



Attitude, perception and consumer behaviour research of Indian consumers towards vertical farming: Can vertical farming offer sustainable solution to India's booming urban population by 2050?

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Abstract

By the year 2050, the world population is expected to grow to 9.8 billion people and 70% of these people will live in cities. India will become the most populous country by 2023, overtaking China and about 53% of the Indian population is expected to live in cities by 2050, up from 35% in 2021 as per World Bank.

However, in India, almost all the food production happens in rural areas and small towns. Transporting food from a farmer's place to consumer's neighbourhood store results in 'food miles', and carbon emissions. Not to mention, food wasted during long journeys that gets dumped into landfills and end up contributing to 10% of greenhouse gas emissions.

To minimize such pollution, emissions and waste, food can be alternatively grown in urban areas via Vertical Farming (VF). VF involves new age technologies like hydroponics, aeroponics or aquaponics. It is more efficient than traditional farming, offers higher yield, is free from chemicals and pesticides. This study measures consumers perception towards VF products and concludes that 80.7% of people care about sustainability, 85% are ready to pay premium and 63% would trust such products. 'Climate-consciousness' and 'buying healthy and fresh food for family' were the perceived benefits from family and friends. However more needs to be done to drive awareness, consideration, availability and affordability of vertical farm products. Only 57% of the respondents are aware about health benefits (chemical and pesticide-free) of VF products, 57.5% were aware about VF or hydroponics and in terms of purchase behaviour, only 44.3% of respondents have bought a VF product.

Keywords: consumer behaviour, attitudes and perception research, Indian consumers, vertical farms, hydroponics, sustainability, eco-friendly, environmentally conscious, climate solutions, urbanisation, urban population, India, food security

Introduction

Background

By the year 2050, the world population is expected to grow to 9.8 billion people and 70% of these people will live in cities. UN estimates that India will become the most populous country by 2023, overtaking China. In India, about 53% of the population is expected to live in cities by 2050.

As per World Food programme (WFP), one-third of food produced for human consumption is lost or wasted globally. This amounts to about 1.3 billion tons per year, worth US\$ 1 Trillion. All such food produced but never eaten would be sufficient to feed 2 billion people. In developing markets, 40% of losses occur at post-harvest, transportation and processing levels, while in developed countries, more than 40% of losses happen at retail and in consumer homes.

The Global Food Security Index (GFSI), which benchmarks 58 unique indicators measuring the drivers of food affordability, availability, quality, and safety for 113 developing and developed countries, ranked India at 71st position in 2021. This low position for India requires it to explore and adopt all technologies and processes to increase farm production yield, minimize losses occurred at farms, avoid spoilage during transportation and inside stores.

There are new technologies available like Vertical Farms (VF), which allow farm products to be grown in small spaces efficiently in cities itself. This will help reduce transportation time from farms in rural areas to cities, minimize fossil fuel usage during transportation, reduce food going waste and reduce landfills and lower the carbon footprint and greenhouse gas emissions.

However, currently, the number of vertical farms in India is very low, awareness about technology seems to be low and consumers are unclear about its various facets. E.g., where to buy such fresh produce from, what are the benefits, should they pay a premium, and is there a trusted quality producer. Hence a research survey was undertaken to measure – 'Attitude, perception and consumer behaviour of Indian consumers towards Vertical Farming'.

Hypothesis & Problem Statement

Five relevant hypothesis were tested in research:

- **H1:** Younger consumers (<30 years) are more positively disposed towards sustainability versus older age groups (> 30 years) and would have higher preference towards healthier farm produce from vertical farms versus older consumers.
- **H2:** Being sustainably conscious, younger consumers (<30 years old) would pay relatively higher premium for produce from vertical farms versus older audiences (>30 years old).
- **H3:** Higher education would make consumers more environmentally conscious and make them buy sustainably grown products.
- **H4:** Consumers are generally sceptical and don't trust new technology innovations, like vertical farms/hydroponics, and the benefits it may offer, such as, lowered pollution, reduced food waste and products that are chemical- & pesticide-free.
- **H5:** Availability of sustainably grown food in supermarkets or neighbourhood stores is quite low now in India.

