observed and noted include mottling of the soil matrix layers, fauna action, soil erosion, and land use; slope percentage and aspect of the landscape. All the descriptions were recorded in a soil description proforma sheet for every profile horizon. The soil master pits were dug up to 150 cm for full soil examination.

The soil data collected in the field, with the support of laboratory chemical analytical data from the Central Water Laboratory – Maji Ubungo have enhanced the evaluation of the soil fertility status of the investigated area.

(3) Laboratory Chemical Analysis

Particle size distribution

The sand fraction dominates this soil at about 90 %. The implication of this very high sand content is an expected low water holding capacity and a correspondingly high water requirement.

Soil Texture

Pit No	Depth (cm)	Sand (%)	Silt (%)	Clay (%)	Textural Class
A-surface	0-20	88	10	2	Sand
A-sub	20-60	92	7	1	Sand
B-surface	10-30	91	8	1	Sand
B-sub	30-70	88	10	2	Sand
Forest soil		37	21	42	Clay

Soil pH

The pH determinations show the very typical values for coarse textured mineral soils. This soil can be regarded as ranging from neutral to slightly acidic at the surface horizon (0-60 cm) and moderately acidic at the sub-soil horizon of the profile (deeper than 60 cm).

Electrical Conductivity

The electrical conductivity of the saturation extract is low 0.01 mmhos/cm in both sites, indicating that the soils are non-saline.

Individual soluble salts – potassium, iron and boron

The levels of the mineral salts present in the soil are not at all enough to plant growth as the soils are non saline. However from the viewpoint of the soil texture we can very safely say that the soils do lack the required mineral salts.

Available Phosphorus

The surface horizon is insufficiently supplies with available phosphorus to the extent that only a very low yield response to plant growth can be anticipated if no phosphate fertilize is applied to the soils. Generally the soils have very low levels of available phosphorus.

Organic Carbon

The level of organic carbon at the surface horizon is insufficient for such light course textured soils, thus it should be raised through manuring.

Available Nitrogen

Organic carbon in the soil helps in conserving soil nitrogen as well as holding other plant's nutrients. It plays a great role by forming humus that has a high base exchange capacity. From this relationship it can be seen that nitrogen level is low through out the profile such that a definite yield response can be expected with the application of nitrogenous fertilisers.

Result of Chemical Analysis

Pit No	Depth (cm)	pH 1:5	EC (mS/cm)	K	Fe	Boron	Available P (ppm)	Organic carbon (%)	Available N (%)
				(me/100g soil)					
A-surface	0-20	7.0	0.02	0.40	0.06	n.d	2.60	0.4	0.03
A-sub	20-60	7.0	0.01	0.50	0.04	n.d	-	-	-
B-surface	10-30	6.0	0.01	0.40	0.12	n.d	n.d	Nil	Nil
B-sub	30-70	5.5	0.01	0.70	0.11	n.d	10.00	-	-
Judgement			*not saline*	*Rich*	*Deficient*	*Deficient*	*Deficient*	*Very low*	*Very low*
Forest Soil		7.3	0.05	0.20	0.13	n.d	6.8	3.0	0.2
Judgement			*not saline*	*Adequate*	*Deficient*	*Deficient*	*Marginal*	*Medium*	*Medium*

n.d = not detected.

(4) Conclusion

The Zegereni soil was judged to be very coarse and not fertile except Potassium. The Nitrogen and Phosphate should be supplied by fertiliser or manure for all kinds of crops. This condition is not special for mangoes.

Out of the micro nutrients, including Boron (B), Copper (Cu), Manganese (Mn), Molybdenum (Mo), Iron (Fe), and Zinc (Zn), only Fe and B contents were measured. Those contents are at deficient level both in the Zegereni soil and the forest soil. As the contents of other five micro elements were unknown, the survey can not clarify which micro nutrients affect strongly to mangoes.

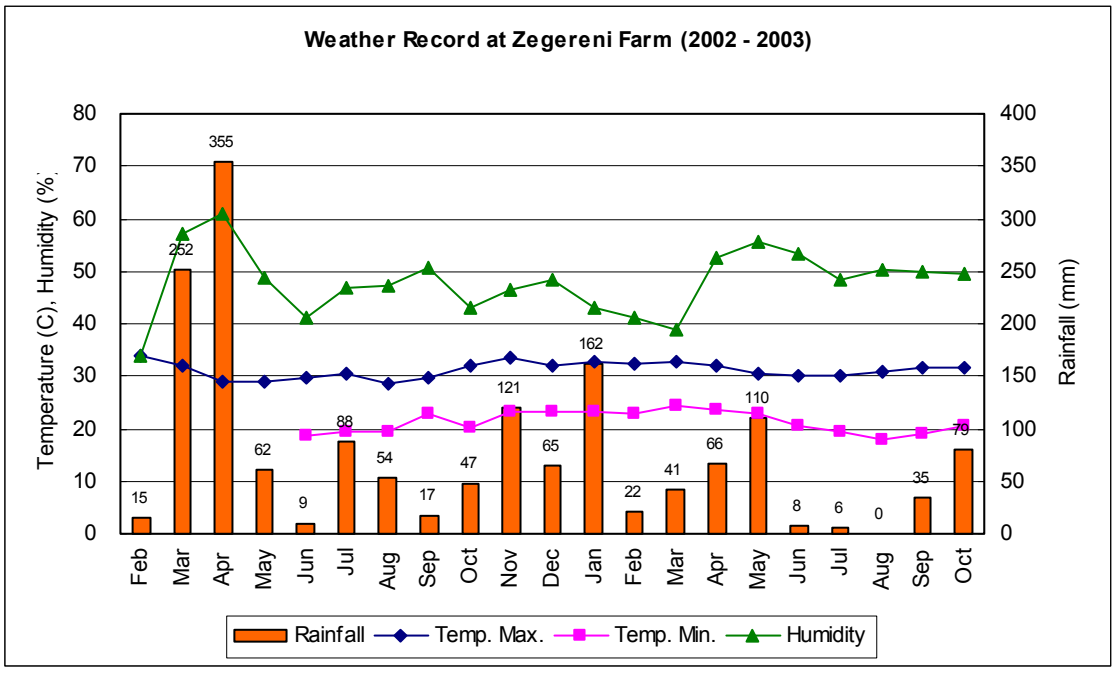
In fact, it seems good for mango growing to use the forest soil and compound fertiliser including micronutrients without cattle manure. To identify the real reason for damage on mangoes, it is recommended to conduct further tests, for example the test using the Zegereni soil mixed with compound fertiliser, the test using the forest soil mixed with NPK fertiliser, the test using the Zegereni soil mixed with NPK fertiliser, and so on.

1.6 Weather Record at Zegereni Farm

The weather records at Zegereni farm are shown below. The rainfall in the 2002 short rain season (usually starting in October 2002) was not sufficient so far. The rainfall in the 2003 long rain season was also little. The rainfall in March and April 2003 were less than one third the last March and April. The temperature after the 2003 long rain season was higher than the same months of 2002 or normal years.

Monthly Average Temperature, Relative Humidity and Monthly Rainfall

Month	Max. Temp. (C)	Min. Temp. (C)	R. Humidity (%)	Rainfall (mm)
March 2002	32.0		57.3	251.7
April	29.1		61.0	354.8
May	29.0		48.7	61.7
June	29.7	18.6	41.1	9.1
July	30.4	19.4	46.7	88.4
August	28.7	19.3	47.3	54.1
September	29.8	22.7	50.7	16.8
October	32.0	20.3	42.9	46.7
November	33.6	23.3	46.4	120.7
December	31.9	23.3	48.4	64.8
January 2003	32.7	23.4	43.2	162.4
February	32.3	23.0	41.3	21.9
March	32.6	24.5	38.9	41.3
April	32.1	23.8	52.5	66.0
May	30.5	22.7	55.7	110.2
June	30.0	20.4	53.2	7.6
July	30.1	19.3	48.5	6.1
August	30.8	17.9	50.1	0.0
September	31.6	19.0	50.1	34.5
October	31.6	20.5	49.6	79.3



F.2 Group Nursery

2.1 Progress of Fruit Seedling Production at Vigama, Mwanambaya and Mkuranga

(1) General

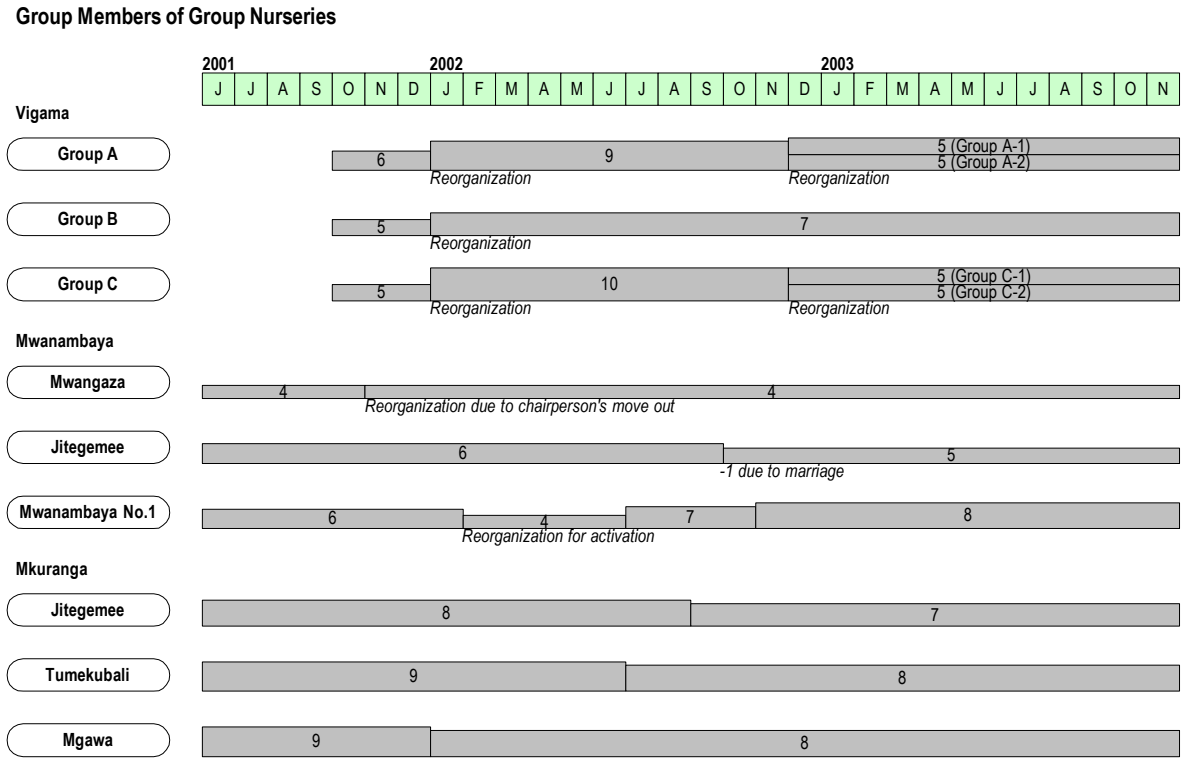
The group nurseries are a part of District Seedling Farm programme. The farmers' groups are expected to produce and distribute the improved fruit seedlings in and around the villages.

In the Verification Study, three sites, namely Vigama, Mwanambaya and Mkuranga, were selected to practice the group nursery activities. The JICA Study Team provided the minimum tools and materials for seedling production to the groups. The district agriculture offices provided technical assistance to them.

(2) Process

1) Group Formation

Groups in Mwanambaya and Mkuranga were formulated under the support of Mkuranga district office in June 2001 when the JICA team did not arrived yet. Mwangaza group and Mwanambaya No.1 were reorganised in October 2001 and January 2002, respectively. Three groups in Vigama were established in October 2001 but they were soon reorganised in January 2002. Then, they were reformed to be five groups at the end of 2002.



2) Technical instruction meeting

The district agriculture offices of Mkuranga and Kisarawe provided a technical instruction on mango

grafting at the three sites in October to November 2001. Then, the technique of citrus budding was instructed for the groups of Mwanambaya and Mkuranga in July 2002. The district officers and extension officers concerned demonstrated the techniques on the grafting of mango and budding of citrus. At the instruction meeting, the member farmers learned and practiced the grafting and budding techniques.

Technical Instruction on Grafting and Budding in Mwanambaya and Mkuranga

Site	Instruction on Mango Grafting		Instruction on Citrus Budding	
	Date	Nos of Participants	Date	Nos of Participants
Vigama	Nov. 21, 2001	12 (75 % of members)	Nov. 21, 2001	12 (75 % of members)
Mwanambaya	Oct. 24, 2001	12 (75 % of members)	July 17, 2002	15 (88 % of members)
Mkuranga	Oct. 25, 2001	23 (88 % of members)	July 17, 2002	20 (87 % of members)

Note: The percentage of attendants is based on the total members at the time.

Technical Instruction on Mango Grafting at Mkuranga (left), Mwanambaya (centre) and Vigama (right)

3) Provision of Mango Scions

The JICA Study Team provided mango scions to farmers' groups three times. The total number of scions provided was 2,135, including 715 for Vigama, 2,030 for Mwanambaya and 1,890 for Mkuranga, as shown in the following table.

Number of Mango Scions Provided to Groups by Site, Group and Variety

Site / Group	1st Nov. 08, 01	2nd Nov. 23, 01	3rd Feb. 12, 02	4th June 25, 02	5th Aug. 03, 02	6th Dec. 24, 02	7th July 24, 03
Vigama	-	-	25 Tommy 15 Keitt 10	-	200 Tommy 100 Keitt 100	300 Tommy 100 Keitt 100 Apple 100	190 Tommy 90 Kent 100
Group A	-	-	-	-	50 Tommy 25 Keitt 25	40 Tommy 10 Keitt 10 Apple 20	70 Tommy 30 Kent 40
Group B	-	-	-	-	25 Tommy 13 Keitt 12	190 Tommy 70 Keitt 70 Apple 50	60 Tommy 30 Kent 30
Group C	-	-	25 Tommy 15 Keitt 10	-	25 Tommy 12 Keitt 13	70 Tommy 20 Keitt 20 Apple 30	60 Tommy 30 Kent 30

Site / Group	1st Nov. 08, 01	2nd Nov. 23, 01	3rd Feb. 12, 02	4th June 25, 02	5th Aug. 03, 02	6th Dec. 24, 02	7th July 24, 03
Mwanambaya	150 Tommy 50 Kent 50 Apple 50	200 Tommy 80 Kent 120	90 Tommy 45 Keitt 45	120 Tommy 60 Kent 60	-	500 Tommy 100 Kent100 Keitt 100 Apple 200	970 Tommy 260 Kent 455 Apple 255
Mwangaza	50 Tommy 16 Kent 17 Apple 17	65 Tommy 25 Kent 40	30 Tommy 15 Keitt 15	60 Tommy 30 Kent 30	-	200 Tommy 40 Kent 40 Keitt 40 Apple 80	280 Tommy 105 Kent 125 Apple 50
Jitegemee	50 Tommy 17 Kent 16 Apple 17	70 Tommy 30 Kent 40	30 Tommy 15 Keitt 15	-	-	200 Tommy 40 Kent 40 Keitt 40 Apple 80	305 Tommy 50 Kent 150 Apple 105
Mwanambaya No.1	50 Tommy 17 Kent 17 Apple 16	65 Tommy 25 Kent 40	30 Tommy 15 Keitt 15	60 Tommy 30 Kent 30	-	100 Tommy 20 Kent 20 Keitt 20 Apple 40	385 Tommy 105 Kent 180 Apple 100
Mkuranga	150 Tommy 50 Kent 50 Apple 50	130 Tommy 50 Kent 80	90 Tommy 45 Keitt 45	180 Tommy 90 Kent 90	-	500 Tommy 100 Kent 100 Keitt 100 Apple 200	840 Tommy 320 Kent 370 Apple 150
Jitegemee	50 Tommy 16 Kent 17 Apple 17	65 Tommy 25 Kent 40	30 Tommy 15 Keitt 15	60 Tommy 30 Kent 30	-	200 Tommy 40 Kent 40 Keitt 40 Apple 80	280 Tommy 100 Kent 130 Apple 50
Tumekubali	50 Tommy 17 Kent 16 Apple 17	-	30 Tommy 15 Keitt 15	46 Tommy 22 Kent 45	-	200 Tommy 40 Kent 40 Keitt 40 Apple 80	310 Tommy 110 Kent 150 Apple 50
Mgawa	50 Tommy 17 Kent 17 Apple 16	65 Tommy 25 Kent 40	30 Tommy 15 Keitt 15	89 Tommy 45 Kent 44	-	100 Tommy 20 Kent 20 Keitt 20 Apple 40	250 Tommy 110 Kent 90 Apple 50

4) Provision of Citrus Buds

The JICA Study Team provided citrus buds to farmers' groups three times. The total number of buds provided was 2,585, including 300 for Vigama, 500 for Mwanambaya and 1,785 for Mkuranga, as shown in the following table.

