

1. INTRODUCTION

Food security and nutrition are the fundamental objectives of the government for the wellbeing of the people particularly at household level. **FOOD SECURITY:** “Ensuring food security and empowerment of farm workers” is part of NDP basic services for inclusive and integrated rural economic development (NDP, 2011:15). **NUTRITION:** “Proper nutrition and diet especially for children under age three is essential for sound physical and mental development” (NDP, 2011:17). As a result NDP commission makes recommendations on among others, child nutrition, and addressing micronutrient deficiencies. **CURRENT GOVERNMENT INTERVENTION:** supply of vegetable gardening inputs to needy households. **LAND:** Access to agricultural land is very limited. According to Statistics SA (2006) 64.5% of South African households have access to only 0.5ha of agricultural land per household. Only 18.3% of the households have access to 0.5-1ha per household. **WATER:** Due to scarcity of water, flood irrigation is discouraged. Only water efficient irrigation technology should be promoted. **SUSTAINABLE AGRICULTURE:** In the spirit of sustainable agriculture, land tillage is discouraged. Sustainable agriculture that condones minimum soil tillage is the way to go.

2. PURPOSE, METHODS AND FINDINGS

The study conducted an experimental observation and comparative analysis of various gardening methods to find the most water efficient gardening technology suitable for food production at household level particularly for water scarce conditions.

Conventional gardening is a common practice in household gardening. However, it has its own challenges. The table tells a bid thereabout.

CONVENTIONAL STANDARD SIZE BACKYARD GARDEN PLOT						
Land size	Tools needed	Sustainable agriculture	Plant Population	Water Efficiency	Weeds	Possible rodent damage
100 x 200 cm	Garden spade, fork, rake, trowel, and watering can	More land tillage	52 $[(100/25) \times (200/15)]$	50 litre/2-3 days	More weeds	Moles and rats

Tyre gardening has been common in subsistence food production sectors in South Africa and many Asian countries. It is commonly used for production of leafy crops such as spinach, shallot, celery, leafy lettuce and dwarf fruit crops such as pepper, marrows. Planting area is 62 cm area in diameter² when trimmed, with soil depth of 20 cm. Plant population vary to the maximum of 13 plants at 10-15 cm spacing within and between rows. Figure 1 and photograph 1 show standard layout of a typical tyre garden and spinach plants in a tyre garden respectively.

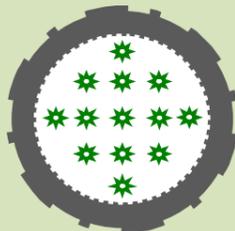


Figure 1: Standard layout = 13 plant population (4 tyres = 52 plant population)



Photograph 1 : Spinach in a tyre

1. Planting is easy and manageable
2. It contains only 13 plant population at 10-15 cm spacing.
3. Uses 5 litre/2-3 days. Too much water is lost through the tyre's open bottom
4. The black rubber absorbs heat from the sun. Temperature becomes too high for the crops. And much water is lost through evaporation



Photograph 2: Tower garden in the backyard of one of the participants in Makhuduthamaga Ward 31 in 2011

A tower garden concept was researched by Agricultural Research Council (ARC) in rural poverty stricken villages within Makhuduthamaga Municipal Ward 31 in Sekhukhune district of Limpopo province under the 2011/12 Eco-Technology program in collaboration with Limpopo Provincial Government Department of Agriculture (Photographs 2). As an agricultural advisor, I personally learned the following about the concept:

1. Planting is easy and manageable
2. The wall is cool. No high wall temperature
3. The technology needed a huge amount of potting soil
4. It used too much water for a small number of plant population
5. Some amount of water just seeped down without being accessed by the plants (No precision)
6. The material was not durable for a longer period
7. The plant insertion process was itself destructive to the garden walls
8. The porous wall material wasted a lot of water through leakage

Having realised many challenges with the above three gardening methods, we tried a recycled polyethylene container in the backyard and later designed and developed a new technology, **Gardenizly®**. Comparing the two tanks, the following lessons were learned.

Recycled poethylene container gardening



Photograph 6: Recycled Tank

1. The tank's wall material was found to be durable
2. Due to its dark colour, the wall material absorbs more heat from the sun (The garden is hot)
3. Due to lack of precision mechanism, more water seeps down without being accessed by the plants
4. The wall prevents water loss (no leaking nor evaporation)
5. Due to its straight tank wall, the plants rest (grow curvy) on the wall of the equipment and suffer the impact of the high wall temperature
6. Takes 56 cm² floor space
7. Takes 200 dm³ volume of potting soil
8. Accommodates 32 plant population

Gardenizly®



Photograph 7: Gardenizly®

1. The Gardenizly's wall material is durable
2. Due to its light colour, the wall material absorbs less heat from the sun (The garden is cool)
3. Due to its precision mechanism, the water is channelled directly to the plants' root systems
4. The wall prevents water loss (no leaking nor evaporation)
5. Due to its sloppy tank wall, the plants grow upright without resting on the wall of the equipment, and no plant suffers burning through wall temperature
6. Takes 76.6 cm² floor space
7. Takes 280 dm³ of planting medium (260 dm³ of potting soil and 20 dm³ of compost)
8. Accommodates 56 plant population

COMPARISON OF GARDENIZLY® WITH A STANDARD SIZE CONVENTIONAL BACKYARD GARDEN

DESIGN	Gardenizly®	Conventional Standard Size Backyard Garden Plot
LAND SIZE	76.6 x 76.6 cm	100 x 200 cm
SOIL REQUIREMENT	280 dm ³	600 dm ³
PLANT POPULATION	56	52 $[(100/25) \times (200/15)]$
WATER EFFICIENCY	10 litre/3-5 days	50 litre/2-3 days
TOOLS	Table spoon, and watering can	Garden spade, fork, rake, trowel, and watering can
SUSTAINABLE AGRICULTURE	No land tillage	More land tillage
WEEDS	No weeds	More weeds
RODENTS DAMAGE	None	Moles and rats

Gardenizly® Water efficient household vegetable gardening technology:

- Researched and developed in a water scarce rural household backyard by an agricultural advisor extensively experienced in agricultural extension and advisory services, in partnership with a duly qualified agricultural scientist specialised in soil sciences.
- Grows vegetables easily, in any space around the house, With minimum amount of water, With no labour nor mess, Without garden tools but table spoon, Up to 56 upright, well ventilated plant population,
- No threats from rodents (rats & moles).
- Ideal for leafy (spinach, lettuce, shallot, morogo, etc) and fruit (tomato, marrow, pepper, etc) vegetables, and herbs (mint, celery, etc).
- Traded by NKGODIDIALE Inc. as a patented Intellectual Property.