Objective of the Study

To feed India's large urban population, vertical farming can offer food security and credible solution to India's increasing food demand. For entrepreneurs, it's important to understand consumer awareness, perception and attitude towards buying products from such vertical farms in cities. This research study analyses consumers' willingness to buy food from vertical farms, reasons to buy, ability to pay premium for healthier produce and compares perceptions across genders, age-groups and level of education. The study then summarizes various initiatives that government and companies need to take to realize the potential of vertical farming.

Research Methodology

Primary research was done in India (sample size 228). Secondary research and analysis were done basis data available from various UN agencies, World Bank studies, research articles, websites, news, and magazine articles to gain a better understanding of the vertical farming topic.

Results & Data Analysis Findings

There are multiple key findings and hypothesis results:

- **Hypothesis 1: Younger consumers (<30 years) are positively disposed towards sustainability versus other age groups(> 30 years) and would have the highest preference towards healthier farm produce from vertical farms that generate less pollution**
Age had no impact in attitude towards sustainability. 99%(< 30 years), 88%(30-45) and 98%(>45 years) agreed that sustainability is important. 95% men and women expressed importance of sustainability in their lives.
- **Hypothesis 2: Being sustainably conscious, younger consumers(<30 years old) would pay relatively higher premium for produce from vertical farms versus older audiences(31-45 and > 45 years old)**
More older audiences were ready to pay premium. 95% consumers in higher age band (> 45 years) and 83% of younger age band(< 30 years) were ready to pay premium for VF products vs 73% in mid-aged bands (30-45 year).
- **Hypothesis 3: Higher education would make consumers more environmentally conscious and make them buy sustainably grown products.**
Education had no bearing on purchase behaviour. 40% of postgraduates, 55% of graduates and 40% of those with high school education have bought a VF product.
- **Hypothesis 4: Consumers are generally sceptical and don't trust new technology innovations, like vertical farms/hydroponics, and the benefits it may offer, such as, lowered pollution, reduced food waste and products that are chemical- & pesticide-free**
Consumers were positively disposed towards VF products. 63% of respondents said that they would trust buying from a vertical farm. And 51% said their families will trust such a product. 57.5% of respondents felt that vertical farms can be the future and sustainable solution for feeding India's increasing urban population.

- **Hypothesis 5: Availability of sustainably grown food in vertical farms in India is quite low now**

Only 54.8% recall seeing vertical farm products in their local markets. Hence, there is scope to increase availability

Conclusion

Indian consumers are aware about concepts like sustainability, indoor vertical farms and food miles and they value the importance of being environmentally friendly. The consumer behaviour study shows several positive trends:

- **Awareness**

80.7% of respondents have heard about sustainability and a higher 95.2% of respondents express that its important in their life. 71.9% of consumers were aware about Food miles concept.

- **Attitude**

Once explained about 'Food miles', 93% consumers mentioned that they would buy local to reduce their food miles and carbon emissions. 85% consumers are ready to pay a premium to reduce pollution generated by 'food miles'. 43.9% said that they would pay up to 10% premium, while 28.5% said they would pay 11-20% premium.

- **Purchase intent**

Nearly two-thirds (63%) of respondents said that they would trust buying from a vertical farm. And 51% said their families will trust such a product.

- **Perceived benefits**

'Climate-consciousness' and 'buying healthy and fresh food for family' were the perceived benefits from family and friends. In women, more emotional perceptions were reasons to buy like 'care to buy healthy and fresh food for family', while in men, it was more rationale perception and triggers like 'being climate-consciousness and environmentally-friendly'.

- **More needs to be done**

to drive awareness, consideration, availability and affordability of vertical farm products.

- **Low awareness for reasons to purchase**

Only 57% of the respondents are aware about health benefits (chemical and pesticide-free) of VF products, 57.5% were aware about Vertical farms or hydroponics and in terms of purchase behaviour, 44.3% of respondents have bought a product from vertical farms. Only 54.8% recall seeing VF products in their local markets.

- **Future positive**

57.5% of respondents felt that vertical farms can be the future and sustainable solution for feeding India's increasing urban population.

