

Introduction

Rooftop Kitchen Gardening is a self-sufficient and community-resilient activity for the household level. The Urban Rooftop Kitchen Gardening Tunnel Initiative is offered to grow vegetables in simply structured and transferrable tunnels on rooftops. The tunnel is coupled with an innovative Responsive Drip Irrigation (RDI) technique that conserves water and automates water supply to plants.

Setup for Urban Rooftop Kitchen Gardening through Automated RDI

1 Tunnel

The state-of-the-art, portable walk-in tunnel is placed on the rooftop for gardening. The irrigation and drainage system is linked with the tunnel, along with further features as follows:



- Screw-connected tunnel parts to assemble and dismantle easily on-site.
- No welded pipes and joints.
- Size customization as per space availability with 4 ft span increment.
- Fabricated with low-cost green net for summer, and polythene sheets for winter season.
- Reduces plant growth damage amid harsh weather and pest attack.
- Controls the microclimatic parameters i.e., temperature, rainfall, and wind.
- Drainage pipes will avoid leakage and roof damage.

2 Vegetable Kitchen Garden

A Rooftop Kitchen Garden is an efficient solution to fulfill urban households' fresh vegetables requirement. It provides vegetables all year round with the following features:

- Dutch buckets for tomatoes, cucumber, bitter guard, melon, and watermelon for vertical gardening.
- Trays for leafy vegetables and salads.
- Vegetables are planted in underutilized rooftop space.
- Meets the urban demand for fresh salad products.
- Cocopeat and compost are used as soil media.



3

Automated Irrigation System through Responsive Drip Irrigation (RDI)

The automated water supply is provided through responsive drip irrigation tubes. These tubes with smart micropores are placed in the subsurface, near the plant's root zone. RDI irrigates according to the plant's demand and has the following features:

- Plants will be neither over-irrigated nor under-irrigated.
- Automated water supply according to the plant's irrigation requirement.
- Subsurface symbiosis corresponds to the plant's moisture absorption capacity.
- Reduces plant's water stress.
- Better irrigation efficiency than HEIS for small plants.
- Reduces evaporation loss and weed growth.
- Reduces operational cost of fertilizer and irrigation.



Economic Benefits

- Cost-effective than conventional kitchen gardening.
- Reduces the cost of fertilizer, machinery, and irrigation.
- Highly productive due to coupled RDI system.
- Reduces the vegetable demand-supply gap in urban markets.
- Reduces community dependency on farmers.
- Readily available vegetables encourage house-neighboring markets.
- Entrepreneurial/online marketing opportunities to sell vegetables.

Societal Benefits

- Promotes urban green space.
- Reduces the urban heat island effect.
- Maintains microclimate and optimizes plant growth.
- Increases at-home availability of freshly grown products.
- Provides sustainable diet options for big families.
- Opens avenues for skill development in kitchen gardening and tunnel installation.
- Utilizes (max or min) rooftop area, as per vegetable requirements of urban households.
- Promotes community engagement activities.

Cost-Benefit Analysis (For One Year)

Tunnel Size = 8ft x 20ft

BOQs

Item	Quantity	Amount
Iron Pipe	17 pipe	Rs 32000
Plastic Sheet	1 bundle	Rs 25000
Fiber Sheet	100 ft	Rs 20000
Accessories	-	Rs 73100

- Tunnel Cost = Rs. 150000
- Irrigation System Cost = Rs. 44000
- Fertilizer Cost = Rs. 15000
- Maintenance Cost = Rs. 20000

System Cost with Tunnel is Rs. 229000
and without Tunnel is Rs. 79000
Based on June 2023 market rates.

Yield Benefits

- Supports Family Members = 10 to 15 persons
- Vegetables all year round can be grown as:

Vertical Hangings	Trays/Pots
Tomatoes, Capsicum, Bitter Gourd, Bottle Gourd	Mint, Coriander, Cucumber, Lettuce, Sugar Beet, Chilies, Onions

CONTACT



Pakistan Agricultural Research Council.
National Agricultural Research Centre.
Climate, Energy & Water Research Institute,
Park Road, Chack Shahzad, Islamabad
+92 51 9255022 +92 51 9253649
directorcewri@parc.gov.pk
asifhukhari1@gmail.com

Urban Rooftop Kitchen Gardening with Automated Responsive Drip Irrigation (RDI) in Tunnel



A Cost-effective Solution for Urban Rooftop
Kitchen Gardening Designed
by CEWRI, NARC

