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UNIDO REVISED FINAL REPORT

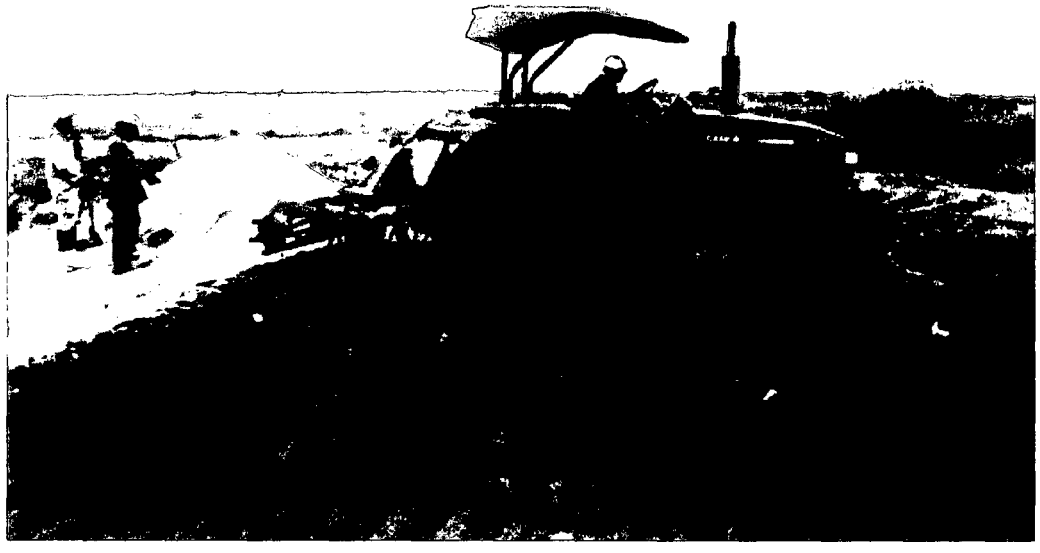
1. INTRODUCTION

The purpose of these trials, held at Legola Farm in Botswana, was to demonstrate the effectiveness of the three possible alternatives to the use of methylbromide in tomatoes grown in the open fields. The three alternatives were dazomet [B], soiless [C], and solarisation/ bio-fumigation [D]. Included with these treatments were, the chemical to be phased - out, MeBr. [A] and, plots for the usual tomato production method i.e. control [O].

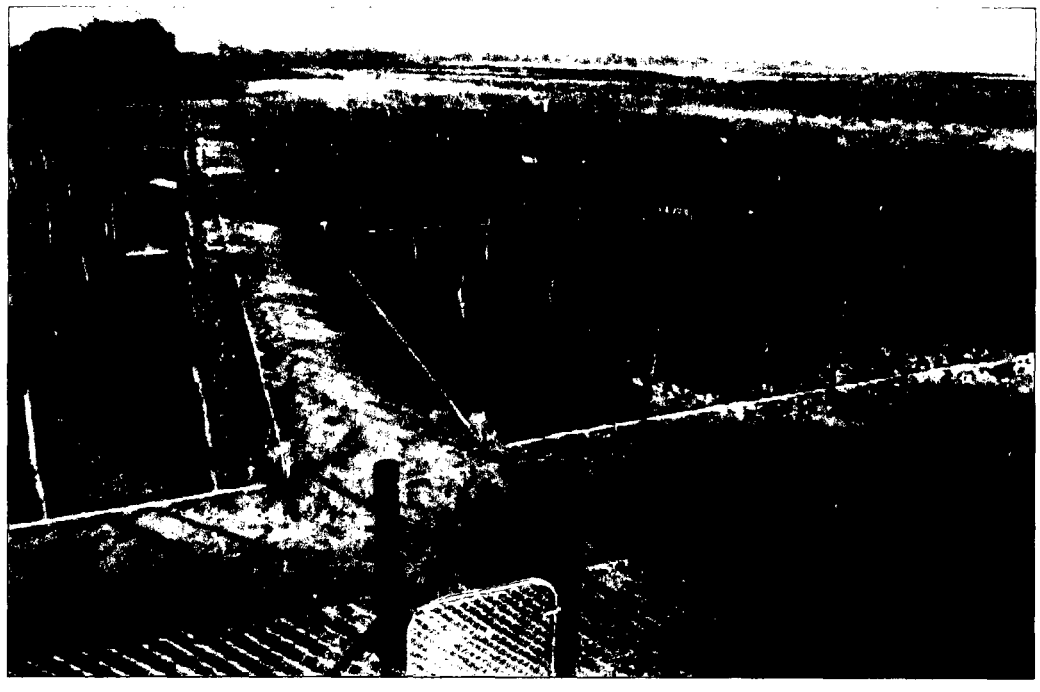
All the above treatments were replicated three times, all on eighty-six [86] square meters in the first year, 2000/2001. At the end of this growing season, an alternative suitable to our conditions would be selected. Based on the following crop management aspects, crop inputs used e.g. amount of basal and top dressing applied, pests and diseases identified, the type and quantities of chemicals used to control them and the yield per plot [both quantity and quality].