Number of Citrus Buds Provided to Groups by Site, Group and Variety

Site / Group	1st July 18, 02	2nd Dec. 18, 02	3rd July 24, 03
Vigama	-	100 Jaffer 55 Matombo 45	200 Valencia 50, Jaffer 50 Pineapple 50, Matombo 50
Group A	-	35 Jaffer 20 Matombo 15	60 Valencia 15, Jaffer 15 Pineapple 15, Matombo 15
Group B	-	35 Jaffer 20 Matombo 15	60 Valencia 15, Jaffer 15 Pineapple 15, Matombo 15

Site / Group	1st July 18, 02	2nd Dec. 18, 02	3rd July 24, 03
Group C	-	30 Jaffer 15 Matombo 15	80 Valencia 20, Jaffer 20 Pineapple 20, Matombo 20
Mwanambaya	100 Binti Juma 20, Pineapple 20 Orando 20, Tangerine 20 Satsuma 20	300 Jaffer 150 Matombo 150	100 Valencia 15, Jaffer 25 Pineapple 40, Matombo 20
Mwangaza	100 Binti Juma 20, Pineapple 20 Orando 20, Tangerine 20 Satsuma 20	100 Jaffer 50 Matombo 50	100 Valencia 15, Jaffer 25 Pineapple 40, Matombo 20
Jitegemee	-	100 Jaffer 50 Matombo 50	-
Mwanambaya No.1	-	100 Jaffer 50 Matombo 50	-
Mkuranga	935 Binti Juma 170, Pineapple 195 Orando 165, Tangerine 215 Satsuma 190	600 Jaffer 340 Matombo 260	250 Valencia 50, Jaffer 80 Pineapple 65, Matombo 55
Jitegemee	350 Binti Juma 70, Pineapple 70 Orando 70, Tangerine 70 Satsuma 70	300 Jaffer 200 Matombo 100	100 Valencia 20, Jaffer 25 Pineapple 35, Matombo 20
Tumekubali	350 Binti Juma 70, Pineapple 70 Orando 70, Tangerine 70 Satsuma 70	200 Jaffer 100 Matombo 100	80 Valencia 15, Jaffer 25 Pineapple 20, Matombo 20
Mgawa	235 Binti Juma 30, Pineapple 55 Orando 25, Tangerine 75 Satsuma 50	100 Jaffer 40 Matombo 60	70 Valencia 15, Jaffer 30 Pineapple 10, Matombo 15



Production and Distribution of Improved Fruit Seedlings at Mwanambaya

2.2 Major Varieties of Fruits

(1) Mango

The following varieties of mango are available in (A) Zegereni farm (possibly from the year of 2005), (B) Sokoine University of Agriculture, and (C) Private mango farm in Mkuranga.

Major Variety of Mango

Apple	Good quality, Good for transportation, Round fruit, Yellow-orange to red [A, B, C]
Tommy Atkins	Early mature, High-yielding, Fruits of 400 - 700g, Red (peel), Good looking, Good taste, Good for transportation [A, B, C]
Kent	Early mature, Fruits of 450 - 550g, Light red (peel), Yellow-orange (pulp), Juicy [A, B, C]
Keite (Keitt)	Late mature, Very large fruits of 750 - 1,000g, Yellow-orange (pulp), Juicy, High-yielding [A, B, C]
Haden	Fruits of 500 - 600g, Red-yellow (peel), Good taste, Good for transportation [A, B, C]
Alphonso	*** [A, B, C]
Dodo	*** [B, C]
Zill (Red Indian)	Fruits of 300 - 500g, Very sweet, Not good for transportation [A, B, C]
Ngowe	Good quality, Large long fruit, Deep yellow (pulp), Good for transportation [B, C]
Sensation	Mid mature, Fruits of 300 - 400g, Red (peel), Yellow (pulp) [B, C]
Boribo	High yielder, Good quality, Large and long orange-red [B, C]
Others	Hot, Palma, Ruby, Vandaik, Jury, Lady Hindia, Sebin, Kesan, Koga, Bonyoa [C]

(2) Citrus

The following varieties of citrus are available in (A) Zegereni farm (possibly from the year of 2005), (B) MOFA Mpiji Farm at the border between Dar es Salaam and Bagamoyo, (C) Sokoine University of Agriculture, and (D) Private farm in Kibaha.

Major Variety of Citrus

Sweet Orange	
Magombo	*** [A, B, C, D]
Matombo	*** [A, B, C, D]
Binti Juma	Early mature [A, B, C, D]
Valencia	Late mature, Growing at El. 0 - 1500m [A, B, C, D]
Pineapple	Late mature, Growing at El. 0 - 1500m [A, B, C, D]
Jaffa	Similar to Matombo [A, B, C, D]
Orando	Large, Good smell [A, B, C, D]
Washington Navel	Growing at El. 1000 - 1800m [A, B, C, D]
Hamlin	Growing at El. 0 - 1500m [A, B, C, D]
Person Brown	*** [A, B, C, D]
Tangerine/Mangarin	
Tangerine	Common Tangerine in Tanzania [A, B, C, D]
Satsuma	Very sweet taste, Growing at El. 0 - 1500m [A, B, C, D]
Grapefruit/Lime/Lemon	
Pomelo	Popular grapefruit in Tanzania [A, B, C, D]
Tahiti	Lime, Green peel, Seedless , Growing at El. 0-1500m [A, B, C, D]

F.3 Soil and Water Conservation

3.1 Demonstration of Soil and Water Conservation at Vigama, Mwanambaya and Mkuranga

(1) General

Objective: To demonstrate a soil and water conservation technique to the villagers.

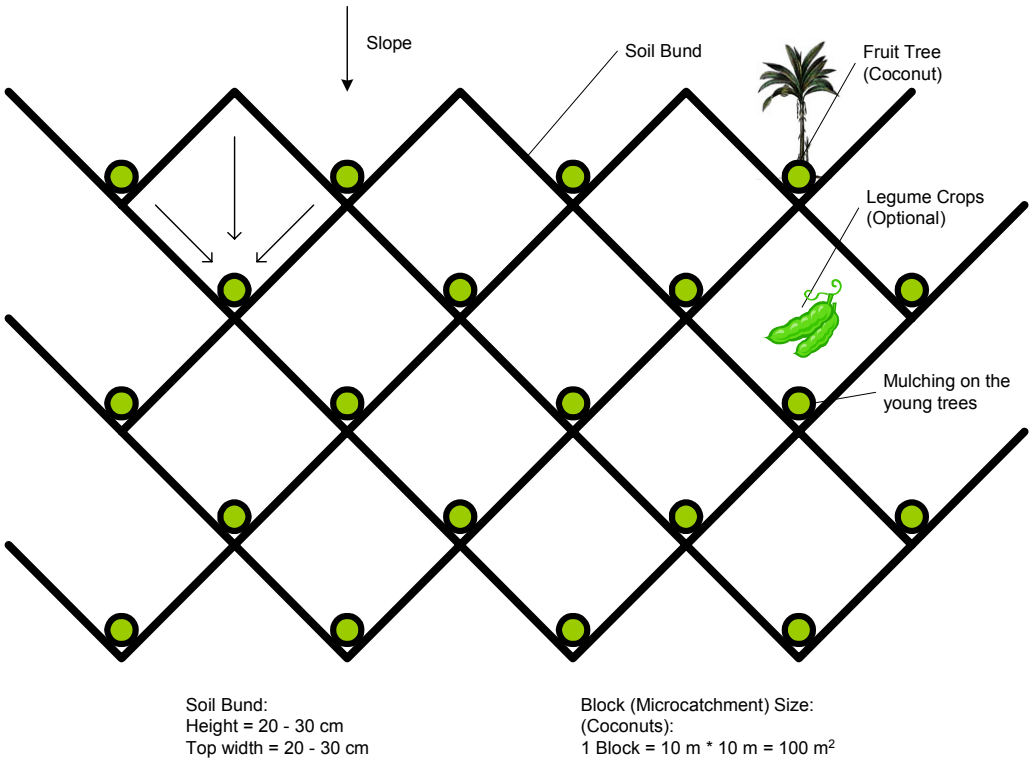
Method: Water Harvesting, designed as the following figure.

Concept: The consecutive water bund catches the runoff water within the microcatchment. The fruit trees which are planted at the bottom of microcatchment uptake the collected water. The mulching on young trees is recommendable to keep moisture. At the same time, the water bunds trap the eroded surface soil. If some legume crops are planted in the microcatchment like an intercropping, nitrogen-rich surface soil may accumulate around the tree.

Crop: Coconut (East African Tall)
Legume crop (ex. cowpea) for Nitrogen fixing

Site: 1 site (1/2 acre) at Vigama
1 site (1/2 acre) at Mwanambaya
1 site (1/2 acre) at Mkuranga

Duration: Starting in November 2002



General Layout of Demonstration Farm on Soil and Water Conservation

(2) Progress

In November 2002, the demonstration of the soil and water conservation has started at the three sites of Vigama, Mwanambaya and Mkuranga. After the explanation and discussion with the farmers, an appropriate design of a water harvesting was employed for the 0.5-acre demonstration farms. The members of the group nurseries have discussed and agreed to select the site, prepare working schedule, and maintenance plan among them. Then, land preparation has started as planned.

Unfortunately, the demonstrations of soil and water conservation were delayed due to extraordinary drought in the year. The members of Mkuranga have started to construct water bunds and plant coconuts seedlings on the slope in the first week of May 2003. The members of Mwanambaya started the activity at the same time. The members of Vigama transplanted 20 coconuts on May 29, 2003. Three demonstration farms were established by villagers' and the extension officers' effort at the suitable locations. However, about a half (at Mwanambaya) or all (at Vigama) of the coconut seedlings dried up due to drought. They will replace them after certain rainfall by themselves.



Water Harvesting at Vigama (left) and at Mwanambaya (centre), and Mulching at Mwanambaya (right)

3.2 General Description on Soil and Water Conservation Techniques

On the course of the awareness creation on soil and water conservation in the area, the Study Team distributed the booklet, which briefly explained the 16 conservation methods, to the district officers including the extension officers. The booklet was prepared by the Team based on the FAO textbook. The names and outlines of all methods are shown below, and most recommendable methods, i.e., composting, contour tillage, mulching and water harvesting, are described in detail.

1. Bench Terraces: Bench terraces are a soil and water conservation measure used on sloping land with relatively deep soils to retain water and control erosion. They are normally constructed by cutting and filling to produce a series of level steps or benches. This allows water to infiltrate slowly into the soil. Bench terraces are reinforced by retaining banks of soil or stone on the forward edges.

2. Composting: Compost is a type of fertiliser derived from the decomposition of plant and animal wastes. Compost is an excellent source of plant nutrients, commonly in home garden. There are many ways to prepare compost (in a pit, above ground, in a field, etc.). Moisture content, an adequate

supply of air and temperature control are important parameters for quality compost production.

3. Contour Tillage/Planting: Contour tillage or planting is practiced on sloping lands to reduce soil erosion and surface runoff. Structures and plants are established along the contour lines following the configuration of the ground. Contour planting may involve construction of soil traps, bench terraces or bunds, or the hedgerows. Contour tillage is being promoted for sustainable upland farming.

4. Cover Crops: Cover crops are grown to protest the soil from erosion and to improve it through green manuring. Cover crops are usually short-term crops, planted in fields or under trees during fallow period, interplanted or relay-planted with grain crops, or planted once in a cropping cycle. Most of the plants used as cover and green manure belong to the legume family.

5. Crop Rotation: Crop rotation is arguably the most important crop management practice. Various crop species are grown in sequence in some part of the farm or field. The cropping patterns can vary from year to year. A good crop rotation takes into account each crop's characteristics so that the net effect is improved soil (ex. paddy-mungbean-maize-cowpea).

6. Diversion Ditches: Diversion ditches are constructed along the contour lines and across slopes for the purpose to intercept surface runoff and divert it to suitable outlets. Diversion ditches are dug at varying intervals, 1 m wide at the top, 0.5 m wide at the bottom and 0.5 m deep. A drainage canal is larger and deeper. Waterways dispose of the excess flow in diversion drains and surface runoff.

7. Drop Structures: Drop structures are constructed to slow the flow of water in channels. In a steep channel, erosion can be controlled by allowing the water to flow over a series of steps or drop structures. These structures are quite expensive for ordinary farmers to construct.

8. Grass Strips: Planting grasses along contour lines creates barriers to minimize soil erosion and runoff. It induces a process of natural terracing on slopes as soil collected behind the grass barrier. Grasses are trimmed regularly to prevent from the flowering, shading and spreading. Grasses can be used as fodder for animals and mulch for crops.

9. Hedgerows: Hedgerows are one of the simplest erosion control practices on sloping land. Nitrogen-fixing trees/shrubs, grasses, fruit trees or other crops are planted in rows along the contour. Various tree and crop species are established in the hedgerow to enhance farm income and diversity.

10. Minimum/Zero Tillage: In minimum or zero tillage system, simple farm implements are used to prepare land and plant food crops. Minimum tillage is common and effective in controlling soil erosion, particularly on highly erodible and sandy soils.

11. Mulching: In mulching, a covering of cut grass, crop residues or organic materials is spread over the ground, between rows of crops or around the trunks of trees. It is commonly used in areas subject to drought and weed growth infestation. Optimum density of soil cover ranges between 30% and 70%.

12. Ridge Terraces: A ridge terrace consists of a furrow and ridge, constructed along the contour on sloping land. Grasses and legume trees are usually used to stabilize the ridge, bur fruit trees and cassava are also commonly used.

During the rainy season, the furrow fills with sediment and farmers put this back on to their land.

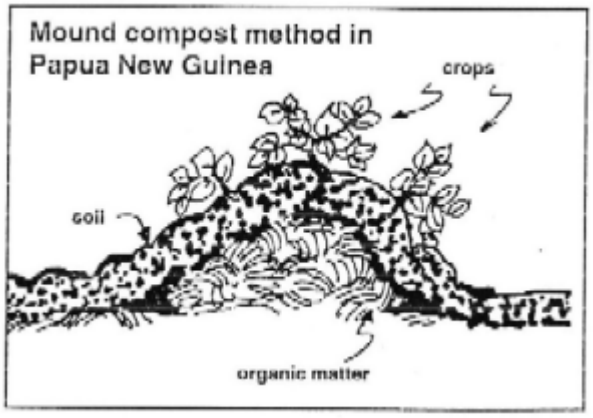
13. Shifting Cultivation: Shifting cultivation is a form of low-input agriculture and fallow management. If managed properly, it can be considered a sustainable practice, particularly in sparsely populated areas. The underbrush is cut, and then most of the trees are felled. In most places, underbrush is burned, but in some parts, no-burn practices are used.

14. Soil Barriers: Soil barriers slow down runoff and retain the soil lost by sheet erosion. They may be made of wood or rocks; over time they may develop into live fences of trees and shrub.

15. Soil Traps: Soil traps are structures constructed to harvest soil eroded from the upper slopes of the catchment. The most common types are check dams and trenches, built in diversion ditches or waterways. The check dam slows down the water flow and allows heavier soil particles to settle. Trenches are built to trap soil along the waterways and complement the function of check dams.

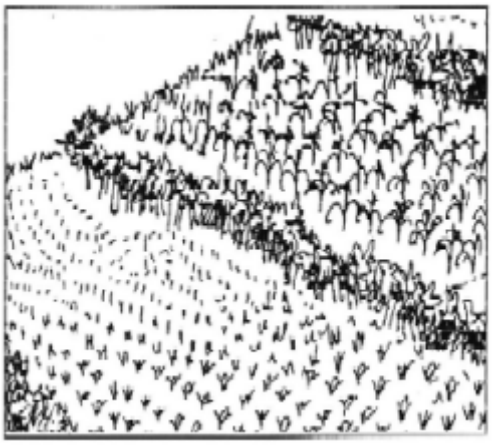
16. Water Harvesting: Small-scale water harvesting is most successful when operated as a system with the catchment area, the reservoir and the service area. Catchment area of sufficient size is needed to drain water into the reservoir. Small-farm reservoir sites are suitable in elevated or depressed areas.