Limitations

The research relied on random interviews conducted via Google forms. In-depth interviews with respondents were conducted over phone and Zoom for people living in other cities to better understand the topic and a few face-to-face discussions in Gurgaon area.

2. What are vertical farms (VF)?

The vertical farm technology involves growing produce (vegetables, fruits) that stack vertically on vertically stacked levels, instead of side by side like in a traditional field. In place of getting sun for photosynthesis, the vertical farms rely on artificial light in an enclosed structure like greenhouse, don't use soil and use nutritious water in case of hydroponics or mist in the case of "aeroponic" farms. As vertical farms are in cities or near urban areas, they help bring down the time, logistic cost, waste and pollution in farm-to-fork journey.

Over the last few years, companies have installed vertical farm systems mostly in urban areas such as, roof tops of buildings and homes, shipping containers, underground tunnels, subway stations, inside restaurants and many more creative spaces, where controlled environment is possible.

What are different types of Vertical farming technologies— Hydroponics, Aeroponics and Aquaponics?

Hydroponics is the technology of growing plants, in which the roots of the plants are exposed to nutrient-rich water, while in aeroponics, the roots of the plants are exposed to nutrient-rich mist. Hydroponics supports more variety of plants and is low maintenance, while aeroponics supports fewer plants such as olives and citrus plants and requires higher investment and higher maintenance.

Aquaponics, on the other hand, is a food production system that couples aquaculture (raising aquatic animals such as fish, snails or prawns in tanks) with hydroponics (cultivating plants in water) in which the aquaculture water rich in nutrients is used to hydroponically feed plants.

The word "hydroponics" is formed from two Greek words: hydro, meaning water and ponein, meaning to toil.

A brief history of Vertical farming

It is said that King Nebuchadnezzar II of Babylon gifted his wife hanging gardens which was the start of vertical farms. The US Air Force used hydroponic tech to grow vegetables for its troops during the World War II. In 1999, the modern concept of vertical farming was proposed by Professor Dickson Despommier from Columbia University, who proposed a concept to grow the food in urban areas, thereby reducing distance and time for bringing the food produced in rural areas to the cities. In 2010, he published 'The Vertical Farm: Feeding the World in the 21st Century', which has become the industry's leading book on the topic.

Benefits and Challenges of Vertical farms vs Traditional Farms

What benefits do vertical farms offer?

1. Reliable year-round crop production

As VF is not dependent on the weather, it allows crops to be grown consistently year-round without worrying about any weather calamities. Also, as it is grown in closed environments, crop is protected, well-monitored and offers peace of mind for growers.

2. Free from pesticides and chemicals

As VF are in controlled environmentally, it doesn't require pesticides, chemicals etc. Hence, the produce is fresher, healthier, safer and cleaner.

3. Environmentally friendly & reduces transport costs

As VF are in enclosed spaces, it reduces the need to use fossil fuels for farming equipment like tractors, heavy

machinery, as it removes the need for sowing, fertilizing, de-weeding or harvesting crops. Being in cities or nearby, growing food closer to consumers offers a pollution-free solution as it reduces transportation & logistic costs, carbon dioxide emissions, reduce pollution and making produce fresher and more profitable

4. Safe for staff

As work is indoor in controlled environment, it doesn't involve working with pesticides, heavy machinery or chemicals, and avoids the occupational hazards & any potential injury.

5. Minimal water usage

Hydroponic technology uses about 10% of the amount of water that traditional soil-based farming uses. Also, the water is clean after usage, hence water can be recycled, reused and this reduces costs and minimizes waste.

6. Higher yield for same area

VF uses a vertically stacked method and can achieve higher productivity on a small land area, while traditional farms require large areas of fertile arable land. Based on the type of crop grown, one acre of vertical farm can grow 365 days the equivalent of 10 to 20 soil-based acre farms. The net effect is an increased yield and improved use of resources.

7. Low labour costs

As VF are semi-automated or automated, it doesn't rely on need huge amounts of manual labour for its production.

What challenges do Vertical farms face?