The chosen alternative would then be tried on a larger scale in the second year, 2001/2002.

LAND PREP YEAR ONE



AN ESTABLISHED CROP IN YEAR ONE



2.MATERIALS AND METHODOLOGY

a. Site Selection and Preparation

Year one: The experiment for this year was sited on virgin land [land that had never had crops on it] and approximately two hundred [200] meters away from land under crops. The land was cleared, levelled, plots marked and fenced with diamond mesh wire.

The plots were random sampled and allocated the following identification numbers;
1,10 and 13 soiless
2, 9 and 15 control
3, 6 and 14 dazomet
4, 7 and 11 bio-fumigation
5, 8 and 12 methylbromide

Year two;

Season	Crops planted	Variety planted
1998	rape and butternuts	English giant and Waltham
1999	tomato and cabbage	star 9006 and conquistador
2000	tomato	H.T.X.
2001	tomato	Star 9006
2002	tomato and green peppers	Star 9006 and capistrano

b. Soil Samples

Soil samples, for both year one and two, were taken in order to be able measure the nematode pressure and also the fertility of the soil before and after plot treatment.

Of these results, only those results showing how much basal fertilisers should be added to the soil, were submitted to this office and those for the nematodes were send to your office in Austria.

c. Experimental Details

YEAR TWO
Type of crop: Tomato

Variety planted: Star 9006

Date treated: 27/11/01

Date planted: 21/12/01

Plant spacing ; inter-row :1500mm.
in-row : 600mm.

Type of irrigation: drip @ 600mm@2 litres /hour

YEAR ONE
Type of crop: Tomato

Variety planted: Sundance

Date treated : 12/12/00

Date planted: 11/01/01

Plant spacing ; inter-row :1200mm.
in-row : 400mm.

Type of irrigation : drip @ 600mm@2 litres /hour

Fertilisation : All plots were applied the same base and top dressing fertilisers as follows;

* 21 kilograms 4:3:4
* 33 kilograms single superphosphate

Weekly applications
* 24 kilograms ammonium sulphate
* 5 kilograms potassium sulphate

* 6 kilograms 4:3:4
* 9 kilograms single superphosphate

Weekly applications
* 7 kilograms ammonium sulphate
* 3 kilograms potassium sulphate

Fertilisation: All plots were applied with the same base and top dressing fertilisers as follows:
* 21 kilograms 4:3:4
* 33 kilograms single superphosphate
* 800 kilograms ammonium sulphate
*170 kilograms potassium sulphate

3.CROP STATISTICS

The crop was harvested on a daily basis, and after harvesting the crop was graded into the three grades and recorded for accumulation into a monthly yield. At the end of the harvesting period the crop yield figures were analysed as follows:

Year one:

	Treatment	A	B	C	D	O	Month Totals
April	first	13.43	32.45	24.45	21.70	10.60	102.63
	second	12.35	22.50	13.20	10.70	12.35	71.10
	reject	5.26	9.75	4.70	4.35	5.10	29.16
May	first	481.5	487.58	620.05	488.02	494.85	2572.00
	second	419.90	396.33	315.11	422.85	415.55	1969.74
	reject	71.15	64.15	55.90	60.10	69.55	320.85
June	first	376.99	325.86	579.85	300.56	398.55	1981.81
	second	560.10	514.80	635.75	468.55	562.58	2741.78
	reject	121.75	94.55	113.35	113.00	108.85	551.50
July	first	0	0	0	0	0	0
	second	0	0	0	0	0	0
	reject	0	0	0	0	0	0
TOTAL YIELD PER TREATMENT		**2062.43**	**1947.97**	**2362.36**	**1889.83**	**2077.98**	
						Total yield for all treatments	**10340.57**

Year two:

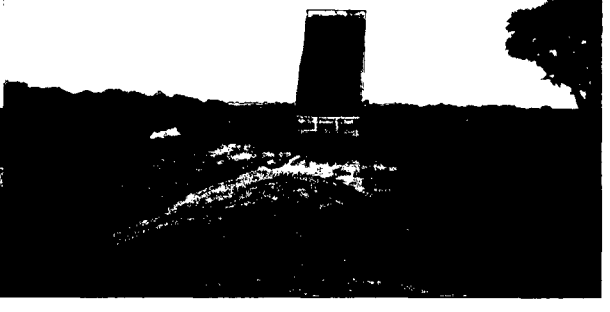
	SOILLLESS [C]			CONTROL [O]			
	first	second	reject	first	second	reject	Month Totals
March	228.65	380.29	44.95	854.11	854.18	151.40	2513.58
April	650.95	785.85	82.95	1177.15	1665.65	118.80	4481.35
May	452.10	526.64	22.55	152.80	316.65	20.80	1491.54
June	158.02	236.34	49.05	54.07	193.91	35.40	726.79
July	0	22.80	13.60	0	18.00	4.80	59.20
Yield per grade	1489.72	1951.92	213.1	2238.13	3048.39	331.20	
TOTAL YIELD PER TREATMENT			3654.74			5617.72	
					Total yield for all treatments		**9272.46**

Key :

O - Control
A - Methylbromide
B - Dazomet
C - Soiless
D - Solarisation/ Bio-fumigation

Planting Seedlings Year Two

Filling Plot for Soilless Year Two



4.STATISTICAL ANALYSIS YEAR ONE

AVERAGE PRODUCTION PER PLANT IN KILOGRAMS

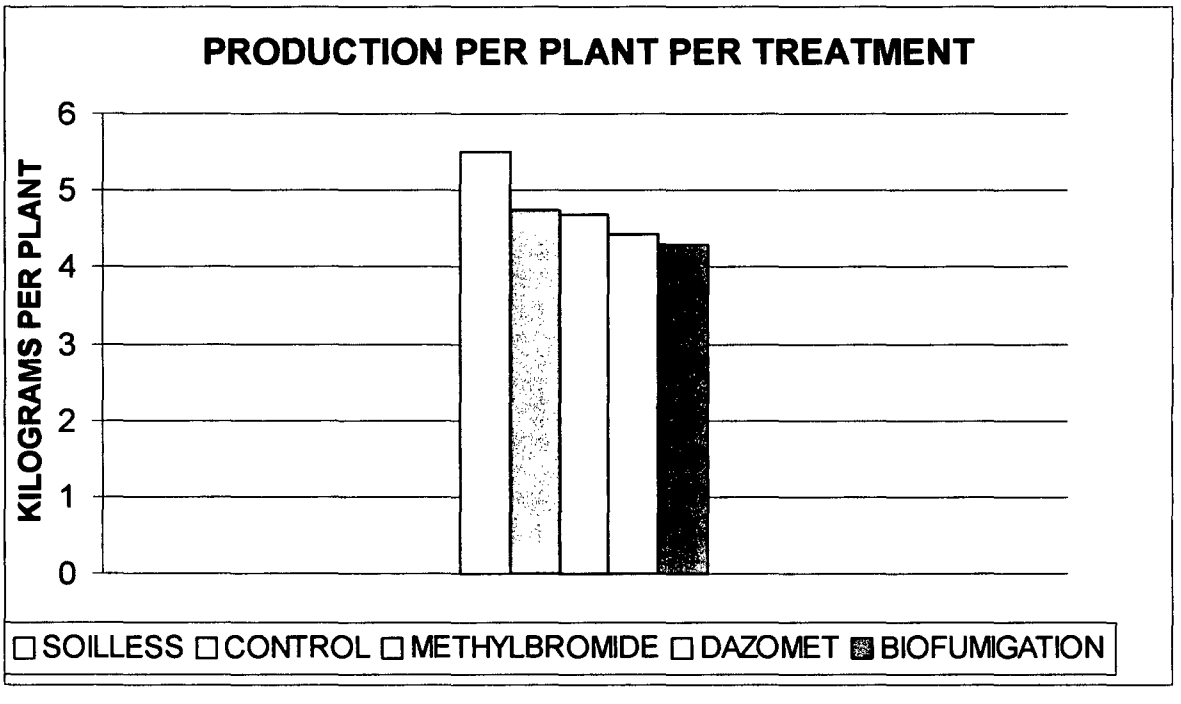
TREATMENT	PRODUCTION Kg./ PLANT	DUNCAN GROUPING 5%	1%
SOILLESS	5.50	a	a
CONTROL	4.74	a	a
METHYLBROMIDE	4.68	a	a
DAZOMET	4.42	b	a
BIOFUMIGATION	4.29	b	b