2. Composting

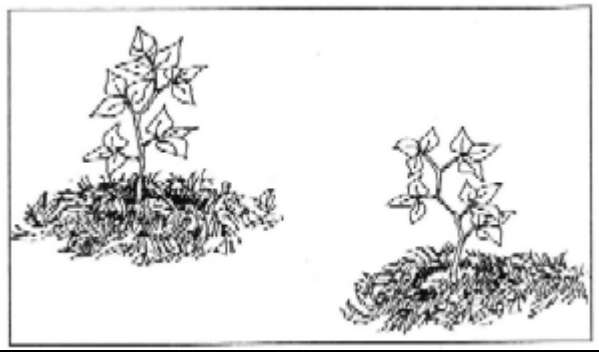


Outline	• Compost is a type of fertiliser derived from the decomposition of plant and animal wastes. • Compost is an excellent source of plant nutrients, commonly in home garden. • There are many ways to prepare compost (in a pit, above ground, in a field, etc.). • Moisture content, an adequate supply of air and temperature control are important parameters for quality compost production.
Advantages	• Decaying compost generates nutrients for crops. • Decaying compost generates heat, which maintains temperature at optimum levels for tuberization, despite very low night temperatures at high altitudes. • Mounds are good for tuberization since the volume of rooting zone is increased.
Limitations	• Compost mounds require a large quantity of plant material (up to 40 ton/ha). • Cannot be used in the lowlands where severe weed infestation is a problem. • Cannot be practiced on steep slopes. • High labour requirement.
Factors affecting adoption	Bio-physical Factors • May not be needed on soils high in organic matter. • Must have adequate supply of biomass. • Biomass requirements may be difficult to meet in drier climates. Socioeconomic Factors • Labour is needed to harvest, haul and distribute the organic matter. • In some societies, it is not acceptable to handle animal dung.

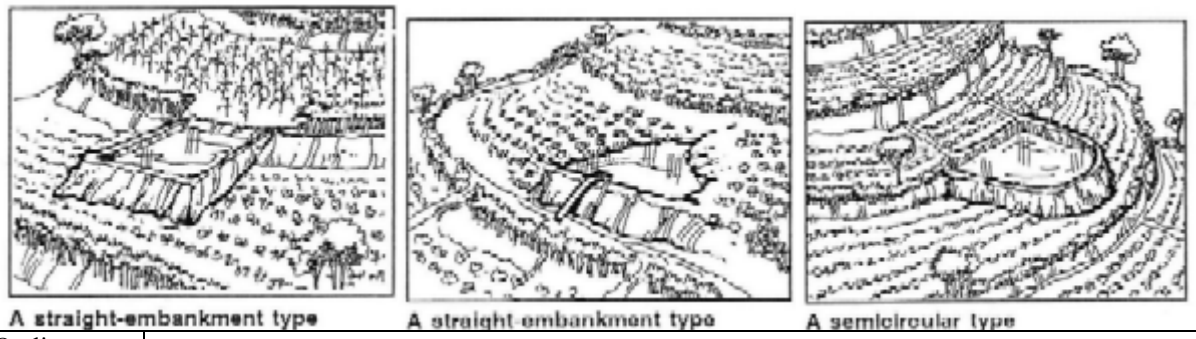
3. Contour Tillage/Planting



Outline	• Contour tillage or planting is practiced on sloping lands to reduce soil erosion and surface runoff. • Structures and plants are established along the contour lines following the configuration of the ground. • Contour planting may involve construction of soil traps, bench terraces or bunds, or the hedgerows. • Contour tillage is being promoted for sustainable upland farming.

Advantages	• Reduces runoff and soil erosion • Reduces nutrient loss. • Cultivation is faster if using draft animals or machinery since the equipment moves along the same elevation.
Limitations	• Improperly laid-out contour lines can increase the risk of soil erosion. • Labour-intensive maintenance. • Needs special skills to determine contour lines.
Factors affecting adoption	Bio-physical Factors • Increased productivity and soil condition are attractive. • Trapping water in the fullows increases infiltration and production. Socioeconomic Factors • In some marginal lands, laws do not allow the construction of engineering structures; so contour planting is an appropriate alternative. • In some areas, people find it easier to cultivate the soil up and down the slope using hand tools.
11. Mulching 	
Outline	• In mulching, a covering of cut grass, crop residues or organic materials is spread over the ground, between rows of crops or around the trunks of trees. • It is commonly used in areas subject to drought and weed growth infestation. • Optimum density of soil cover ranges between 30% and 70%.
Advantages	• Intercepts the direct impact of raindrops on bare soil and reduces runoff and soil loss. • Suppresses weeds and reduces labour costs of weeding. • Increases soil organic matter. • Improves soil chemical and physical properties. • Increases the moisture-holding capacity of the soil. • Helps to regulate soil temperature.
Limitations	• Possible habitat for pests and diseases. • Not applicable in wet conditions. • Difficult to spread evenly on steep land. • Lack of available materials suitable for mulching. • Some grass species used as mulch can root and become a weed problem.
Factors affecting adoption	Bio-physical Factors • Suited to areas with limited or irregular rainfall. • Insufficient availability of mulch may be a constraint in upland areas. Socioeconomic Factors • Farmers are used to burning crop residues instead of returning them to the soil. • Labour for collecting mulch and applying it is a problem. • Mulch is more important in home gardens or valuable horticulture crops than in less-intensive farming systems.

16. Water Harvesting



Outline	• Small-scale water harvesting is most successful when operated as a system with the catchment area, the reservoir and the service area. • Catchment area of sufficient size is needed to drain water into the reservoir. • Small-farm reservoir sites are suitable in elevated or depressed areas.
Advantages	• Improves food production. • Promotes conservation and ecological balance. • Involves low investment cost per hectare. • Easy to construct. • Provides alternative uses to offset sacrificed land area. • Protects against drought. • Allows irrigation by gravity. • Mostly individually owned, hence, minimal social problems.
Limitations	• Requires large amount of labour. • High seepage and evaporation losses possible. • Floating vegetation may infest reservoir. • Uncontrolled runoff in high intensity rainfall areas can overtop and damage the embankment. • Poor design and management can lead to erosion and flooding.
Factors affecting adoption	Bio-physical Factors • Soils that have high seepage and percolation rates may require lining. Socioeconomic Factors • Farmers may be unwilling to sacrifice a portion of their land for reservoir. • Land tenure status can influence the investment decision. • Labour may be insufficient. • Funds or credit services may be unavailable. • Engineering knowledge is required.

Source: Resource Management for Upland Areas in Southeast Asia, An Information Kit; FAO

F.4 Experimental Plot

4.1 Experimental Plots at Viziwaziwa and Mwanabwito

(1) Methodology

1) Site

VAEOs of Viziwaziwa and Mwanambaya selected the sites of experimental plots. The skilled farmers were chosen by them, but some farmers, who were not committed enough to the cropping test, were excluded from the next tests. The list of all plots operators for 1st to 4th cropping tests are shown below.

1st Cropping Test - 6 sites in Viziwaziwa

Code	Farmer's Name	Sub-village	Site	Nos	Status in the Project
VZ101	Rehema Mohamed	Viziwaziwa	Valley	1st	None
VZ102	Dunia Iddi	Viziwaziwa	Valley	1st	None
VZ103	Hiyari Mzee	Viziwaziwa	Valley	1st	None
VZ104	Sauda Saidi	Viziwaziwa	Valley	1st	None
VZ105	Asha Abbasi	Mdungalo	Valley	1st	None
VZ106	Charles Francis	Sagale	Valley	1st	VEO

1st Cropping Test - 6 sites in Mwanabwito

Code	Farmer's Name	Sub-village	Site	Nos	Status in the Project
MB101	Juma Lukali Amri Kibwanta	Mwanabwito	K. Pond side	1st 1st	KKM-Secretary KKM-Treasurer
MB102	Mintanga Kalega	Mwanabwito	Right of Ruvu	1st	None
MB103	Fijina Mwarabu	Mwanabwito	Right of Ruvu	1st	None
MB104	Pazi Sanze	Kihembahemba	K. Pond side	1st	None
MB105	Ashura Abalah	Kidai	Right of Ruvu	1st	Member-Watering
MB106	Jalala Simba	Kidai	Right of Ruvu	1st	Member-Watering

2nd Cropping Test - 7 sites in Viziwaziwa

Code	Farmer's Name	Sub-village	Site	Nos	Status in the Project
VZ201	Mr. Mohamed Abdallah	Viziwaziwa	Valley	1st	KKM Chairman
VZ202	Mr. Mohamed Kazumari	Viziwaziwa	Valley	1st	KKM Vice Chairman
VZ203	Ms. Rehema Khamisi	Viziwaziwa	Valley	2nd	Member of Input Credit
VZ204	Mr. Ali Said	Viziwaziwa	Viz. Pond side	1st	
VZ205	Mr. Hiyari Mzee	Mdungalo	Valley	2nd	
VZ206	Mr. Dunia Iddi	Mdungalo	Valley	2nd	
VZ207	Mr. Maneno Hassan	Sagale	Undulating	1st	

2nd Cropping Test - 6 sites in Mwanabwito

Code	Farmer's Name	Sub-village	Site	Nos	Status in the Project
MB201	Mr. Pazi Sanze	Kihembahemba	K. Pond side	2nd	Leader of Input Credit
MB202	Mr. Mintanga Kalega	Mwanabwito	Right of Ruvu	2nd	Leader of Input Credit
MB203	Mr. Amri Kibwana	Mwanabwito	Right of Ruvu	2nd	
MB204	Mr. Fortunatus Ngitu	Mwanabwito	Right of Ruvu	1st	Village Extension Officer
MB205	Mr. Maulidi Rubawa	Mwanabwito	Right of Ruvu	1st	Member of Mill
MB206	Mr. Rajabu Magaila	Kidai		1st	Member of Pump

3rd Cropping Test - 6 sites in Viziwaziwa

Code	Farmer's Name	Sub-village	Site	Nos	Status in the Project
VZ301	Mr. Mohamed Abdallah	Viziwaziwa	Valley	2nd	CPMU Chairman
VZ302	Mr. Mohamed Kazumari	Viziwaziwa	Valley	2nd	CPMU Vice Chairman
VZ303	Mr. Rashidi Omari	Viziwaziwa	Valley	1st	Member of Input Credit
VZ304	Mr. Hiyari Mzee	Mdungalo	Valley	3rd	
VZ305	Mr. Dunia Iddi	Mdungalo	Valley	3rd	
VZ306	Mr. Maneno Hassan	Sagale	Undulating	2nd	

3rd Cropping Test - 6 sites in Mwanabwito

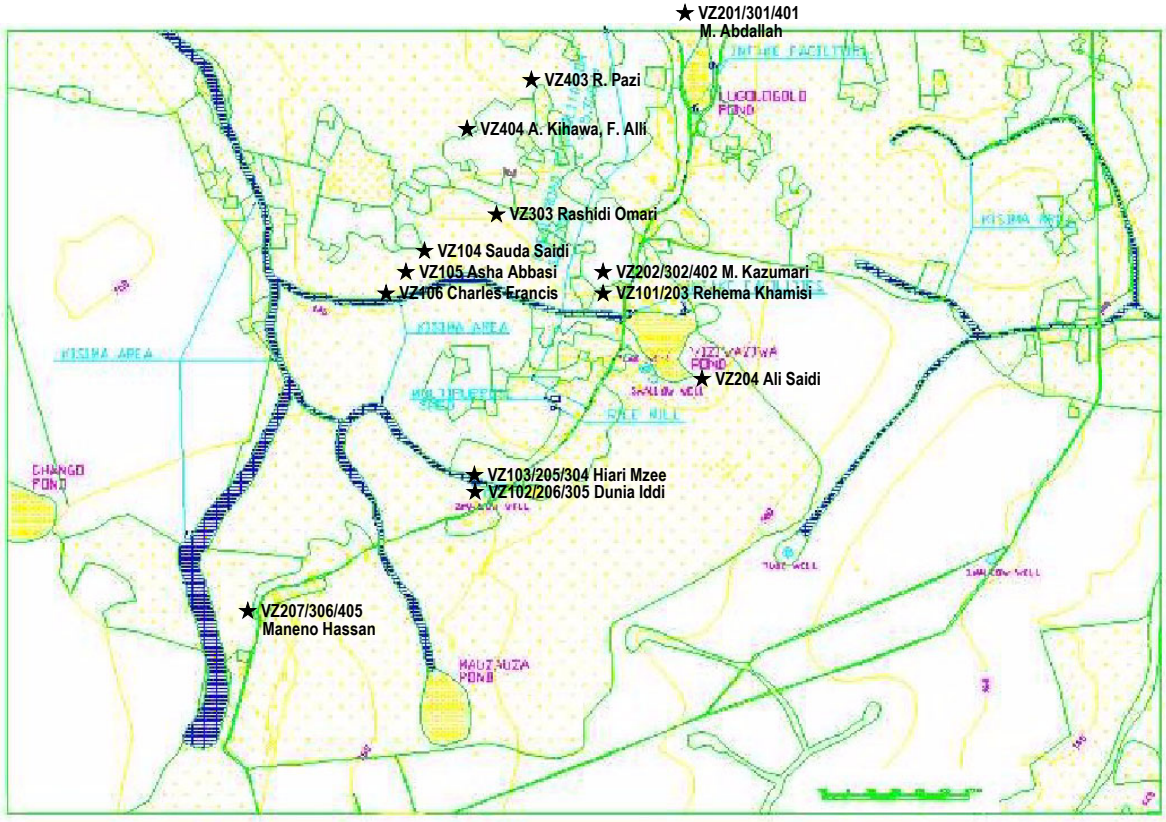
Code	Farmer's Name	Sub-village	Site	Nos	Status in the Project
MB301	Mr. Pazi Sanze	Kihembahemba	K. Pond side	3rd	Leader of Input Credit
MB302	Mr. Amri Kibwana	Mwanabwito	Right of Ruvu	3rd	CPMU Treasurer
MB303	Mr. Maulidi Rubawa	Mwanabwito	Right of Ruvu	2nd	Member of Mill
MB304	Mr. Rajabu Magaila	Kidai	Right of Ruvu	2nd	Member of Pump
MB305	Mr. Kongeza Mfunda	Mwanabwito	Right of Ruvu	1st	Village Chief
MB306	Mr. Mintanga Kalega	Mwanabwito	Right of Ruvu	3rd	Leader of Input Credit

4th Cropping Test - 5 sites in Viziwaziwa

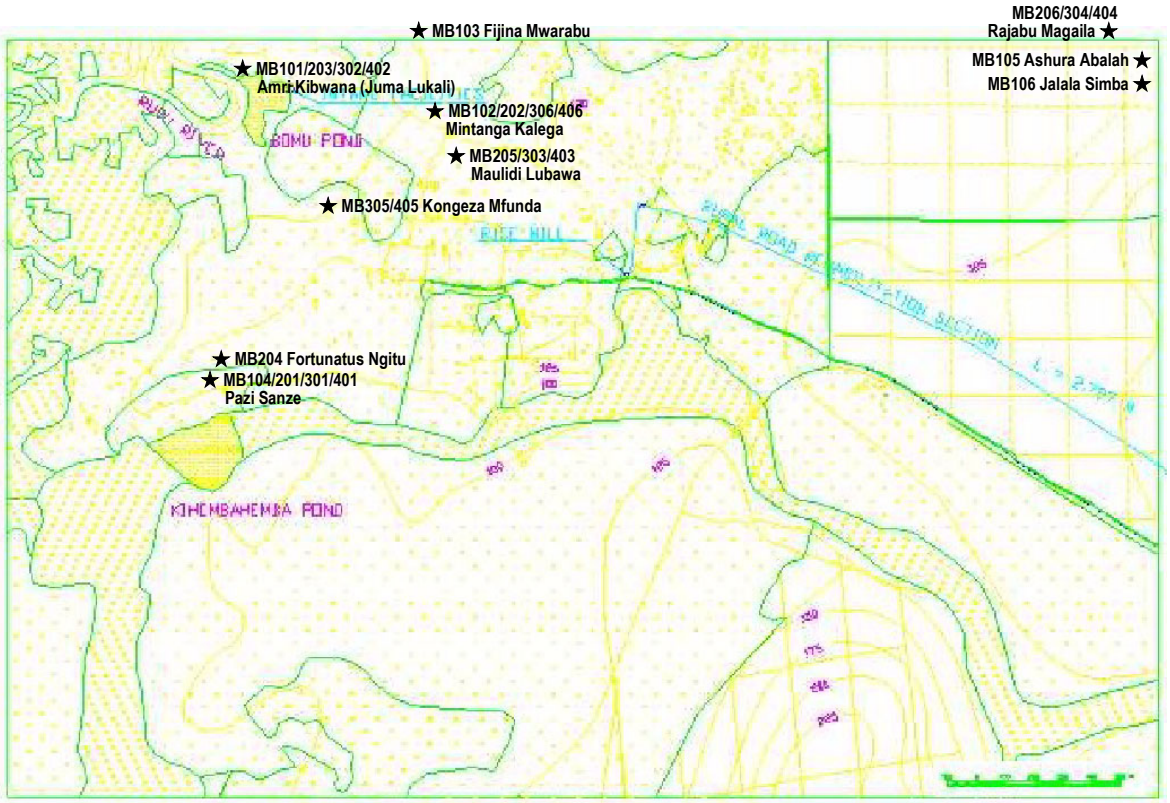
Code	Farmer's Name	Sub-village	Site	Nos	Status in the Project
VZ401	Mr. Mohamed Abdallah	Viziwaziwa	Valley	3rd	CPMU Chairman
VZ402	Mr. Mohamed Kazumari	Viziwaziwa	Valley	3rd	CPMU Vice Chairman
VZ403	Mr. Ramadhani Pazi	Viziwaziwa	Valley	3rd	Member of Input Credit
VZ404	Ms. Ashula Kihaw	Ngugwa	Valley	1st	Member of Input Credit
	Ms. Fatuma Allia			1st	Member of Input Credit
VZ405	Mr. Maneno Hassan	Sagale	Undulating	2nd	

