

# HYDROPHONIC VEGETABLE GARDENING IS A KEY SOURCE OF HEALTHY ECO SYSTEM IN URBAN AREA



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## **INTRODUCTION**

Nature has unpredictability in climatic conditions and most of the time adverse suitable climatic condition such as flood, drought, soil erosion due to wind, water erosion from soil etc. hampers the agriculture production, productivity and which ultimately causes unavailability of nutritious quality vegetables in market place. Apart from this in urban area due to utilization of land by construction of buildings, apartments & homestead purposes, it is difficult to develop garden. Again high population leaving in urban & towns for which there is a deficiency of unavoidable substances that is Oxygen. Deficiency of Oxygen and increase in carbon dioxide in urban results unpleasant environment and pollute our eco system. Similarly in the leaving place due to lack of vegetation oxygen scarcity will be observed through symptoms like depression, sickness, poor natural skins etc.

We have identified this problem in Bhubaneswar of Odisha, India, where urban peoples consumption pattern of vegetables, cooking standards, mind set are slightly not satisfactory due to busy life style, less occasion due to adoption of all urban style, formalities, unavailability of fresh vegetables, which causes unhealthiness, depressions, unnatural charms in face and adjective life standard. Keeping the above view in mind and objectives such as a) to evaluate the two types of hydroponic model such as vertical & horizontal suitability. b) Analysis of performance of exotic & leafy vegetables such as lettuce, spinach, coriander, chinese cabbage, asavi tsai & amaranthus under soil less culture hydroponic model both vertical & horizontal vegetable garden structure by using new scientific automatic equipments in customer own place itself.

Hydroponic is a method of growing plants without using soil. By using liquid food supplement to plant in form of mineral nutrient solution with water & allowing the nutrient uptake process to be more efficient than with soil nutrition.

This technology of hydroponics (last 100 years) was suggested by a gentleman named William Frederick Gericke. While working at the University of California, Berkeley, he began to popularize the idea that plants could be grown in a solution of nutrients and water instead of soil.

We have taken an inventiveness to adopt this concept of hydroponic in Bhubaneswar, Odisha, India by innovative appropriate model development in the roof top of fascinated urban dwellers.

## **MATERIALS USE IN GREEN VISION MARKETING & CONSULTANCY HYDROPHONIC GARDEN**

**Table No. - 1**

Sl. No.	Particular/Item	Unit	Quantity
1	PVC Pipe food grade (75 mm)	Mtr.	45
2	Socket (for 75 mm & 110 mm size PVC Pipe)	piece	60
3	PVC Stand (110 mm) for 12 X 10 ft. size	Mtr.	20
4	Iron Angel Stand 1.5"	Mtr	20
5	Net Pot 3"	Nos.	450
6	Green bio NPK liquid nutrient & other liquid nutrient supplement & PP	ml.	200
7	Clay ball (mix with clay pot mixture)	per net pot	100

We have followed the recommended concentration of elements in nutrient solution for NFT cropping (Cooper, 1979) and with reference to the recommendation we have add our own developed products having multiple uses and developed from all natural sources as below in table number - 2.

	(C1 + C2 + P + V + B) brand secret	mixture in gm.	
8	Seeds (lettuce, spinach, coriander, chinese cabbage, asavi tsai & amaranthus)	gm	50
9	Skill Human Days	nos	15
10	Agro shed net (50 % shed) with plastic rope to hang	mtr	200

### Nutrition table to Hydroponic Garden by Green Vision Marketing & Consultancy Services:

**Table No. – 2**

Sl. No.	Name of our products for plant nutrition	Major contents	Doses in ml.	Application interval
1	Green Plant Whole Care	Organic vegetable extracts for supplementary food to all plants. Contents Minerals: Sodium (1%), Phosphorous (3%) & Potassium (8%), Magnesium (8%), Zinc (2%) & Calcium (1%). Vitamins: Pantothenic acid (7%), Pyridoxine (31%), Choline (2%) & Vitamin C (10 %).	2.5 ml in 1 liter of water on hydroponic plant through channel irrigation or foliar spray.	7 Days Interval
2	Green Plant Health Care	Organic vegetable extracts for supplementary vitamin & micro nutrient to all plants. Minerals: Calcium (2%), Iron (5%) & Potassium (10%), Vitamin C (25 %), Vitamin B6 (5%), Fiver (5%), Boron (25%).	4 ml in 1 liter of water on hydroponic plant through channel irrigation or foliar spray.	10 Days Interval
3	Green Eco OMEGA	Natural horticulture plant extract insulin is able control multiple stress and mosaic virus and improves immunization. Is in form of Alpha Linolenic Acid (ALA)	0.2 – 0.5 ml in 1 litre of water on hydroponic plant through channel irrigation or foliar spray.	Once in a crop cycle during pre vegetative growth
4	Green Kabak Ban	compound contained Trichoderma viridae which works against many fungus, control common fungi in vegetable, agriculture field crops by foliar spraying, soil application and in combination with compost and farm yard manure and ability to fight against soil borne pathogens and diseases like damping off.	4 ml in 1 litre of water on hydroponic plant through channel irrigation or foliar spray.	15 Days Interval
5	Green neem oil	Control insects pests in organic way. The compound contained oil which works against many insects, interfering with their reproductive cycle, inhibiting their feeding, control common fungi in vegetable plants like mildews; it acts as contact insecticides and fungicides.	3 ml in 1 liter of water on hydroponic plant through channel irrigation or foliar spray.	15 Days interval / as required
7	Green Kit Killer Bio-Pesticide	and has potential to kill all pest like white worm, leaf worm, flies, beetle etc. from vegetables and field crop. It consists selected vegetable oil and water.	5 ml in 1 liter of water on hydroponic plant through channel irrigation or foliar spray.	As required
8	Green bio NPK	Atmospheric Nitrogen, soluble Phosphate and mobilize potash, zinc and silica in to plant use form as supplementing balance nutrition to crops.	8 ml by fertigation tank as / on hydroponic plant through channel irrigation or foliar spray.	7 Days interval