PERCENTAGE SECOND GRADE [%]

TREATMENT	PERCENTAGE %	DUNCAN GROUPING 5%	1%
METHYLBROMIDE	48.25	a	a
DAZOMET	48.11	a	a
CONTROL	47.97	a	a
BIOFUMIGATION	47.79	b	a
SOILLESS	40.69	b	b

PERCENTAGE REJECTS [%]

TREATMENT	PERCENTAGE %	DUNCAN GROUPING 5%	1%
METHYLBROMIDE	9.67	a	a
BIOFUMIGATION	9.40	ab	a
CONTROL	8.84	ab	a
DAZOMET	8.77	ab	a
SOILLESS	7.49	b	b



5.STATISTICAL ANALYSIS YEAR TWO

PRODUCTION PER PLANT IN KILOGRAMS

TREATMENT	PRODUCTION Kg/PLANT	DUNCAN GROUPING 5%	1%
CONTROL	6.18	a	a
SOILLESS	3.68	b	a

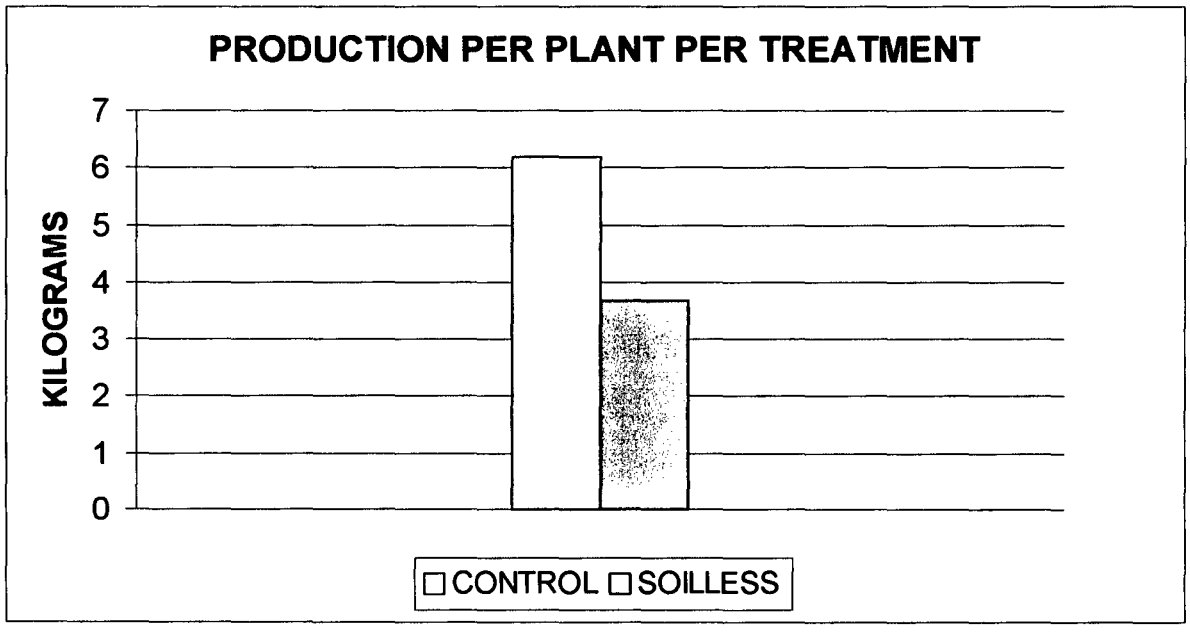
There is a clear difference at 5 % level.
Hence we can conclude , that with a 95 % certainty, the yield differences as recorded are as result of the treatment.