4th Cropping Test - 6 sites in Mwanabwito

Code	Farmer's Name	Sub-village	Site	Nos	Status in the Project
MB401	Mr. Pazi Sanze	Kihembahemba	K. Pond side	4th	Leader of Input Credit
MB402	Mr. Amri Kibwana	Mwanabwito	Right of Ruvu	4th	CPMU Treasurer
MB403	Mr. Maulidi Rubawa	Mwanabwito	Right of Ruvu	3rd	Member of Mill
MB404	Mr. Rajabu Magaila	Kidai	Right of Ruvu	3rd	Member of Pump
MB405	Mr. Kongeza Mfunda	Mwanabwito	Right of Ruvu	2nd	Village Chief
MB406	Mr. Mintanga Kalega	Mwanabwito	Right of Ruvu	4th	Leader of Input Credit



Location Map of Experimental Plots in Mwanabwito



Location Map of Experimental Plots in Mwanabwito

4.2 First Vegetable Cropping Test at Viziwaziwa and Mwanabwito

(1) Objective

- To observe the effectiveness of the fertiliser on Tomato and Okra in various field conditions.

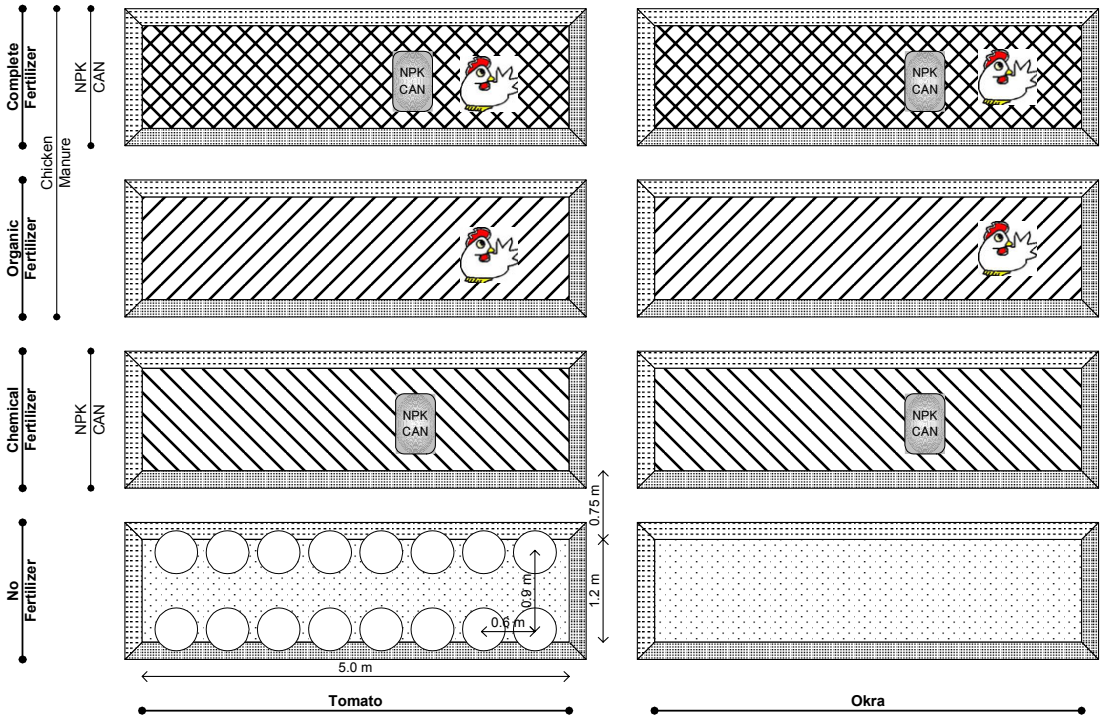
(2) Methodology

1) Site

- 6 sites in Viziwaziwa (sandy soils)
- 6 sites in Mwanabwito (fertile clayey soils)

2) Scale

- 8 ridges with 5.0 m length and 1.2 m width
- Spacing of 60 cm by 90 cm for tomato and okra
- 16 plants a ridge





Explanation Meeting at Viziwaziwa (L), and Land Preparation at VZ102 (C), and at VZ103 (R)

3) Duration

- November 2001 to February 2002

4) Crop

- Tomato (Roma VF)
- Okra (Clemson Spinless)

5) Treatment for Tomato and Okra

- complete fertiliser
- chemical fertiliser
- organic fertiliser
- no fertiliser

The application of insecticide and fungicide is equal among the treatments.

Design of Fertiliser Treatment

Crop/Treatment* / Input per 0.5 acre	Tomato				Okra			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Seed (g)	50	50	50	50	1,500	1,500	1,500	1,500
Chemical Fertiliser								
NPK 20-10-10 (kg)	80	80	-	-	80	80	-	-
CAN (kg)	40	40	-	-	40	40	-	-
Booster (lit)	0.8	0.8	-	-	0.8	0.8	-	-
Organic Fertiliser								
Chicken Manure (bag)	43	-	43	-	43	-	43	-
Insecticide								
Karate (lit)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Fradan (kg)	3	3	3	3	3	3	3	3
Fungicide								
Dithane M45 (kg)	3.6	3.6	3.6	3.6	-	-	-	-
Antacol Blue (kg)	-	-	-	-	3.6	3.6	3.6	3.6

Note: * (1) complete fertiliser, (2) chemical fertiliser, (3) organic fertiliser, and (4) no fertiliser.

6) Material

All necessary materials, i.e., seeds, fertiliser and agro-chemical, were provided by the JICA Study Team prior to the test. A knapsack sprayer was lent for the six plots of each site.

7) Record Keeping

The extension officers support the daily operation of the experiments. The daily activity record shall be kept by the operators using the form provided by the JICA Study Team.

(3) Results

1) Information

The results of trials were not as good as expected due to unavoidable circumstances. There was lack

of water for watering the crops and heat intensity produced by very hot sunlight made plant growth difficult. Also pests (mainly elegant grasshoppers) infested especially in Mwanabwito.

Lack of water made tomato growing impossible at Viziwaziwa at the seedling stage in the nursery. Elegant grasshoppers infestation made it impossible for growing tomato at Mwanabwito as the crop was damaged at the seedling stage in the nursery by these pests. Since all tomatoes eventually failed in the test, only Okra could be used for the experiment plots in this season.

Apart of these two problems, lack of commitment to some participants also caused the results to be not so good. The few participants farmers who were committed to success of the trials made the work not a complete failure.

The performance and results in the trials by participants farmers is as follows.

VZ101 Rehema Mohamed

- Activity
  - Farm preparation [27 Oct 2001]
  - Manure application [27 Nov 01]
  - Searing of seeds [19 Dec 01]
  - Weeding [12 Jan 02]
  - Transplanting [13 Jan 02]
  - CAN application [13 Jan 02]
- Results
  - Complete Fertiliser: the yields were good at all.
  - Chemical Fertiliser: the plants and fruits were very slander. The plant growth and fruits qualities were in better condition.
  - Organic Fertiliser: the plant growth and fruits quality were better.
  - No Fertiliser: the condition was even better from plant, flowers to fruits and they were looking good.

VZ102 Dunia Iddi

They did not plant as their area was hit by drought. If the trials are going to be conducted again after the long rains they are going to participate, as will be enough water for watering crops.

VZ103 Hiyari Mzee

They did not plant as their area was hit by drought. If the trials are going to be conducted again after the long rains they are going to participate, as will be enough water for watering crops.

VZ104 Sauda Saidi

- Activity
  - Farm preparation [27 Oct 2001]
  - Manure application [19 Nov 01]
  - Searing of Seeds [22 Nov 01]
- Results
  - Complete Fertiliser: the growth and harvest were best.
  - Chemical Fertiliser: the flowers were a bit in good condition compared with the No Fertiliser.
  - Organic Fertiliser: the plant growth, the leaves and flowers were better, but due to drought the fruits were not in good condition.
  - No Fertiliser: the plants were not in good condition and flowers were absolutely dry and failed to form fruits.

VZ105 Asha Abbasi

- Activity
  - Farm preparation [27 Oct 2001]
  - Manure application [19 Nov 01]
  - Searing of seeds [22 Nov 01]
  - Transplanting [26 Dec 01]
- Results
  - Complete Fertiliser: the growth and harvest were best.
  - Chemical Fertiliser: the flowers were a bit in good condition compared with the No Fertiliser.
  - Organic Fertiliser: the plant growth, the leaves and flowers were better, but due to drought the fruits were not in good condition.
  - No Fertiliser: the plants were not in good condition and flowers were absolutely dry and failed to form fruits.

VZ106 Charles Francis

- Activity
  - Farm preparation [26 Oct 2001]
  - Organic manure application [11 Nov 01]
  - Seed sowing [19 Nov 01]
  - Weeding [3 Dec 01]
  - Transplanting [11 Dec 01]
  - CAN application [14 Dec 01]
  - NPK application [2 Jan 02]
  - Karate & Booster application [3 Jan 02]

– Harvesting [from 13 Jan 02 to 3 Feb 02 (8 times)]

Date	Complete Fertiliser	Chemical Fertiliser	Organic Fertiliser	No Fertiliser	Price
13/01/02	15 Fruits	7 Fruits	10 Fruits	5 Fruits	300
16/01/02	20 Fruits	6 Fruits	15 Fruits	5 Fruits	450
19/01/02	25 Fruits	8 Fruits	20 Fruits	4 Fruits	550
22/01/02	40 Fruits	12 Fruits	20 Fruits	3 Fruits	700
25/01/02	42 Fruits	16 Fruits	30 Fruits	NIL	800
28/01/02	30 Fruits	8 Fruits	15 Fruits	NIL	400
31/01/02	20 Fruits	NIL	NIL	NIL	200
03/02/02	6 Fruits	NIL	NIL	NIL	50
Total (% to Max)	193 Fruits (100%)	57 Fruits (30%)	110 Fruits (57%)	17 Fruits (9%)	3,500

- Results
  - Complete Fertiliser: Best plant growth and Highest production (193 fruits)
  - Chemical Fertiliser: Worse production (57 fruits)
  - Organic Fertiliser: Better production (110 fruits)
  - No Fertiliser: Poor growth and Lowest production (17 fruits)

The number of fruits in all beds is 377, which in weight is 23 kg (61 g/fruit).

General Information from the VAEO of Viziwaziwa

From the results in the trials the observations suggest for best plant growth at Viziwaziwa use organic fertiliser, CAN as a Booster application and NPK as top dressing. Better results can be obtained in growth and yields by using Manure alone than using chemical fertiliser only for growing plants depending natural fertility.

MB101 Juma Lukali, Amri Kibwanta

- Activity
  - Land preparation [21/22 Nov 2001]
  - Manure and chemical (Furadan) Application [23 Nov 01]
  - Seed sowing (Okra) [25 Nov 01]
  - 2nd seeds sowing (after attacks by Elegant grasshoppers) [2 Dec 01]
  - Chemical application [16 Dec 01]
  - Fertiliser application (CAN) [18 Dec 01]
  - Fertiliser application (NPK) [3 Jan 02]
  - Harvesting [from 18 Jan 02 to 26 Feb 02]
- Result
  - Total production of Okra was 6.5 kg.

MB102 Mintanga Kalega

- Activity
  - Land preparation [10 Nov 2001]
  - Manure and chemical application [16 Nov 01]
  - Seeds sowing (Okra) [18 Nov 01]
  - Weeding [10 Dec 01]
  - Fertiliser application (CAN + NPK) [19 Nov 01]
  - Chemical spraying (Karate) [20 Dec 01]
  - Harvesting [From 5 Jan 02 to 25 Feb 02]
- Result
  - Total production of Okra was 29 kg.

MB103 Fijina Mwarabu

- Activity
  - Land preparation [10 Nov 2001]
  - Manure and chemical application [13 Nov 01]
  - 1st seeds sowing (after attacks by Elegant grasshoppers) [10 Dec 01]
  - Thinning and gap-filling [24 Dec 01]
  - Chemical application [28 Dec 01]
  - Fertiliser application (CAN) [31 Dec 01]
  - Fertiliser application (NPK) [14 Jan 02]
  - Harvesting [21 Jan 02 to 28 Feb 02]

MB104 Pazi Sanze

- Activity
  - Land preparation [7 Nov 2001]
  - Manure and chemical application [19 Nov 01]
  - 1st sowing [22 Nov 01]
  - 2nd sowing (after pests attacks - elegant grasshoppers) [1 Dec 01]
  - Chemical application [10 Dec 01]
  - Thinning and weeding [14 Dec 01]
  - Fertiliser application (CAN) [18 Dec 01]
  - Chemical application [21 Dec 01]
  - Fertiliser application (NPK) [3 Jan 02]
  - Chemical application [18 Jan 02]
  - Harvesting [20 Jan 02 to 27 Feb 02]
- Result
  - Total production of Okra was 54 kg.

MB105 Ashura Abalah

She could not conduct the trials due to pests and doughty in their area. She had to stop the activities in early stages of the crops growth.

MB106 Jalala Simba

He could not conduct the trials due to pests and doughty in their area. He had to stop the activities in early stages of the crops growth.

General Information from the VAEO of Mwanabwito

- Natural Fertiliser - Stunted Growth, yellowing of leaves
- Manure alone - good growth but moderate in yield
- NPK and CAN - high growth rate, early pods motility and high / good yields
- Manure CAN and NPK - High growth rate, and have a higher and better yields in comparison to other treatments

2) Summary of Inspection

Though general performance in conducting trials was poor especially in recording crop performance, the target of the trials was reached through observations. Through observation in the trials at Viziwaziwa Village for good crops growth and yields the best treatment is using Manure in incorporation with organic fertiliser CAN and NPK 20-10-10 followed by using Manure alone Using artificial fertilisers alone crop growth and yield are poor and this indicates natural fertiliser is very low at Viziwaziwa. Growing crops by depending on Natural fertility is even worse for fertility is very low for crop growth and yields.

At Mwanabwito the best treatment for crop growth and yield is using manure in incorporation with CAN and NPK 20-10-10 fertilisers. The next follows using artificial fertilisers without Manure, then manure alone and the last Natural fertility. This shows natural fertility at Mwanabwito is high and in incorporation with artificial fertilisers (CAN and NPK) better plant growth and yield can be achieved. Plant growth and yields are a bit lowered and even lower by depending on Natural fertility alone.