Vertical farming also suffers from certain challenges and disadvantages. Here are a few of them:

1. High investment cost

Due to the complexity of building a profitable plant, the upfront investment is quite high.

2. High running costs

VF require experts to run the operations, plants, and crop produce and this can be significant part of expenses.

3. High power consumption

As vertical farm runs in enclosed spaces, light must be generated artificially for plants via LEDs. Hence, the cost of power can be high.

4. High maintenance

As VF require artificial and monitoring(AI) technology, climate control and harvesting technology, due to this high complexity and the continuous operation year-round, the potential components break down may require repair and service.

5. Potential pest infestation

With vertical farms running in closed spaces, the scope for external pests or organisms is minimized. However, employees inadvertently can bring in pests and this can lead to infestation of crops. Hence employees need to clean and disinfect before handling plants.

Results from primary and in-depth research survey
Results from my primary research survey of 228 respondents across India conducted during Nov-Dec'22, across multiple cities shows:

Respondent profile

- **Age:** 32.9% were < 30 years, 28.9% were 30-45 years and 38.2% were > 45 years
- **Gender:** 52.2% were female, 47.8% were male
- **Education:** 67.5% were post-graduate, 28.1% were graduate and 4.4% were High school
- **Profession:** 62.3% were working professionals, 16.7% were homemakers, 16.2% were business owner and 4.8% were students

A. Awareness and Importance of sustainability: Less have heard about sustainability, but more think it's important

Have you heard about sustainability? Is sustainability important for you?

Q: 'Sustainability consists of fulfilling the needs of current generations without compromising the needs of future generations, while ensuring a balance between economic growth, environmental care and social well-being. It means avoiding depleting the natural resources to maintain an ecological balance with nature.' Have you heard about sustainability?

80.7% of respondents have heard about sustainability and a higher 95.2% of respondents express that its important in their life. 73% of men and 87% of women had heard about sustainability. 99%(< 30 years), 88%(30-45) and 98%(>45) agreed that sustainability is important.

B. Awareness about Vertical Farms

Currently slightly more than half of the respondents(57.5%) were aware about Vertical farms or hydroponics. Amongst those aware, higher age groups(> 45 years) had most awareness(80%) about Vertical farms, followed by 47%(< 30 years).

C. Availability in local markets

54.8% recall seeing vertical farm products in their local markets. The younger audience (< 30 and 30-45 years) recall seeing it higher (61%), versus 45% for > 45 years.

D. Purchase behaviour

54.8% recall seeing products from Vertical Farms in their local market and 44.3% of respondents have bought a product from vertical farms, with nearly half of women respondents have bought a VF product (49%), while only 39% of men have bought one. Amongst the women, 94% of those who saw a VF product ended up buying a product, while 68% of men who saw also bought. The trial was much higher in women segment versus men. Age had no correlation with purchasing VF products. More mid-aged consumers (30-45 years) followed by younger consumers have bought a VF product.

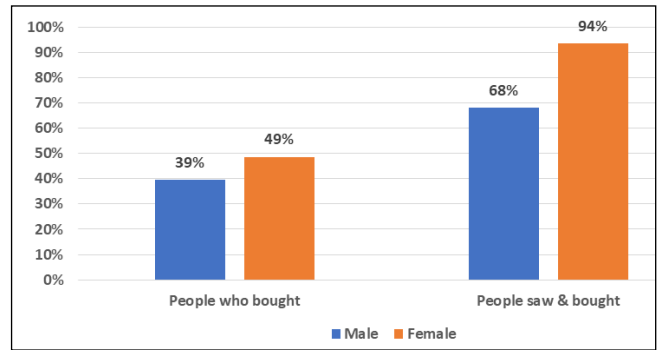


Fig 1: Buying after seeing

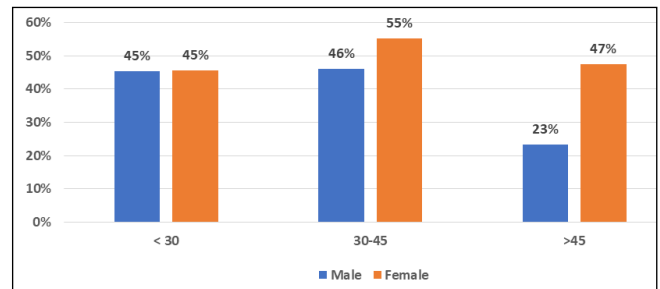


Fig 2: Have you bought any VF food in your local market?