PERCENTAGE SECOND GRADE [%]

TREATMENT	PERCENTAGE %	DUNCAN GROUPING 5%	1%
CONTROL	58.78	a	a
SOILLESS	53.98	a	a

TREATMENT	PERCENTAGE %	DUNCAN GROUPING 5%	1%
CONTROL	18.51	a	a
SOILLESS	17.86	a	a

*** Treatments followed by a similar letter are not significantly different.**



6.PLOT LAY-OUT FOR YEAR ONE

N

Plot no: 1 **C**	Plot no: 6 **B**	Plot no: 11 **D**
Plot no: 2 **O**	Plot no: 7 **D**	Plot no: 12 **A**
Plot no: 3 **C**	Plot no: 8 **A**	Plot no: 13 **C**
Plot no: 4 **D**	Plot no: 9 **O**	Plot no: 14 **B**
Plot no:5 **A**	Plot no: 10 **C**	Plot no: 15 **O**

7.PLOT LAY-OUT FOR YEAR TWO

N

Plot no: 4 **C**	Plot no: 5 **O**	Plot no:6 **C**
Plot no: 3 **O**	Plot no: 2 **C**	Plot no: 1 **O**

8.YIELD [kgs.] VERSUS AREA PLANTED [m2]

	YEAR ONE		YEAR TWO	
	area planted	Yield [kgs.]	area planted	Yield [kgs.]
O-Control	258	2077.98	900	5680.92
A-MeBr	258	2062.43	0	0
B-Dazomet	258	1947.97	0	0
C-Soilless	258	2362.36	900	1951.92
D-Solarise	258	1889.83	0	0
	1290	**10340.6**	**1800**	**7632.84**

9.A DISCUSSION OF THE RESULTS

The following information can be extracted from the statistical analysis in year one and two:

a. That the soilless treatment produced the highest yield per plant and the least rejects, therefore better quality, saleable tomatoes that is in year one. But in the second year yield dropped by 1.82 kilograms per plant.

b. The area planted to the tomatoes was enlarged by three and a halve times, from 258 square meters in the first year to 900 square meters in the second year, but the yield did not reflect the same. The control treatment more than doubled its yield, on a larger scale, while the soilless treatment fell on yield.

10.CONCLUSIONS

It would be very difficult to give a recommendation after only two seasons.
The trials were carried-out on two different soil environments, the following can be recommended; the soilless produces a good quality crop and better yields, which is what every farmer expects. But from our experience from our trials, the larger the area, the greater the difficult in preparation. However this method is suitable for smaller producers.

Added to the above, larger producers who want to rotate with other crops, have to remove the sand, sterilise it for the next crop and remove the now decomposed poultry manure, and put raw and fresh manure. This is uneconomical.

Dazomet is the alternative larger farmers could use, it is simpler to apply but I would recommend, if possible, for more trials

At plus or minus 18 000 plants per hectare of tomatoes, a yield of 100 000 tones [i.e. more or less than 5.5 kgs. per plant], is not exceptional but good and economical.