Inspection of Okra at VZ 106 (L), at MB102 (C), and at MB104 (R)

3) Data Analysis

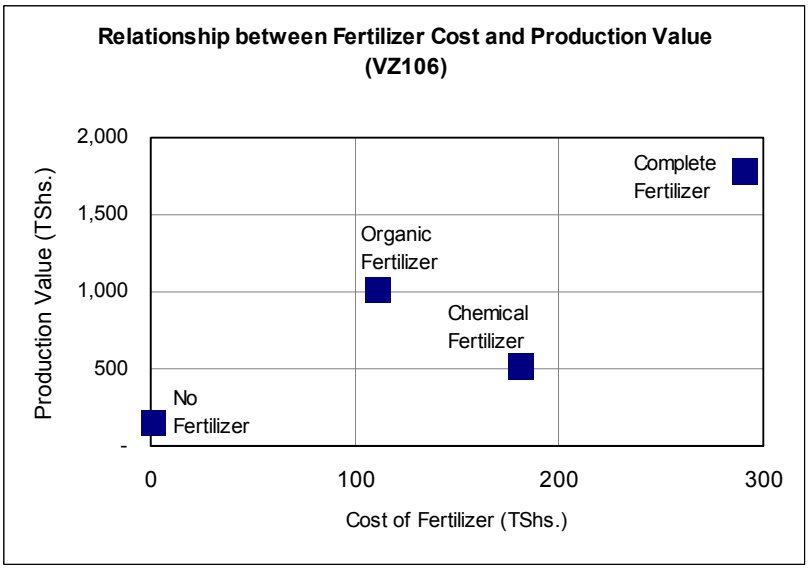
Although general performance in conducting trials was poor especially in recording crop performance, the results of the Okra cropping test is summarized in the following table.

Treatment	Viziwaziwa	Mwanabwito
General	4 operators cultivated okra. 1 operator recorded yield by treatment. Total harvest of Okra: 23 kg (VZ106)	4 operators cultivated okra. 3 operator recorded yield as a total. Total harvest of Okra: 6.5 kg (MB101) 29 kg (MB102) 54 kg (MB104)
Complete Fertiliser	**Best** growth/harvest. High growth. Higher and better yield. (100 % yield at VZ106)	**Best** growth/harvest. High growth rate. Higher and better yield.
Chemical Fertiliser	**3rd** growth/harvest. Poor growth. Low yield. (30 % yield at VZ106)	**2nd** growth/harvest. High growth rate. Early pods mortality. High and good yield.
Organic Fertiliser	**2nd** growth/harvest. Good growth. Good fruit quality. (57 % yield at VZ106)	**3rd** growth/harvest. Good growth. Moderate yield.
No Fertiliser	**Worst** growth/harvest. Very poor growth. Very low yield. (9 % yield at VZ106)	**Worst** growth/harvest. Stunted growth. Yellowing of leaves.

The total production of Okra from the four 5-m ridges (64 plants) was 23 kg at the well-managed plot in Viziwaziwa. While, the average production of three plots in Mwanabwito was 30 kg. This may show that he soil productivity in Mwanabwito is higher than Viziwaziwa. The No Fertiliser plots in Viziwaziwa could produce less than 10 % of the Complete Fertiliser plots, while in Mwanabwito the No Fertiliser plots could produce more. The difference between the villages might be caused by very poor soil fertility in Viziwaziwa compared with Mwanabwito.

The order of harvest between Chemical Fertiliser plots and Organic Fertiliser plots differed by site. In case of Viziwaziwa, chemical fertiliser got higher response than organic fertiliser. The plots in Mwanabwito showed reverse order of effect (no reliable data). For each ridge, the cost of chicken manure (2.15 bag) was about TShs. 110, while NPK (0.4 kg) and CAN (0.2 kg) was about TShs.180.

Only VZ106 plot has recorded the production amount and total sales value. In case of VZ106, the relationship between production value and fertiliser cost can be analysed as shown in the following chart and table.



	Complete Fertiliser	Chemical Fertiliser	Organic Fertiliser	No Fertiliser
Production Value (TShs.)	1,792	529	1,021	158
Fertiliser Cost (TShs.)	290	180	110	0
Cost-Effectiveness* (TShs)	5.6	2.1	7.8	-

Note*: Increment by fertiliser cost of TShs. 1.00.
= {(production of the treatment) - (production of No Fertiliser treatment)} / Fertiliser cost

From this tentative analysis, chicken manure seems to be more cost-effective than chemical fertiliser, at least in a poor soil condition.

4.3 Second Vegetable Cropping Test at Viziwaziwa and Mwanabwito

(1) Objective

- To observe the effectiveness of the fertiliser on Tomato in various field conditions.
- To test the adaptability of Onion and Carrot in various field conditions.

(2) Methodology

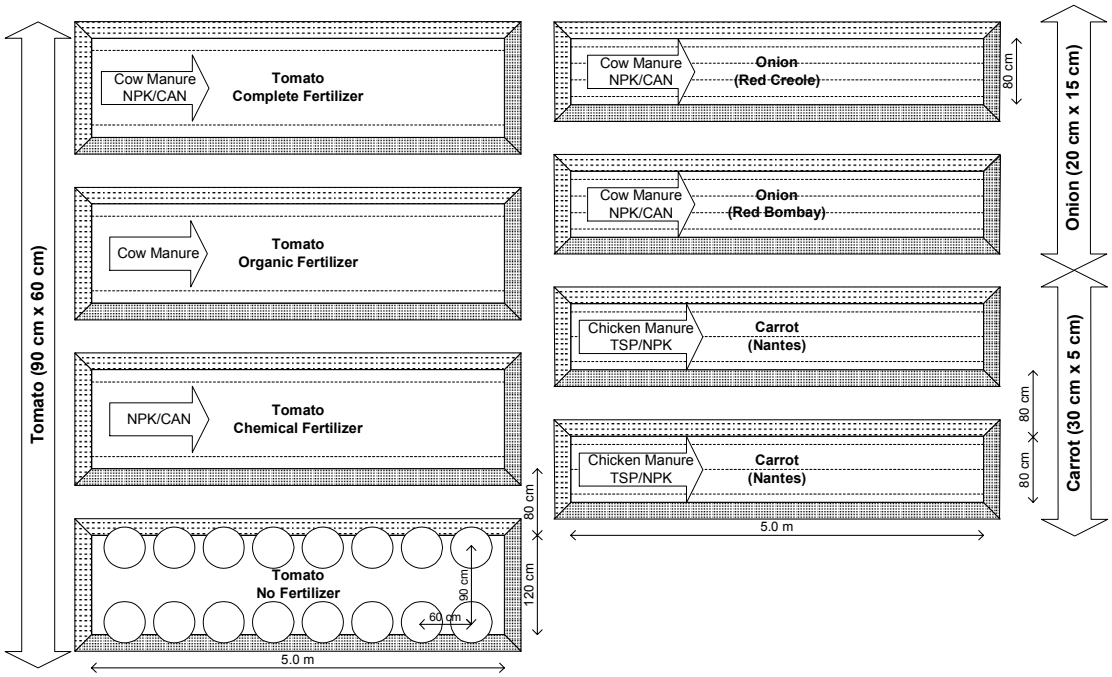
1) Site

- 7 sites in Viziwaziwa (sandy soils)
- 6 sites in Mwanabwito (fertile clayey soils)

2) Scale

- Tomato:
  4 ridges with 5.0 m length and 1.2 m width for Tomato
  Spacing of 60 cm by 90 cm
  16 plants a ridge

- Onion:
  2 ridges with 5.0 m length and 0.8 m width
  Spacing of 20 cm by 15 cm
- Carrot:
  2ridges with 5.0 m length and 0.8 m width
  Spacing of 30 cm by 5 cm



Instruction on Seeding of Carrot at VZ 205 (L) and of Onion at VZ202 (C), and Inspection of Plots of VZ204 (R)

3) Duration

- June 2002 to November 2002

4) Crop

- Tomato (Cal-J)
- Onion (Red Creole, Bombay Red)
- Carrot (Nantes)

5) Treatment for Tomato

- Complete fertiliser
- Chemical fertiliser
- Organic fertiliser
- No fertiliser

Design of Fertiliser Treatment

Crop/Treatment* / Input per 0.5 acre	Tomato			
	Complete F.	Chemical F.	Organic F.	No F.
Seed (g)	50	50	50	50
Chemical Fertiliser				
NPK 20-10-10 (kg)	80	80	-	-
CAN (kg)	40	40	-	-
Booster (lit)	0.8	0.8	-	-
Organic Fertiliser				
Chicken Manure (bag)	43	-	43	-
Insecticide				
Karate (lit)	0.5	0.5	0.5	0.5
Furadan (kg)	3	3	3	3
Fungicide				
Dithane M45 (kg)	3.6	3.6	3.6	3.6
Antacol Blue (kg)	-	-	-	-

6) Material

Seeds, Fertiliser, Chemicals and Watering Cans are provided to each participant by JICA team.
Sprayer (knapsack-type) is rented to each village.

7) Record Keeping

The extension officers support the daily operation of the experiments. The operators using the form provided by the JICA Study Team shall keep the daily activity record.

(3) Results

1) Information

- Generally speaking, the harvest of onion and carrot was very successful. Every plot could produce certain amount of the vegetables. The operators sold them in good prices.
- The average size of onion was about 7 cm in diameter. The maximum size was 11 cm at VZ201.
- The length of carrot was about 20 to 25 cm. Malformation on carrot was sometimes observed at some plots.
- The farm gate price of tomato was about TShs. 50 to 100 per kg at Viziwaziwa village in the term of September to October 2002.



Harvested Onion in Viziwaziwa (L, C) and Carrot in Mwanabwito (R)

2) Data Analysis

All individual harvesting data, as much as collected till November 2002, were tabulated in the following two tables.

Harvesting Data in Viziwaziwa (Unit: kg/5m-ridge)

	VZ201	VZ202	VZ203	VZ204	VZ205	VZ206	VZ207
Tomato (Cal-J)							
Complete Fertiliser	95.0	41.5	28.0	19.0	22.5	22.0	123.5
Chemical Fertiliser	95.5	17.3	19.0	13.5	8.5	10.5	124.8
Organic Fertiliser	65.0	19.0	10.0	13.0	26.0	19.0	78.5
No Fertiliser	51.5	17.5	9.0	7.0	2.5	4.0	94.5
Onion							
(Red Bombay)	36.0		8.0				
(Red Creole)	29.5		5.0				
Carrot (Nantes)							
Watering Everyday	31.5	15.0					
Watering Every 2 Days	27.0	8.0					

Harvesting Data in Mwanabwito (Unit: kg/5m-ridge)

	MB201	MB202	MB203	MB204	MB205	MB206	
Tomato (Cal-J)							
Complete Fertiliser	18.0	20.0	23.5	13.0	26.5	26.0	
Chemical Fertiliser	19.5	15.0	30.0	7.0	23.0	21.5	
Organic Fertiliser	19.5	39.0	25.5	8.0	12.5	17.5	
No Fertiliser	18.0	7.0	27.0	11.3	7.5	13.0	
Onion							
(Red Bombay)	14.0	15.0	9.0	13.0	10.0	10.0	
(Red Creole)	8.0	5.5	7.5	6.5	6.0	6.0	
Carrot (Nantes)							
Watering Everyday	16.0	20.0	11.0	11.0	25.0	10.0	
Watering Every 2 Days	18.0	20.0	12.0	16.0	25.0	14.0	

The individual data of harvesting was summarized to lead some findings from the tests. The summary data are shown in the following table.

Summary of Harvesting Data (Unit: kg/5m-ridge)

	Average VZ	Average VZ (1,7)	Average VZ (2-6)	Average MB	Average All
Tomato (Cal-J)					
Complete Fertiliser	50.2	109.3	26.6	21.2	36.8
Chemical Fertiliser	41.3	110.1	13.8	19.3	31.2
Organic Fertiliser	32.9	71.8	17.4	20.3	27.1
No Fertiliser	26.6	73.0	8.0	14.0	20.8
Average	37.8	91.0	16.4	18.7	29.0
Onion					
(Red Bombay)	22.0	36.0	8.0	11.8	14.4
(Red Creole)	17.3	29.5	5.0	6.6	9.3
Average	19.6	32.8	6.5	9.2	11.8
Carrot (Nantes)					
Watering Everyday	23.3	31.5	15.0	15.5	17.4
Watering Every 2 Days	17.5	27.0	8.0	17.5	17.5
Average	20.4	29.3	11.5	16.5	17.5

Due to the timing of the data collection, the harvesting data of onion and carrot were not accumulated to the JICA team. All data for Mwanabwito were collected by the VAEO and sent to the team.

The data on the fertiliser test of tomato gives the following findings.

- The yield on VZ201 and VZ207 was much higher than the other five plots in Viziwaziwa.
- These two plots run under good plant management, and their harvesting period was much longer than the others. As the effect of the organic fertiliser (basal dressing) could not last so long, the yield of that treatment was very low compared with the chemical fertiliser treatment (top dressing).
- In the two plots, the yield of the chemical fertiliser treatment was almost the almost the same as the complete fertiliser treatment. The effect of the top-dressing may determined the maximum yield under good crop husbandry.
- The other five plots in Viziwaziwa, the basal dressing of the organic fertiliser gives larger effects on the tomato production.
- The fertiliser effect in Mwanabwito, whose natural fertility is higher, was lower than that in Viziwaziwa.
- Generally, the yield of tomato in this cool period was much higher than the former test in the hot season.

The data on the crop adaptability test of onion and carrot gives the following findings.

- As for onion, the variety of Red Bombay performed better than Red Creole in all plots.
- The overall average yield was 14.4 kg/5m-ridge (18 ton/ha) for Red Bombay and 9.3 kg/5m-ridge (12 ton/ha) for Red Creole.
- The yield of onion in Viziwaziwa was higher than Mwanabwito. The reasons might be better crop husbandry in Viziwaziwa, coarse soil texture in Viziwaziwa, and so on.
- The overall average yield of carrot (Nantes) was 17.5 kg/5m-ridge (22 ton/ha) in this period.

The data on the watering interval test of carrot gives the following findings.

- The yield of everyday watering treatment is higher than of 1/2-day watering treatment in Viziwaziwa.
- On the contrary, the yield of everyday watering treatment is lower than of 1/2-day watering treatment in Mwanabwito.
- The difference might occur due to soil texture or water-holding capacity of soils.

4.4 Third Vegetable Cropping Test at Viziwaziwa and Mwanabwito

(1) Objective

- To observe the effectiveness of the fertiliser on Tomato in various field conditions.
- To test the adaptability of Tomato (Tanya) in various field conditions.

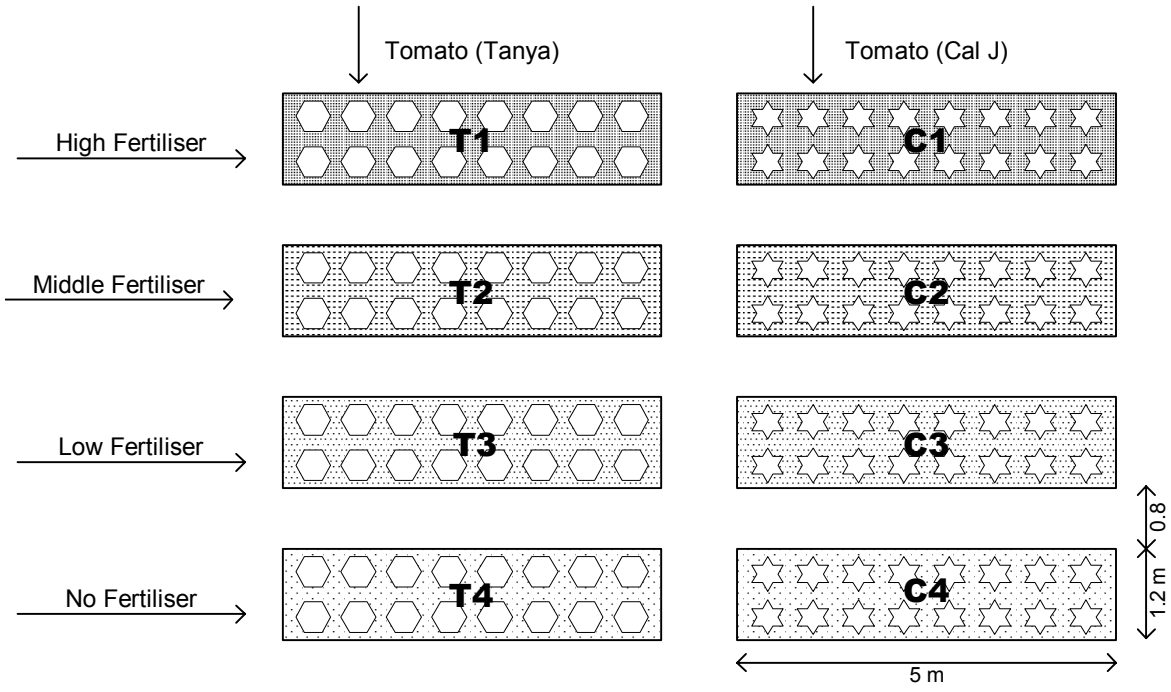
(2) Methodology

1) Site

- 6 sites in Viziwaziwa (sandy soils)
- 6 sites in Mwanabwito (fertile clayey soils)

2) Scale

- Tomato (Tanya, Cal J):
  8 ridges with 5.0 m length and 1.2 m width for Tomato
  Spacing of 60 cm by 90 cm
  16 plants a ridge



3) Duration

- November 2002 to March 2003

4) Crop

- Tomato (Tanya)
- Tomato (Cal-J)

5) Treatment of Fertiliser

- High fertiliser
- Middle fertiliser
- Low fertiliser
- No fertiliser

Design of Fertiliser Treatment

Crop/Treatment* / Input per 0.5 acre	Tomato			
	High F.	Middle F.	Low F.	No F.
Seed (g)	40	40	40	40
Organic Fertiliser				
Chicken Manure (bag)	30	20	10	0
Chemical Fertiliser				
NPK 20-10-10 (kg)	60	40	20	0
CAN (kg)	30	20	10	0
Booster (lit)				0
Insecticide				
Furadan (kg)	3	3	3	3
Karate (lit)	0.5	0.5	0.5	0.5
Fungicide				
Dithane M45 (kg)	3.6	3.6	3.6	3.6

6) Material

- Seeds, Fertiliser, Chemicals and Watering Cans are provided to each participant by JICA team.
- Sprayer (knapsack-type) is rented to each village.