E. Education had no bearing on purchase behaviour. 40% of postgraduates, 55% of graduates and 40% of those with high school education have bought a VF product.

Table 1

	Post-graduate	Graduate	High school
Male	30	11	2
female	32	24	2
	62	35	4
	40%	55%	40%

F. Awareness about health benefits (chemical and pesticide-free) of Vertical farm products: 57% of the respondents are aware about health benefits (chemical and pesticide-free) of Vertical farm products. However, more needs to be done by brands and retailers to promote such products based on such benefits. Both older respondents (> 45 years) at 71% and younger (< 30 years) at 53% were aware about health benefits of VF products. On speaking to respondents, the higher awareness amongst younger audience was due to reading, climate activism amongst youth, while amongst older audience, it was due to focus on looking for healthier products for children. More women were aware about health benefits of VF products, but more men bought them.

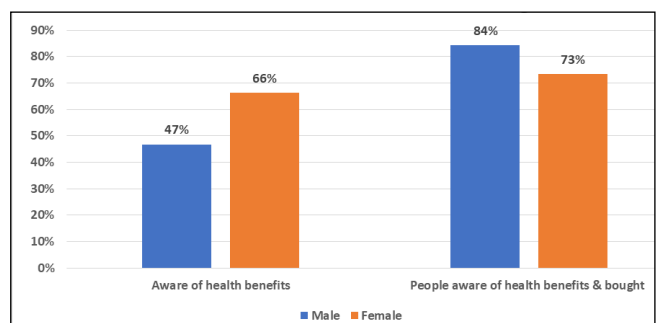


Fig 3: Aware of Health Benefits and Then Bought

G. Awareness about Food miles & interest to reduce them and pollution related to it: A resounding 71.9% Indian consumers are aware about food miles and that their average farm product travels hundreds of kilometres before it reaches their kitchen. There was uniform awareness across age-groups and genders. While 71.9% of consumers were aware about Food miles concept, but once explained, 93% consumers (90% men, 96% women) mentioned that they would buy local to reduce their food miles and carbon emissions and pollution related to long distance their food travels. on 1 to 1 discussion, some consumers thought that local meant buying from same city, while for others it meant same state. Some even expressed concern that what will farmers living in rural areas do if everyone buys locally. They also expressed that their retailer should clearly mention which products are from local areas and therefore generates less pollution.

Q: Food miles is the average distance food travels from the place of production by the farmer to the place of consumption by the consumer. Are you aware that the regular foods that you consume travels anywhere from 200 to 2000 kilometres in India before it reaches you?

Q: Will you prefer to buy products grown locally within your city, so you can reduce food miles and the carbon emissions and pollution?

H. Attitude towards sustainability

4 out 5 respondents (84.6%) said they would pay a little more for a product that is environmentally friendly. This is a positive sign and shows that consumers are committed towards lowering their carbon footprint and protecting nature for next generation. 95% consumers in higher age band (> 45 years) and 83% of younger age band (< 30 years) were ready to pay premium for VF products vs 73% in mid-aged bands (30-45 year).

Q: Food that travels less miles (or kilometres) has lower food miles, lower carbon footprint, generates less pollution and is more environmentally friendly. Would you pay a little more for a product that is environmentally friendly?

I. Premium ready to pay for buying local

43.9% said that they would pay up to 10%, while 28.5% said they would 11-20% and one out of 10 said they would above 21% premium over regular products for VF products sourced from locally. 1 out 6 (16.7%) said they wouldn't any premium for vertical farm products.

Q: How much more are you ready to pay for locally produced farm products, that travels less than 50 kilometres?