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## RESULTS & DISCUSSIONS

### Vegetable under Hydroponic garden 45 Days crop cycle:

**Table No. - 3**

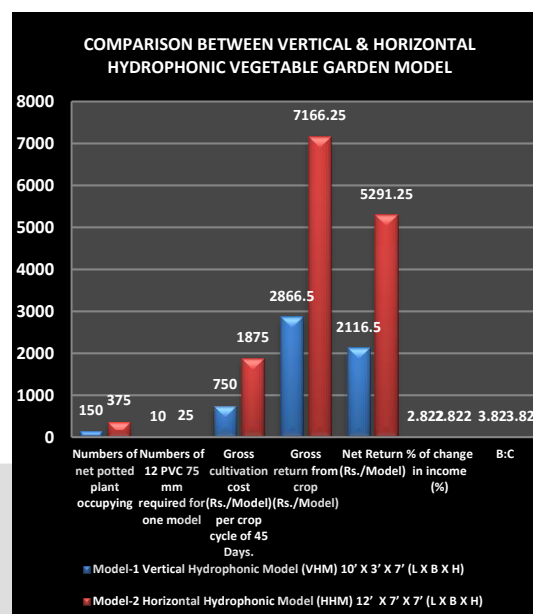
Crop	Variety	No. of hydroponic plant grows in 200 sq. ft. area	Value(Rs)
Coriander	Kalami (hybrid)	100	500
Lettuce	Red & Green	100	4000
Spinach	All green	150	600
Chinese Cabbage	Hybrid CC	25	1000
Asavi	Asavi Tsai	25	1000
Amaranthus	Red amaranth	50	1500
<b>Total</b>		<b>450 plants</b>	<b>Rs. 8600/ crop cycle</b>
<b>Per Plant profit = Rs. 19.11</b>			

It was observed during the experiment in horizontal model a single crop cycle within 200 square feet area six to seven types of exotic /leaf vegetables can grow. Analysis also resulted that in flat bed system five 75 mm PVC pipe of 120 inch each flat bed with a spacing 12 inch between two PVC pipe and 8 inch between two net pot placing hole and five layered (each layer 5 PVC of 75 mm) and of size 12' X 7' X 7' (L X B X H) occupy 375 numbers of plants. And in vertical iron angle model as shown in the handmade picture layout & snap having 5 layers of 75 mm PVC pipe of 120 inch each size (that is two side = 5 layers X 2 side = 10 layers) 10' X 3' X 7' (L X B X H) occupy 150 numbers of plant in 10 layers. Average per plant profit of Rs. 19.11 has been obtained with a total income of Rs. 8600/- per 45 days crop cycle from 450 plants (as in Table number – 3) which is calculated 8 numbers of crop cycle per Year and value about **Rs. 68,800/- in whole year** from hydroponic vegetable garden.

## Comparison between horizontal & vertical hydroponic vegetable garden model developed by us:

**Table No. - 4**

Parameter	Model-1 Hydroponic Vertical Model (VHM)	Model-2 Hydroponic Horizontal Model (HBM)
Size of model	10' X 3' X 7' (L X B X H)	12' X 7' X 7' (L X B X H)
Numbers of net potted plant occupying	150	375
Numbers of 12 PVC 75 mm required for one model	10	25
Gross cultivation cost (Rs./Model) per crop cycle of 45 Days.	750	1875
Gross return from crop (Rs./Model)	2866.50	7166.25
Net Return (Rs./Model)	2116.50	5291.25
% of change in income (%)	2.822	2.822
B:C	3.82	3.82
Sustainability	Sustainable	Sustainable
Management standard	Best	Better
Aesthetic values (Best – Better – Good)	Best	Best
Irrigation process & viability (Best – Better – Good)	Best	Good
Model Installation Fixed cost @ Rs. 200 per cubic feet. (Rs.)	Rs. 42,000/-	Rs. 1,17,600/-
Productivity	Productive	More productive



As shown in the table number – 4, a comparison between two types of hydroponic garden model has been done and found Model -1 that is Vertical model has occupying 210 cubic feet roof top landed area & 150 numbers net potted plants require of working capital cost is only Rs. 750/- per 45 Days crop cycle and is the best technology for management is concern. Whereas Model – 2, the Horizontal model is more productive due to occupying maximum numbers of net potted plant that is 375 numbers in 588 cubic feet land on roof top and require of Rs. 1875/- working capital per crop cycle. We can get maximum produce in model number – 2 with advance irrigation technology.

Hydroponic model has an initial fixed cost as shown in the table number - 4 & column Model Installation Fixed cost @ Rs. 200 per cubic feet found in vertical model the fixed is Rs. 42,000/- & in Horizontal/flat bed model the fixed cost is Rs. 1,17,600/-. So as per ability & interest hydroponic entrepreneur can choose the suitable one.

### **CONCLUSION**

The above experiment is newly demonstrate in the urban area and set up suitable for healthy environment, quality vegetable production without using soil, easy mechanized system operated by one person only one hour per Day with less inputs and motorize ferti - irrigation system one can able to receive an income of Rs. 68,800/- per Year with BC ratio of 3.82 from each hydroponic model (both Vertical& Horizontal). Apart from that a roof top hydroponic garden makes best aesthetic values by releasing sufficient Oxygen and provides us healthy organic vegetables throughout the Year in any adverse climatic condition, which ultimately results a good health.