7) Record Keeping

The extension officers support the daily operation of the experiments. The daily activity record shall be kept by the operators using the form provided by the JICA Study Team.

(3) Results

1) General

All necessary materials have been distributed to the operators in November 2002. All operators have prepared seedlings of tomatoes. The demonstration of fertiliser application was carried out at Viziwaziwa and Mwanabwito at the end of November.

Nursery Bed of Tomato at MB301 (L),
Demonstration of Land Preparation (C) and Manure Application (R) at VZ301

Unfortunately, there was heavy rain in early January 2003, and tomatoes were damaged by flood at two sites of Viziwaziwa and one site of Mwanabwito. After that, the dry and hot weather suffered the growth of tomatoes. Therefore, no reliable data were taken in this season. Generally, Tanya variety was damaged by heat stress, and Cal-J variety was damaged by the disease (Black Spot).

2) Harvesting Record

VZ301 Mr. Mohamed Abdallah

Date	Tanya				Cal-J			
	High F.	Middle F.	Low F.	No F.	High F.	Middle F.	Low F.	No F.
Feb 02	0.50 kg	- kg	0.50 kg	- kg	2.00 kg	1.00 kg	1.50 kg	1.00 kg
Feb 07	1.00 kg	0.75 kg	0.75 kg	0.50 kg	3.25 kg	2.00 kg	2.75 kg	2.00 kg
Feb 11	0.75 kg	0.50 kg	0.25 kg	0.50 kg	1.00 kg	1.00 kg	0.75 kg	1.00 kg
Feb 19	1.00 kg	0.75 kg	- kg	- kg	1.00 kg	0.75 kg	0.25 kg	0.75 kg
Total	3.25 kg	2.00 kg	1.50 kg	1.00 kg	7.25 kg	4.75 kg	5.25 kg	4.75 kg

VZ302 Mr. Mohamed Kazumari

Date	Tanya				Cal-J			
	High F.	Middle F.	Low F.	No F.	High F.	Middle F.	Low F.	No F.
Feb 01	1.00 kg	0.50 kg	0.25 kg	- kg	1.25 kg	0.25 kg	- kg	- kg
Feb 05	1.25 kg	0.50 kg	0.25 kg	0.50 kg	2.00 kg	1.50 kg	1.00 kg	- kg
Mar 09	0.50 kg	0.25 kg	- kg	0.25 kg	0.75 kg	0.50 kg	- kg	- kg
Mar 12	1.00 kg	0.50 kg	0.25 kg	0.50 kg	2.50 kg	1.00 kg	0.75 kg	0.50 kg
Mar 18	1.25 kg	0.75 kg	0.50 kg	0.25 kg	2.00 kg	1.00 kg	0.25 kg	- kg
Total	5.00 kg	2.50 kg	1.25 kg	1.50 kg	8.50 kg	4.25 kg	2.00 kg	0.50 kg

VZ303 Mr. Rashidi Omari

No harvest due to flood on January 1.

VZ304 Mr. Hiyari Mzee

No harvest due to flood on January 1.

VZ305 Mr. Dunia Iddi

No harvest due to flood on January 1.

VZ306 Mr. Maneno Hassan

Date	Tanya				Cal-J			
	High F.	Middle F.	Low F.	No F.	High F.	Middle F.	Low F.	No F.
Feb 17	- kg	- kg	- kg	- kg	0.03 kg	0.12 kg	- kg	- kg
Feb 19	- kg	- kg	- kg	- kg	0.12 kg	0.60 kg	0.03 kg	- kg
Feb 21	0.08 kg	0.04 kg	0.25 kg	- kg	1.25 kg	1.00 kg	0.50 kg	- kg
Feb 23	0.04 kg	0.04 kg	0.25 kg	- kg	1.25 kg	1.50 kg	0.50 kg	- kg
Feb 25	1.50 kg	0.25 kg	0.08 kg	- kg	1.00 kg	0.50 kg	0.25 kg	- kg
Feb 27	1.00 kg	0.25 kg	0.04 kg	- kg	1.00 kg	0.50 kg	0.25 kg	- kg
Mar 01	1.00 kg	0.08 kg	0.08 kg	- kg	1.25 kg	0.09 kg	0.06 kg	- kg
Mar 03	0.32 kg	0.12 kg	0.04 kg	- kg	0.18 kg	0.12 kg	0.06 kg	- kg
Mar 05	0.24 kg	0.12 kg	0.04 kg	- kg	0.18 kg	0.06 kg	0.06 kg	- kg
Mar 07	0.16 kg	0.12 kg	0.04 kg	- kg	0.12 kg	0.03 kg	0.03 kg	- kg
Total	4.34 kg	1.02 kg	0.82 kg	0.00 kg	6.38 kg	4.52 kg	1.74 kg	0.00 kg

MB301 Mr. Pazi Sanze

Date	Tanya				Cal-J			
	High F.	Middle F.	Low F.	No F.	High F.	Middle F.	Low F.	No F.
Feb 10	- kg	- kg	- kg	- kg	0.06 kg	0.06 kg	0.06 kg	0.06 kg
Feb 15	- kg	- kg	- kg	- kg	- kg	0.25 kg	0.50 kg	0.25 kg
Feb 18	- kg	- kg	- kg	- kg	- kg	0.75 kg	1.00 kg	0.25 kg
Feb 22	- kg	- kg	0.12 kg	- kg	0.06 kg	1.00 kg	1.50 kg	0.25 kg
Feb 26	- kg	- kg	0.24 kg	- kg	0.30 kg	1.50 kg	2.00 kg	0.50 kg
Mar 02	0.25 kg	0.16 kg	0.16 kg	- kg	0.50 kg	2.00 kg	2.00 kg	1.50 kg
Mar 06	- kg	- kg	- kg	- kg	0.50 kg	1.50 kg	1.50 kg	1.00 kg
Total	0.25 kg	0.16 kg	0.52 kg	0.00 kg	1.42 kg	6.81 kg	8.56 kg	3.81 kg

MB302 Mr. Amri Kibwana

Did not harvest anything as there were many deaths to plants due to wilting problems and a few plants that remained could not produce any fruits due to heat stress (both flowering and fruiting were affected by very high temperature).

MB303 Mr. Maulidi Rubawa

Did not harvest anything as the plants were attacked by mosaic virus disease at a flowering stage.

MB304 Mr. Rajabu Magaila

Date	Tanya				Cal-J			
	High F.	Middle F.	Low F.	No F.	High F.	Middle F.	Low F.	No F.
Feb 22	0.50 kg	0.50 kg	0.25 kg	- kg	1.00 kg	0.75 kg	0.25 kg	- kg
Feb 26	1.50 kg	0.75 kg	0.25 kg	- kg	2.50 kg	1.25 kg	0.75 kg	0.25 kg
Mar 03	4.00 kg	2.00 kg	1.50 kg	0.50 kg	3.00 kg	2.75 kg	2.25 kg	- kg
Mar 06	4.00 kg	2.25 kg	2.00 kg	- kg	3.50 kg	2.75 kg	2.25 kg	- kg
Mar 10	2.50 kg	1.50 kg	1.00 kg	- kg	2.75 kg	2.00 kg	2.00 kg	- kg
Mar 14	1.25 kg	1.00 kg	0.50 kg	- kg	1.50 kg	1.00 kg	0.75 kg	- kg
Total	13.75 kg	8.00 kg	5.50 kg	0.50 kg	14.25 kg	10.50 kg	8.25 kg	0.25 kg

MB305 Mr. Kongeza Mfunda

He remained with only 39 plants after flood destroyed all of the rest of them resulted by the January heavy rain. All of the remaining plants were Cal-J and the applied the high rate of fertilisers.

MB306 Mr. Mintanga Kalega

Did not participate as he had family problems.

Reference: Zegereni

Date	Tanya				Cal-J			
	High F.	Middle F.	Low F.	No F.	High F.	Middle F.	Low F.	No F.
Jan 31	- kg	- kg	0.25 kg	0.05 kg	0.50 kg	0.75 kg	0.25 kg	0.75 kg
Feb 03	- kg	- kg	0.05 kg	0.05 kg	0.30 kg	0.65 kg	0.45 kg	0.80 kg
Feb 05	- kg	- kg	- kg	- kg	0.25 kg	0.60 kg	0.45 kg	0.60 kg
Feb 07	- kg	0.05 kg	- kg	0.25 kg	0.45 kg	0.80 kg	0.65 kg	0.95 kg
Feb 10	0.15 kg	1.00 kg	1.00 kg	0.30 kg	0.85 kg	1.50 kg	0.95 kg	0.35 kg
Feb 13	0.70 kg	2.00 kg	2.00 kg	0.75 kg	1.65 kg	1.90 kg	1.50 kg	1.60 kg
Feb 17	1.70 kg	1.60 kg	1.70 kg	0.70 kg	1.10 kg	1.60 kg	1.00 kg	1.90 kg
Feb 21	2.70 kg	2.85 kg	2.80 kg	0.80 kg	0.65 kg	1.50 kg	1.10 kg	0.60 kg
Feb 24	1.45 kg	1.50 kg	1.00 kg	0.40 kg	0.40 kg	0.40 kg	0.70 kg	0.20 kg
Feb 28	0.50 kg	0.90 kg	0.25 kg	0.10 kg	- kg	- kg	- kg	- kg
Mar 03	0.40 kg	0.10 kg	0.10 kg	- kg	0.25 kg	0.40 kg	0.20 kg	- kg
Total	7.60 kg	10.00 kg	9.15 kg	3.40 kg	6.40 kg	10.10 kg	7.25 kg	7.75 kg

3) Summary and Analysis

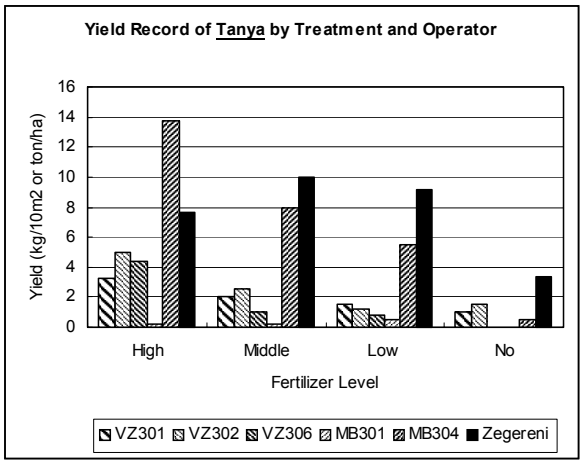
- The performance of Tanya in the field was poor both in growth and production due to being affected by high temperature persisted in the period.

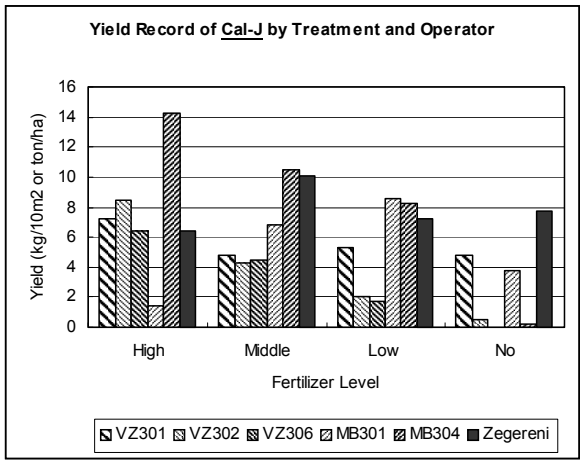
- The high temperature also affected the performance of Cal-J both in growth and production, but the situation was better than Tanya. The varieties developed in Tengeru (Arusha) such as Tanya and Tengeru 97 are not suitable in the hot season of Coast region. Those varieties should be carefully selected for the cool season, because the performance in the last cool season was better.

- The Blossom-end Rot attack on fruits formed in the plants was more severe on Cal-J than on Tanya, although the total number of final number of fruits harvested in Cal-J was better than in Tanya.

- Production was also affected by poor flowering caused by heat stress due to high temperature in the period.

- The harvesting data was taken from three plots of Viziwaziwa, two plots of Mwanabwito and Zegereni farm. The summary of the harvest was illustrated in the following char and also tabulated in the following table.



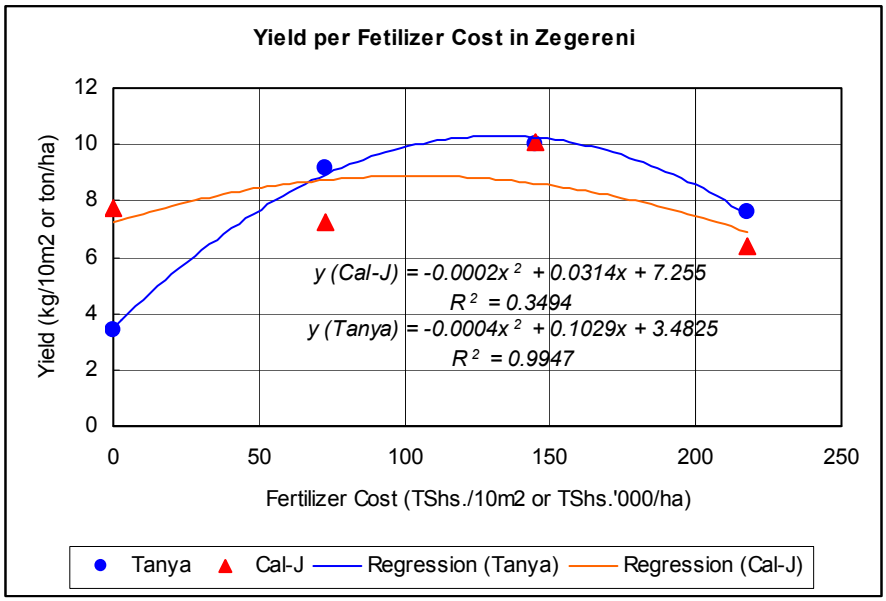


Site	Total Harvest (Tanya)				Total Harvest (Cal-J)			
	High F.	Middle F.	Low F.	No F.	High F.	Middle F.	Low F.	No F.
VZ301	3.25	2.00	1.50	1.00	7.25	4.75	5.25	4.75
VZ302	5.00	2.50	1.25	1.50	8.50	4.25	2.00	0.50
VZ306	4.34	1.02	0.82	0.00	6.38	4.52	1.74	0.00
Average - Viziwaziwa	**4.20**	**1.84**	**1.19**	**0.83**	**7.38**	**4.51**	**3.00**	**1.75**
MB301	0.25	0.16	0.52	0.00	1.42	6.81	8.56	3.81
MB304	13.75	8.00	5.50	0.50	14.25	10.50	8.25	0.25
Average - Mwanabwito	**7.00**	**4.08**	**3.01**	**0.25**	**7.84**	**8.66**	**8.41**	**2.03**
Zegereni	**7.60**	**10.00**	**9.15**	**3.40**	**6.40**	**10.10**	**7.25**	**7.75**

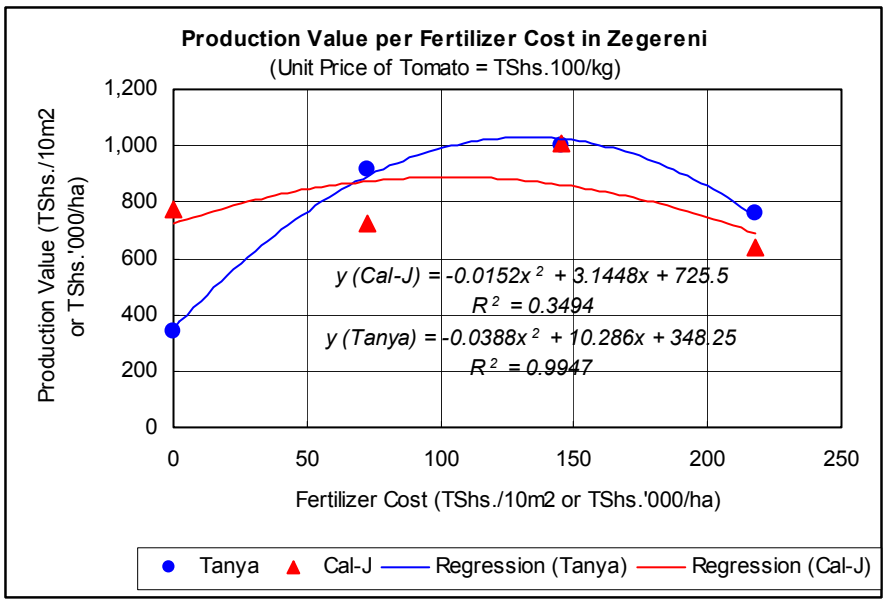
- The harvesting record above can be read as yield in kg per 10 m^2 (5 m * 2 m) or ton per ha. The average yield of tomatoes is 7.8 ton/ha in Tanzania, according to the FAO statistics. Roughly speaking, therefore, the harvest at Zegereni is the standard level but the harvest at other sites is lower than the average.