J. Trust buying from VF by respondent and their family & friends

Nearly two-thirds (63%) of respondents said that they would trust buying from a vertical farm. And 51% said their families will trust such a product. Shoppers trust the VF products more, having seen them, while they feel that their families and friends will probably have slightly lower trust in VF products. Trust in older segments is slightly higher.

Q: Will you trust buying a product grown in a vertical farm using hydroponic technology?

Q: Will your family and friends approve of you buying a product grown in a vertical farm using hydroponic technology?

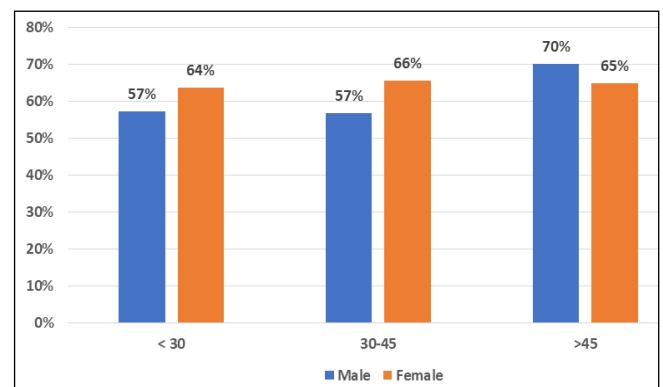


Fig 4: Will you trust buying a product grown in a VF?

K. Perception of 'friends & family' about you when they know you are buying VF products

'Climate-consciousness' at 46.9% and 'buying healthy and fresh food for family' at 47.8% were the main triggers and perception generated by family and friends about respondents. In women, more emotional perceptions were created like 'caring buying healthy and fresh food for family', while in men, it was more rationale perception and triggers like 'being climate-consciousness and environmentally-friendly'.

Q: When your family and friends hear about you buying a product grown in an urban farm or indoor vertical farms using hydroponic technology, how will they perceive you?

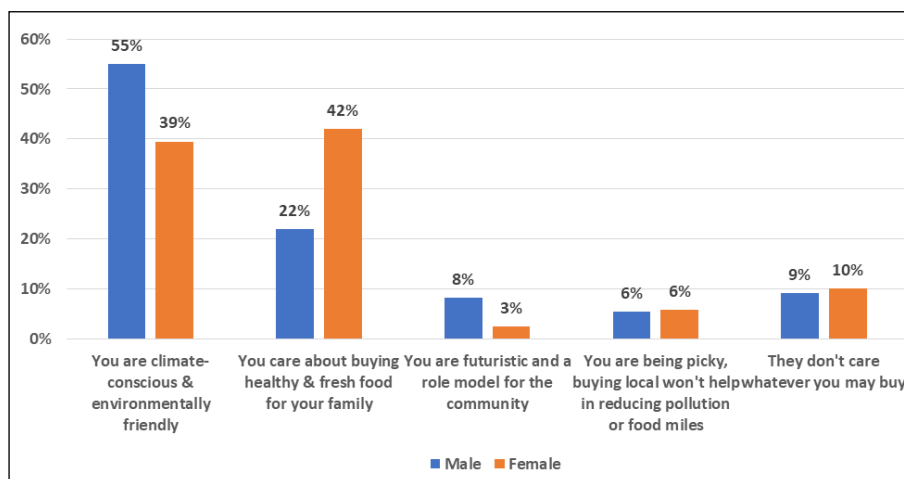


Fig 5: Perception of your Family & Friends, when they hear you buying a VF product.

L. Can Vertical Farms be the future of agriculture for feeding increasing urban population: 57.5% of respondents felt that vertical farms can be the future and sustainable solution for feeding India’s increasing urban population.

Q: India's urban population will increase from 35% today to about 53% by 2050. Do you believe that vertical farms using hydroponic technology can be the future of agriculture?

Summary: AIDA Consumer buying behaviour model is a process to describe how a consumer buys a product or service, and it involves grabbing a customer’s attention, making him/her interested in the product, making them desire and then buy it.

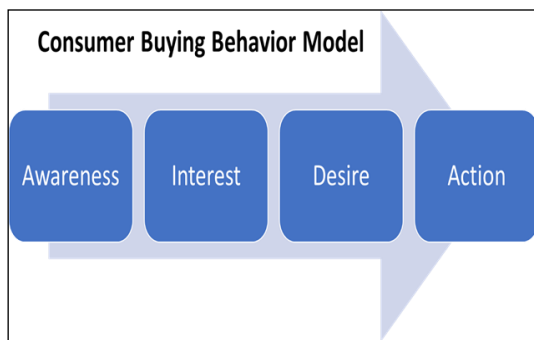


Fig 6

From the consumer research, following results emerge Consumers are aware about sustainability, followed by ‘food miles’ concept and last for ‘vertical farming’ products. Once explained, consumers have high interest to act on sustainability and ‘food miles’. A simple concept like ‘food miles’ which involves buying locally is easily understood and 85% have already expressed their action to buy locally. In terms of actionability, 44% have already bought a VF product. For increasing desire and action for VF products, awareness, benefits and availability need to be increased.

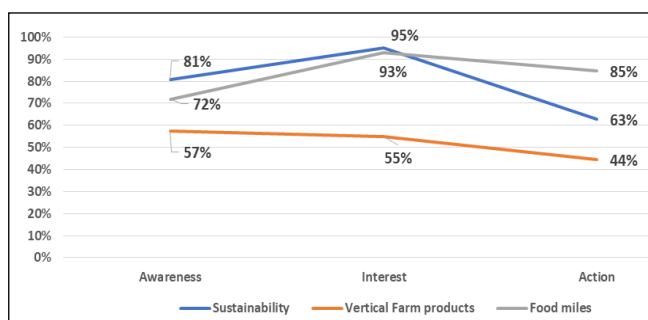


Fig 7: Consumer Behaviour towards Sustainability, Vertical Farm products & Food miles

Vertical Farms Globally

As per “Vertical Farming Global Market Report 2022”, the global vertical farming market is expected to grow from \$4.21 billion in 2021 to \$5.04 billion in 2022 at a compound annual growth rate (CAGR) of 19.72%. The market is expected to grow to \$11.58 billion in 2026 at a CAGR of 23.15%.

India is expected to gain 416 million urban residents by 2050, China 255 million, and Nigeria 189 million.

Therefore, the rise in urbanization is driving the vertical farming market.

Can Vertical farms be the solution to feeding India’s 53% population living in urban areas by 2050?

As per World Bank data, India’s agricultural area makes up 60.2 % of its land area. As per the Indian Ministry of Agriculture & Farmers’ Welfare, land use statistics 2016-17, the total geographical area of the country is 328.7 million hectares, of which 139.4 million hectares is the reported net sown area.

As per World Bank, India’s urban land area is 222,688 sq. km (in 2010), or about 6.8% of its total land area. The total urban population living in this urban area is 493 million in 2021, about 35% of total population. That’s quite a lot in such a small area. If 5% of this urban area is allocated to green areas including vertical farms, that works out to be 11,133 sq. km. This works out to be just 0.8% of the total 139 million hectares (1.39 million sq. km) net sown area.

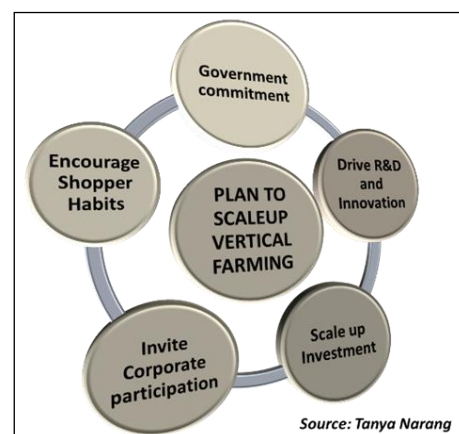
So, if 0.8% area is reserved in urban areas for green areas, including vertical farms, the productivity and efficiency must be immense. This is where, government, corporate, start-ups and R&D labs have to step in to ensure food security via enabling funding, relevant technology, training and encouraging collaboration.

Singapore currently produces 8-10% of its food requirements via urban vertical farms or rooftop farms. As land is scarce in Singapore, it has created an ambitious “30 by 30” plan that aims to increase its local farm production to 30% of total requirement by 2030 via high-tech vertical farms.