- The data in Mwanabwito was very different between two operators, while the data in Viziwaziwa was not different so much among three operators.

- The yield response by fertiliser was analysed using the data from Zegereni farm, which might be most reliable. The yield of both Tanya and Cal-J under the high fertiliser level was lower than under the middle and low fertiliser level. The yield of the middle fertiliser level was the best. According the regression shown in the following chart, the maximum yield can be obtain at 10.1 ton/ha under TShs. 133,000 /ha fertiliser level for Tanya and at 8.4 ton/ha under TShs. 103,000 /ha fertiliser level for Cal-J.



- The most profitable fertiliser level is also analyzed on the same data. Assuming the unit price of tomatoes at TShs. 100 /kg, the chart can be redrawn as shown below. On the new regressions, the point at the inclination of 1 ($\Delta y = 1$) shows the most profitable point. The most profitable fertiliser level is estimated at TShs. 120,000 /ha when the return is TShs. 1,024,000 /ha for Tanya, and at TShs. 71,000 /ha when the return is TShs. 872,000 /ha for Tanya. The additional input cost for seeds and agro-chemicals was about TShs. 300,000 /ha for all treatments.



Variety	Regression	Differential Equation	Δy = 0		Δy = 1	
			x	y	x	y
Tanya	$y = -0.0388x^2 + 10.286x + 348.25$	$\Delta y = -0.0766x + 10.286$	133	1,034	120	1,024
Cal-J	$y = -0.0152x^2 + 3.1448\,x + 725.5$	$\Delta y = -0.0304x + 3.1448$	103	888	71	872

- The analysis above was made under the very limited condition in terms of weather, soil condition, treatment, and crop husbandry. These kinds of data should be accumulated to the

district office and then analyzed more carefully to determine the standard input level for certain conditions.

- The average weight of fruits was 41 g for Tanya and 28 g for Cal-J, according to the data from Zegereni.

4.5 Fourth Vegetable Cropping Test at Viziwaziwa and Mwanabwito

(1) Objective

- To observe the effectiveness of the fertiliser on Tomato in various field conditions.
- To test the adaptability of Tomato (Tanya) in various field conditions.
- To test the adaptability of Garlic and Watermelon in various field conditions.

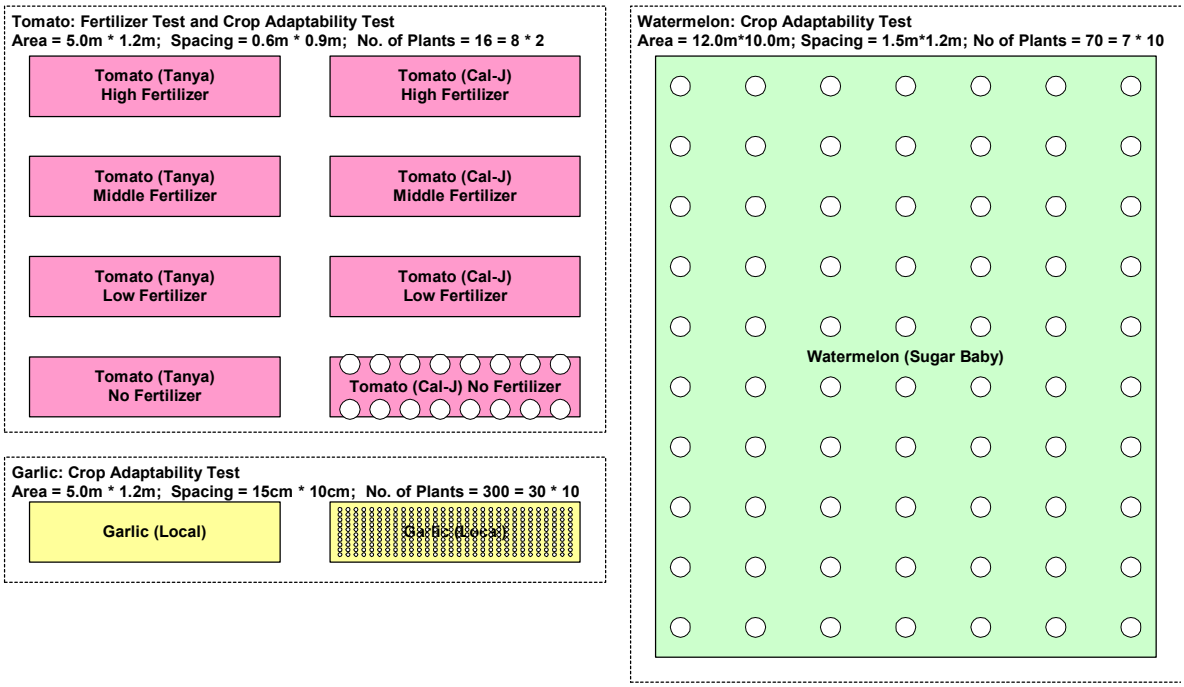
(2) Methodology

1) Site

- 5 sites in Viziwaziwa (sandy soils)
- 6 sites in Mwanabwito (fertile clayey soils)

2) Scale

- Tomato (Tanya, Cal J):
  8 ridges with 5.0 m length and 1.2 m width for Tomato
  Spacing of 60 cm by 90 cm
  16 plants a ridge
- Garlic:
  2 ridges with 5.0 m length and 1.2 m width for Garlic
  Spacing of 60 cm by 90 cm
  300 plants a ridge
- Watermelon: 1 plot with 12 m length and 10 m width, 70 plants a plot



3) Duration

- July 2003 to November 2003

4) Crop

- Tomato (Tanya)
- Tomato (Cal-J)
- Watermelon (Sugar Baby)
- Garlic (Unknown variety)

5) Treatment of Fertiliser for Tomato

The treatment of fertiliser for tomatoes was the same as the 3rd experiments.

- High fertiliser
- Middle fertiliser
- Low fertiliser
- No fertiliser

6) Material

- Seeds, Fertiliser, Chemicals and Watering Cans are provided to each participant by JICA team.
- Sprayer (knapsack-type) is rented to each village.

7) Record Keeping

The extension officers support the daily operation of the experiments. The daily activity record shall

be kept by the operators using the form provided by the JICA Study Team.

(3) Results

All necessary materials have been distributed to the operators in July 2003. All operators have prepared seedlings of tomatoes and plots of garlic and watermelon. The demonstration of fertiliser application was carried out at Viziwaziwa and Mwanabwito in July.

The field inspections were made at the end of August and at the end of September 2003. The progress of the cropping tests

VZ401 Abdallah Mohamed

Working Records (up to the end of August 2003)

	Tomato	Garlic	Watermelon
01-07-03	Land preparation	Land preparation	Land preparation
02-07-03		Land preparation	Land preparation
03-07-03	Nursery (sowing seeds)		
07-07-03		Planting (sewing direct)	Planting (sewing direct)
09-07-03			Manure application
10-07-03	Demolishing the last beds and prepare new ones	Land preparation beds	
14-07-03			Sowing direct
19-07-03	Preparation of new beds	Chicken manure application	
22-07-03	Spraying of Selecron & Dithane		
27-07-03			Spraying Selecron to watermelon
29-07-03	Chicken manure application	Replacement	Replacement
30-07-03	Transplanting		
10-08-03	CAN and spraying of Selecron & Dithane		Weeding, application of CAN, and spraying Selecron & Dithane
19-08-03	Selecron & Dithane	Application spraying Selecron & Dithane	Application spraying Selecron & Dithane
23-08-03		Weeding	
26-08-03	Selecron & Dithane		

Inspection Record of Crops (at the end of September 2003)

Tomato:

The crop is in flowering stage.

In performance Tanya is better than Cal J as far as fruiting is concerned.

	Tanya	Cal-J
No fertiliser	poor condition due to poor general plants performance leaf curling main reasons. One plant affected by wilting.	situation or condition of the crop is bad the plants have wilting problem.
Low fertiliser	fruiting is satisfactory but these are some leaf yellowing. One plant is about to wilt.	Situation is as above.
Middle fertiliser	same performance or condition as previous (low rate).	Fruiting is good but there are some plants wilting 5 plants have been affected.

	Tanya	Cal-J
High fertiliser	performance is not as good as the previous two (middle and low rate). Fruit size and number is reduced, may be due to leaf folding. One plant is affected by mosaic.	Fruiting is not as good as previous bed (middle rate) due to higher rate of plants wilting 9 plants are affected. In addition, there is some leaf curling.

Garlic:

Good performance, germination was good. There are three beds. The crop is in young stage.

Watermelon:

Good performance, plants are in young stage.

VZ402 Mohamed Kazumari

Working Records (up to the end of August 2003)

	Tomato	Garlic	Watermelon
01-07-03			Land preparation
04-07-03			Sewing direct
06-07-03			Application of manure
09-07-03			Direct Sowing
11-07-03	Land preparation	Land preparation	
12-07-03	Land preparation		
16-07-03		Application of manure	
20-07-03	Nursery sewing seeds		
28-07-03	Application manure		
04-07-03	Transplanting the plants		
21-07-03	Application CAN, Selecron & Dithane		
05-08-03			Application of CAN Selecron & Dithane
21-08-03		Replacement Spraying Selecron & Dithane	NPK Selecron & Dithane

Inspection Record of Crops (at the end of September 2003)

Abandoned the experimental plots activities due to;

- wilting of plants in tomato,
- melon flies, and
- poor germination in garlic.

VZ403 Ramadhani Pazi

Working Records (up to the end of August 2003)

	Tomato	Garlic	Watermelon
10-07-03	Land preparation	Land preparation	
11-07-03	Nursery seed	Cow manure	Poultry manure
12-08-03	Poultry application		
15-07-03		Planting seeds directly	Planting seeds directly

	Tomato	Garlic	Watermelon
30-07-03		Spraying Selecron & Dithane	CAN application, Spraying Antacol Blue & Selecron and weeding
18-08-03	Transplanting		
25-08-03	Spraying Selecron & Dithane	Gap filling	Spraying Antacol Blue

Inspection Record of Crops (at the end of September 2003)

Tomato:

As we did not meet the participants we could not identify the varieties or the rates of fertilisers according to beds for each variety for no labels for identification were forced. One variety, which seems to be Cal-J has these beds. With plants in good performance and one bed in poor performance plants. One variety which seems to be Tanya has plants with very poor condition and the plants are all almost dead. The reason on this portion having plants with poor condition maybe due to transplanting weak plants or seedlings accompanied by hot and dries conditions.

The tomato portion with good plants the crop is in flowering stage. Tomato plots is far from the plots with other crops and near the tomato plot with there is a well with a little amount of water.

Garlic:

Germination was good but plants are now almost dead due to not being watered, as there is completely no water in the wells for watering the plants.

Watermelon:

The crop is fruiting stage and the fruits are almost ready for consumption but there is no water for the plants and the crops is left unattended. The plants have serious blight infection as is left unattended.
In fact the crops will die soon.

VZ404 Ashura Kihawa & Fatuma Ally

Working Records (up to the end of August 2003)

	Tomato	Garlic	Watermelon
10-07-03			Land preparation
12-07-03			Apply poultry manure
14-07-03	Land preparation		Direct Sowing
15-07-03	Sowing nursery	Land preparation	
20-07-03		Direct Sowing	
30-07-03			Gap filling
10-08-03	Transplanting the plants		
26-08-03	Applications of CAN		

Inspection Record of Crops (at the end of September 2003)

Tomato:

	Tanya	Cal-J
No fertiliser	same as for cal-J explanation	Good foliage but fruits number and size small
Low fertiliser	More fruits in number and bigger	Good in both foliage and fruits (number and size)
Middle fertiliser	foliage and fruiting not as good as in previous rate due to be in higher ground and leaf miner attacks.	Good foliage and fruits number and size. Performance is better than the formers.
High fertiliser	Performance in fruiting the same as in middle rate but better in foliage appearance as leaf miner attacks not as severe as the former.	Foliage is not nice looking as in the former rates. Good fruits number but of small size. High ground may be the reason of this performance.

Performance in Cal-J is better than in Tanya in both fruiting and foliage appearance. Cal-J is in fruiting stage. There are more blight and leaf miner attacks in Tanya than in Cal-J.

Garlic:

In foliage producing stage or rather young stage. First sown or planted bulb portion good growth. Second sown or planted bulb portions poor growth.

Watermelon:

Performance is moderately good. Only quarter of the area is good and this maybe due to the area being in low ground. These quarters of the area, performance is poor and this maybe due to the area being in lower ground. The crop is in both fruiting and flowering stages.

VZ405 Maneno Hassan

Working Records (up to the end of August 2003)

	Tomato	Garlic	Watermelon
21-07-03	Land preparation		
11-07-03	Nursery beds and Poultry Applications		
14-07-03	Nursery seeds		
24-07-03			Land preparation
25-07-03			Poultry applications
28-07-03			Planting directly
05-08-03	Preparation beds and Application of Poultry		
10-08-03			Spraying Karate
11-08-03	Transplanting		
27-08-03	Application and Spraying Dithane & Selecron and application of CAN		Spraying Dithane & Selecron

Inspection Record of Crops (at the end of September 2003)

Tomato:

The crops is in fruiting and flowering stages.

Problems are leaf curling, leaf miner and poor plants watering due to inadequate water in wells. No advices were given as the participants were away during the visit.

Performance between the two varieties Tanya is better than Cal-J as fruiting in Cal-J was not as good as in Tanya due to more diseases attacks in Cal-J.

	Tanya	Cal-J
No fertiliser	Least performance	Least performance
Low fertiliser	performance better than the former	Better performance than the former in fruiting
Middle fertiliser	same as the former (low rate) foliage appearance but better in fruiting	Condition is poor. There is leaf curling and mosaic problems in many plants. Good plants have some nice fruits.
High fertiliser	Fruiting better than the former (Meddle fertiliser rate) but some plants have mosaic disease.	Condition is poor due to same reasons as for middle fertiliser rate but the condition here is poorer as apart of leaf curling and mosaic there are spaces with no plants and gap filling was not done.

Garlic:

Germination was poor. Watering is completely not done at all and the plants will all die very soon. There are 2 (two) beds.

Watermelon:

Grows well, it is in flowering and fruiting stages. There are some leaf miner and blight infestation.

MB401 Pazi Sanze

Mr. Pazi Sanze has abandoned his crops plots due to water shortage. The crops of tomato and watermelon and they are in fruiting stage. He has abandoned garlic due to negligence, as the crop is grown in another area where they're plenty of water (near the river). The garlic germination was very poor and there are very few plants in two beds. The crops are in young stage.