How can Indian government and companies promote policy and initiatives to boost vertical farming in India?

The world’s population reached 8 billion on 15 November 2022. In 2022, China and India, with more than 1.4 billion each were the two most populous countries. As per UN estimates, India is projected to surpass China as the world’s most populous country during 2023. As India urbanises and with 53% of population expected to live in cities by 2050, it needs to encourage solutions that offer quick, fresh and pesticides-free farm produce to its citizens. To transport food across long distances requires reliance on fossil fuels and increases India’s oil import bill and carbon footprint.

To support adoption of vertical farming on a national scale, the following framework is proposed for the government:



Source: Tanya Narang

Fig 8

- **Commitment to increase awareness and visibility of VF**

Most consumers haven't seen one or haven't bought any products from such a farm. The government should increase visibility by putting up urban farms in metro cities and urban centres, in supermarkets, sharing in the media, tradeshows and exhibitions, so consumers can see them. Using government media to showcase projects funded by it and their success story can drive visibility and inspire confidence for investing.

- **Drive R&D and innovation**

Today, only a few crops can be grown by vertical farming. Keeping Indian consumer diets in mind, government should ask its R&D labs to come up ways to grow traditional crops.

- **Training, courses & jobs**

The governments should partner with universities to develop new courses and deliver it to farmers and anyone via open university digitally. It should use its infrastructure to upskill existing farmers and train new tech workers who can support such farms on a mass scale.

- **Invite Corporate collaboration**

With its policies and forums, the government can promote discussions across industry, community and academics to jointly explore the positive benefits like food security, reducing 'oil, fertilizer and farm subsidies' bills, lowering pollution, promoting healthy living via sustainable cities, ensuring fresh food, and profitable growth for growing different types of crops in vertical farms.

- **Scale up Investment**

Cost of setting up Vertical farms: As per World Economic Forum analysis, the capital expenditure required to set up a vertical farm is quite high. The starting price can vary from INR 60-70 lakhs (\$72k-85k) for 1 acre of land to a fully automated unit costing upwards of INR 1.5 crores (\$182k). The electricity required to power is about 40% of the total operating expenses. As vertical farms require high capex, the government need to ask banks to give loans for research, setting up farms and ensuring access and availability to consumers in their local markets. This would help increase the number of entrepreneurs investing in this type of technology and secure our food chain for farmers, consumers and retailers. Existing farmers should be encouraged to invest in vertical farms, so they can grow all 365 days in a year for continuous income, thereby reducing governments farm subsidies.

- **Encouraging Shopper Habits**

The Kerala State Horticulture Mission is buying and distributing Arka Vertical Garden structures to individuals living in urban areas around the state to promote and boost urban farming. Vegetables, medicinal plants, and flower harvests can all be grown in these structures. The vertical garden structure costs Rs 20,000, and the State Horticultural Mission will give a 75 % subsidy for the initial period. The government

needs to encourage consumer adoption via promoting VF products.

Conclusion

The consumer behaviour study shows several positive trends

80.7% of respondents have heard about sustainability and a higher 95.2% of respondents express that its important in their life. 85% consumers are ready to pay a premium to reduce pollution generated by 'food miles'. Nearly two third (63%) of respondents said that they would trust buying from a vertical farm.

'Climate-consciousness' and 'buying healthy and fresh food for family' were triggers and perception generated by family and friends about respondents. 57.5% of respondents felt that vertical farms can be the future and sustainable solution for feeding India's increasing urban population.

However more needs to be done to drive awareness, consideration, availability and affordability of vertical farm products.

Only 57% of the respondents are aware about health benefits(chemical and pesticide-free) of Vertical farm products. In terms of purchase behaviour, only 44.3% of respondents have bought a product from vertical farms. Currently only 57.5% were aware about Vertical farms.

Vertical Farming is the future of modern agriculture and can be a panacea in feeding India's burgeoning urban population, fighting food transportation-related pollution, reduce food miles, food waste and associated greenhouse gas emissions.

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