MB402 Amri Kibwana

Working Records (up to the end of August 2003)

	Tomato	Garlic	Watermelon
06-07-03	Land preparation		Land preparation
07-07-03	Sewing seeds to the nursery		Land preparation
08-07-03			Poultry application
09-07-03		Land preparation	
10-07-03			Spraying
11-07-03		Manure Application	

	Tomato	Garlic	Watermelon
12-07-03			Planting seeds
14-07-03	Spray application		Spraying Selecron and Dithane
15-07-03	1st planting seeds directly	1st planting seeds directly	
04-08-03	Poultry application		
06-08-03	Transplanting		
11-08-03		Weeding	
14-08-03	Selecron, Dithane and CAN application		
15-08-03	Selecron, Dithane and CAN application	2nd planting	
19-08-03	Weeding		
21-08-03	Spraying Selecron and Dithane	Spraying Selecron and Dithane	Spraying Selecron and Dithane
22-08-03	NPK Application		NPK Application
25-08-04	Spraying Selecron and Dithane	Spraying Selecron and Dithane	Spraying Selecron and Dithane
27-08-03	Spraying		
29-08-03	NPK Application		
30-08-03	Spraying Selecron & Dithane	Spraying Selecron & Dithane	Spraying Selecron & Dithane

Inspection Record of Crops (at the beginning of October 2003)

Tomato:

The crop is in fruiting stage.

	Tanya	Cal-J
No fertiliser	Condition poor in fruit number and size Problem – Leaf miner attacks.	Ordinary performance fruit number and size medium. Problems – Leaf miner attacks on leaves.
Low fertiliser	Condition better than the previous in fruit number and size. Problems – Leaf miner attacks	Condition is better than the previous in fruit number and size. Problems- Leaf miner and some blight.
Middle fertiliser	Condition better than the previous in fruit number and size. Problems – Leaf miner attacks	
High fertiliser	Best of all in fruit number and size. Problems – Leaf miner attacks	Condition the poorest of all in fruit number and size. Problems - Heavy leaf miner infection and some blight attacks. Tanya

Garlic:

Condition is not good due to high temperature and irregular watering. The germination was poor so the plants are few. The plants start bulbs formation. Advised to improve watering the crop to grow well.

Watermelon:

The crop condition is poor due to leaf miner and melon flies infestation. The crop has been abandoned due to the pest's infestation. The crop is in fruiting stage but melon flies have attacked all fruits. Apart of these problems it seems the husbandry was poor especially watering and chemicals spraying is not regularly.

Others:

Mr. Amri Kibwana has grown carrot as an extra crop. The crop grown well though there are some gaps in the two beds where the crop is grown. The crop starts roots formation.

MB403 Maulidi Kubawa

Working Records (up to the end of August 2003)

	Tomato	Garlic	Watermelon
07-07-03	Land preparation and nursery sowing seeds		Land preparation
08-07-03		Land preparation	
09-07-03			Poultry application
10-07-03		Manure application	
12-07-03			Planting seeds
13-07-03		1st planting seeds directly	
05-08-03	Poultry application	Weeding	Weeding
08-08-03	Transplanting		
09-08-03			CAN application
12-08-03		Spraying Dithane & Selecron	
16-08-03	Spraying	2nd gap filling	
22-08-03	CAN application		
23-08-03	Spraying		Spraying NPK
24-08-03		Spraying Dithane & Selecron	Spraying
30-08-03			Spraying
25-08-03		Poultry application	
30-08-03		Spraying Dithane & Selecron	

Inspection Record of Crops (at the beginning of October 2003)

Tomato:

Tomatoes are in fruiting stage.

	Tanya	Cal-J
No fertiliser	Poorest in fruiting and general plants performance. Stunted and yellow leaved plants. Fruiting (number and size small). Problems- leaf miner and blossom end.	the condition is poorest in growth and fruiting. Stunted and yellowish leaved plants. Problems - Leaf miner blossom end rot and ball worm attacks.
Low fertiliser	Condition better than the previous in fruit number and size plus general plants growth than the former. Problems- some blight on leaves	Condition is better in fruit number and size than the former. Problems- As above.
Middle fertiliser	Better Condition in fruiting (number and size.) Than the previous. Problems- some as above	Condition is better in fruiting (number and size.) Than the previous. Problems- As above.
High fertiliser	poor in fruit l (number and size.) the former may be due to more leaf miner attacks. Problems- As above.	High fertiliser rate – Best than all in (number and size.) Problems - As previous.

Garlic:

Performance of the crop is moderate. There is one bed. The bed is not full with plants due to poor germination initially. The crop is in young stage. Problem is elegant grasshopper attacks.

Watermelon:

Abandoned after heavy aphids infestation at flowering stage.

Advice given for improvements – spraying chemicals to check up pests and diseases attacks but the participant says as the previous one that the chemicals are finished.

MB404 Ramadani Mfunda

Working Records (up to the end of August 2003)

	Tomato	Garlic	Watermelon
07-07-03	Land preparation		
10-07-03		Land preparation	
12-07-03			Land preparation
14-07-03	Nursery sowing seed		
16-07-03	Land preparation	Manure application	
19-07-03		Land preparation	
20-07-03			Poultry application
23-08-03			Planting seeds directly
25-07-03		1st planting seeds directly	
29-08-03			Spraying Selecron
01-08-03	Spraying Selecron & Karate		
10-08-03		Spraying	Spraying Selecron & Karate
12-08-03	Spraying Selecron & Karate	Weeding	
15-08-03		2ndsowing and gap filling	
18-08-03		Spraying	Spraying Selecron & Karate
22-08-03	Gap filling		
24-08-03	Spraying Selecron & Karate	Spraying	
28-08-03	Transplanting seeds		
30-08-03		Spraying	

Inspection Record of Crops (at the beginning of October 2003)

Tomato:

Tomato and Watermelon have been abandoned due to heavy infestation of pests - Leaf miner on both and melon flies on watermelon. Both crops were in fruiting stage. During the first visit these crops were I very good condition and they were in flowering stage. The participant claims the chemicals (Selecron and karate were not effected).

Garlic:

It is in satisfactory condition there are two beds. The first bed performance better than the second. The first bed has stronger plants than the second. Two plantings had to be done due to poor germination in the first planting.

Problems - Cyprus sp. weeds have infested the second bed.

Advice given for improvement - Regular watering to the crop and frequent imp rooting by hand of Cyprus weeds.

Watermelon:

Abandoned.

MB405 Kongeza Mfunda

Working Records (up to the end of August 2003)

	Tomato	Garlic	Watermelon
07-07-03	Land preparation		
09-07-03	Planting nursery		
22-07-03			Land preparation
23-07-03	Land preparation		Direct Sowing
26-07-03		Land preparation	Replacement/gap filling
27-07-03	Transplanting		
31-07-03		Direct Sowing	Thinning
05-08-03	Application of CAN		
06-08-03	Spraying Dithane and karate		
27-08-03	Application of NPK	Direct Sowing	

Inspection Record of Crops (at the beginning of October 2003)

Tomato:

In end of flowering, fruiting, commencing fruits ripening and commencing harvesting.

Advice given for improvement – spraying chemicals against pests (ball worms and leaf miner) and diseases (mainly blight). Also recording the fruits harvested by weight for every treatment.

	Tanya	Cal-J
No fertiliser	condition is satisfactory in fruiting (number & size) Problems - some blight attacks on leaves.	Poor condition persists in fruiting (number & size) as compared with other treatments. Problems –some leaf yellowing
Low fertiliser	Condition better than the previous in fruit number & size. Problems- some blight on leaves	Condition better than the previous in fruit number & size. Problems- some blight attacks on leaf.
Middle fertiliser	Better condition in fruiting (number & size) Problems- some blight on leaves	in fruiting (number & size.) Condition better than the previous but foliage attacked more by blight than the former. Problems- some blight on leaves.
High fertiliser	Best performance in all (number & size.) Problems - some blight on leaves. Some leaf miner attacks on leaves and a few blossom ends rot attacks on fruits.	poorest performance than all and more attacks by blight. Problems – blight attacks on leaf.

General comments on Cal-J and Tanya:

Performance tomato varieties at Mwanabwito experimental plots only in Mr. Kongeza Mfunda plot the difference in performance between the two varies can be noted. The difference here is fruit quality. The Tanya variety has more fruits in number and size than the Simlaw Cal-J. In other participant's plots the difference is not easily noted as plants performance is much affected by leaf miner pest.

Garlic:

Condition not well due to poor germination initially - two plantings were done but there are few plants. There is irregular watering of plants due to water storage therefore plants growth is not good. The plants are in young stage.

Watermelon:

Condition is poor due to pests (Aphids, melon flies and leaf miner) and leaf yellowing. The crop has been abandoned and no activities are going on any more. The crop is in flowering and fruiting stages.

MB406 Mintanga Kalega

Working Records (up to the end of August 2003)

	Tomato	Garlic	Watermelon
04-07-03	Land preparation		Land preparation
05-07-03			Poultry application
06-07-03		Land preparation	
07-07-03	Nursery sowing seeds		
08-07-03			Planting seed directly
10-07-03		Manure application	
13-07-03		1st planting seeds directly	
26-07-03			Spraying Dithane & Selecron
30-07-03			Spraying Dithane & Selecron
05-08-03	Poultry application		
07-08-03			Application of CAN
09-08-03	Transplanting		
12-08-03		Spraying Dithane & karate	
14-08-03		Weeding 2nd planting/gap filling	
15-08-03		2nd planting/gap filling	Spraying Dithane & Selecron
19-08-03	Spraying Selecron & Dithane Application fertiliser CAN		
22-08-03			Spraying NPK
23-08-03	Weeding		
24-08-03	Spraying Selecron & Dithane	Spraying Dithane & karate	
27-08-03	Spraying NPK		
29-08-03			Spraying Dithane & Selecron
30-08-03	Spraying Selecron & Dithane	Spraying Dithane & karate	

Inspection Record of Crops (at the beginning of October 2003)

Tomato:

Tomatoes are in fruiting stage and bit of flowering.

	Tanya	Cal-J
No fertiliser	best in foliage appearance, as there are little leaf miner attacks but the poorest in fruit number and size. Problems-there is ball worm.	condition is good in fruiting (number and size) moderate. Problems- leaf miner and bale worms attacks.
Low fertiliser	Condition is better in fruit number and size. Problems- Leaf miner and blossom end rot.	poor than the former in fruit number and size. Problems- Leaf miner and blight attacks on leaves.
Middle fertiliser	Condition is better in fruiting (number and size.) Problems- Leaf miner and ball worm attacks.	poor than the former in fruiting (number and size) Problems- Leaf miner attacks most serious than all.
High fertiliser	Best than all in number and size. Problems- Leaf miner and ball worm attacks.	Condition best than all in number and size. Problems- some blossom ends rot attacks on fruits, leaf miner and blight attacks on leaves.

Garlic:

Condition is poor as the plants are weak and are few to poor germination initially. There is only one bed with plants.

Watermelon:

Condition is very poor the crop is in the flowering stage.

Problems - Melon flies, Leaf miner and elegant grasshoppers attacks. Elegant grasshoppers are in young stages but do a considerable damage to plants. The participants say the chemicals to spray the pests are finished.

4.6 Major Varieties of Vegetables

OKRA - CLEMSON SPINELESS

A robust plant that produces very long uniform pods that is spineless. Good yielder of quality pods of deep green colour. Larger framework than Pusa Sawani and later maturity.

Trans-plant Harvest Days	Seed Rate kg/ha	Row Width cm	Plant Spacing cm			
60	9	90	45			

OKRA - PUSA SAWANI

A fairly new variety of very early maturity, first picking in about 55-60 days. It is spineless and of reputable export quality. Heavy yielder tolerating dreadful diseases yellow vein mosaic. Pods are ribbed with smooth surface of dark green colour.

Trans-plant Harvest Days	Seed Rate kg/ha	Row Width cm	Plant Spacing cm			
55	9	90	45			

TOMATO (Processing) - CAL J

Very compact determinate variety. Processing type but also good table tomato. Tremendous vigour and high productivity. Tolerant to verticillium and fusarium wilts. Very suitable at lower warmer areas.

Trans-plant Harvest Days	Seed Rate kg/ha	Row Width cm	Plant Spacing cm	Fruit Size cm	Fruit Shape
65	0.2	90	45	Determinate	Square

TOMATO (Processing) - ROMA VF
An excellent processing variety suitable for canning whole or juice extraction. Verticillium and fusarium resistant. A scarlet, pear shaped fruit with thick meaty wall. Tolerant to cracking. High uniform yielder.

Trans-plant Harvest Days	Seed Rate kg/ha	Row Width cm	Plant Spacing cm	Fruit Size cm	Fruit Shape
70	0.2	90	45	Determinate	Pear shaped

TOMATO (Fresh) - MARGLOBE
A valuable variety, adapted to a wide range of climatic conditions. Highly productive and a value to market gardeners and canners. Medium long to large fruits rather blocky in shape. Fruits will set over a long period of time.

Trans-plant Harvest Days	Seed Rate kg/ha	Row Width cm	Plant Spacing cm	Fruit Size cm	Fruit Shape
65	0.2	90	60	Indeterminate	Globe

TOMATO (Fresh) - MONEY MAKER
Large and vigorous plant. Heavy yielder of medium size smooth solid bright red fruits. Firm flesh. Excellent gardeners variety.

Trans-plant Harvest Days	Seed Rate kg/ha	Row Width cm	Plant Spacing cm	Fruit Size cm	Fruit Shape
65	0.2	90	60	Indeterminate	Round

EGGPLANT - BLACK BEAUTY
A popular variety of large sized round fruits. Very glossy almost black in colour. Flesh white and very meaty. Keeps well after picking.

Trans-plant Harvest Days	Seed Rate kg/ha	Row Width cm	Plant Spacing cm	Fruit Size cm	Fruit Shape
100	0.4	75	60	15x2	Oval to heart shape

EGGPLANT - FLORIDA HIGH BUSH
High yielding, widely adapted variety. Plants are erect, with fruit borne off the ground. Fruits are large about 20 cm long 8 cm wide tapering towards the stem end, dark purple in colour. An ideal export variety.

Trans-plant Harvest Days	Seed Rate kg/ha	Row Width cm	Plant Spacing cm	Fruit Size cm	Fruit Shape
85	0.4	75	60	20x8	Elongate oval

EGGPLANT - EARLY LONG PURPLE

An early slicing variety. Plant tall, high yielding of long, club shaped dark purple fruits about 20 cm long 6 cm wide. Could be planted closer than either Black Beauty of Florida High Bush.

Trans-plant Harvest Days	Seed Rate kg/ha	Row Width cm	Plant Spacing cm	Fruit Size cm	Fruit Shape
85	0.4	75	60	20x6	Long cylindrical

ONION - RED CREOLE

One of the best available onion variety. Foliage highly resistant to "purple blotch". Bulbs are flat to thick flat shape. Flesh is hard and very pungent. The medium sized bulb store well if kept dry and well ventilated.

Maturity Day	Seed Rate kg/ha	Row Width cm	Plant Spacing cm	Fruit Texture Colour	Fresh Colour	Fruit Shape
165	3.5	30	10	Semi flat	Red	Red purple

ONION - BOMBAY RED

Good variety for home gardeners. Not "Blast" resistant but suitable for dry and warmer conditions. Small medium sized globe shaped, purplish red and pungent.

Maturity Day	Seed Rate kg/ha	Row Width cm	Plant Spacing cm	Fruit Texture Colour	Fresh Colour	Fruit Shape
160	3.5	30	10	Globe	Dark red	White purple

CARROT - NANTES

Cylindrical roots about 15 cm long with round shoulders and almost coreless. Flesh is of an orange sweet colour and tender. Excellent for home garden.

Maturity Day	Seed Rate kg/ha	Row Width cm	Plant Spacing cm	Fruit Texture Colour	Fresh Colour	Fruit Shape
80	4.5	30	5	Cylinder	Light orange	-

CARROT - CHANTENAY

This improved variety has a deeper and richer colour; large size roots than Nantes and more tapered with wider shoulders. Very heavy yielder as a table as well as for processing. The most popular carrot with market gardeners.

Maturity Day	Seed Rate kg/ha	Row Width cm	Plant Spacing cm	Fruit Texture Colour	Fresh Colour	Fruit Shape
82	4.5	30	5	Tapered	Dark orange	-

MELON - HONEY DEW

Almost round melon, rind, creamy white, smooth and hard without ribbing or netting. Flesh, pale appetizing green. Excellent quality.

Maturity Day	Seed Rate kg/ha	Row Width cm	Plant Spacing cm	Fruit Texture Colour	Fresh Colour	Fruit Shape
80	3.5	150	90	Smooth	Lime green	Oval

MELON - HALES

Early and large sized, almost round fruits heavily netted rind with greyish colour, flesh thick salmon coloured with excellent flavour. Suitable for the local market and home gardens. Powdery mildew tolerant.

Maturity Day	Seed Rate kg/ha	Row Width cm	Plant Spacing cm	Fruit Texture Colour	Fresh Colour	Fruit Shape
80	3.5	150	90	Netted	Salmon	Oval

Source: Web Page of Kenya Seed Company Co., Ltd.