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SUSTAINABILITY

Growing Agriculture Markets with Vertical Farms

by Mark Esposito

Population demands and rising costs will make conventional farming prohibitively difficult to sustain. Vertical farms have many compelling qualities that could help define the future of agriculture.

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It is getting harder to ignore the steady rise in food prices. On average, prices have gone up by 2.6% annually in the past two decades worldwide. This steady rise is a reflection of global food security issues. Through the lens of the DRIVE framework, we can detect the megatrends behind the breakdown of traditional agriculture.

Trend analysis: Why field farming is no longer enough

- **Demographic and social changes**
  The world's population is growing. According to the FAO (2009), food production must increase by 70% by the year 2050 if it is to meet global food needs. However, food production today is already facing problems: people are rejecting rural farming as a profession in favor of an urban lifestyle while the built environment is taking over arable land. Moreover, demand for local food has gone mainstream in response to environmental concerns and the desire to eat fresh foods that haven't been refrigerated or frozen for days before arriving at the supermarket.

- **Resource scarcity**
  70% of global water consumption is taken up by traditional agriculture. As water scarcity becomes more of an issue over time, water usage will add more to the total cost of agriculture. Movement in the supply chain is another issue. Perishable produce can blemish and spoil during harvesting, packaging, processing, and distribution. According to one report, some activities waste up to 50% of a harvest.

- **Inequality**
  Alongside malnutrition and poverty in developing countries, food inequalities exist within industrialized countries. In places like the U.S., the high cost of fresh foods have led vulnerable populations to eat a diet of processed, budget-priced foods high in fat, while households with more disposable income buy "superfoods" like kale and quinoa. The consequence has been an increase in diabetes and an obesity epidemic. As long as the price of fresh food stays out of reach for low-income workers, these inequalities in health and nutrition will persist, if not worsen.

- **Volatility**
  Natural disasters have been occurring with greater frequency in recent decades, which can affect an entire year's worth of crops and exacerbate food prices. Prices can also be affected by government policies. In the U.S., for instance, an ethanol

mandate accounts for 10–15% of food price hikes, and regulations on pesticides and fertilizers also hurt crop yields. These forces, which impact prices directly, are not going away any time soon, nor can they be predicted in the long-term.

Given these observations, food costs are not likely to stabilize as long as we rely on traditional farming as our main food source. When looking to make a call on the future of agriculture, vertical farms have compelling qualities that merit serious consideration.

Turbocharging Agriculture with Vertical Farming

Sufficient availability of arable land is no longer a concern when it comes to vertical farming, the practice of using hydroponic and/or aeroponic bays stacked up in layers to produce food indoors. Vertical farms typically use enclosed structures like warehouses. Sometimes referred to as “grow houses,” vertical farms provide a controlled environment for crops. The plants receive either natural light or LED lighting, and they absorb nutrients that have been carefully measured and added to the water or soil system. The temperature is regulated by an algorithms monitor. At New Jersey–based AeroFarms, the resulting yield is 130 times more than that of a traditional field farm with the same surface area. Additionally, water consumption is 95% less and no pesticides are used.

Vertical farming is also adaptable to differences in geography, culture, government policies, investor dynamics, and local markets. Some cities have more empty buildings to set up as grow houses, while some towns may need a more portable solution like a converted shipping container. No matter how a vertical farm is custom fit to its market, the advantages over traditional field farming remains the same.

For managers interested in expanding into vertical farming, there are ways to minimize risk and maximize their success:

- **Change the conversation from farming to new technology**
  Traditional farming is labor-intensive, vulnerable to climate change, and disconnected from modern living. In some regions, farming is associated with low

incomes and lack of education. When it comes to vertical farms, however, farmers are the new technologists. They must know how to operate computer systems, manage sophisticated equipment, and analyze data accurately. Understanding this transformation is the first step to communicating the potential of vertical farming with different stakeholders.

- **Pitch the right story to investors**
  Investors are part of the bigger picture as we enter the age of vertical farming. AeroFarms required six rounds of funding equaling $95.8 million to reach the point where they could begin to scale. To win the attention of investors, the company positioned itself as “an urban agriculture and cleantech company”. Bridging a conversation with investors could begin with a discussion on the trend toward using technology to grow crops, especially nutrient-specific crops like Fujitsu’s low-potassium lettuce, which is marketed to patients with kidney disease. That particular market is on track to grow from ￥23.4 billion in 2013 to ￥150 billion in
    1. Vertical farming’s cost savings, reduced water usage, and high yields outperform traditional farming in all aspects.

- **Encourage local food culture and support through partnerships**
  Governments and relevant associations are ideal partners. They are prime stakeholders in the local economy and will also have data on dietary trends and insights into the local market. Regional governments can even set policies to help with growth. For example, the government of Ontario, Canada, funded more than $40 million in local food projects in 2015–2016 fiscal year.

- **Promote hydroponic innovations and educate consumers**
  The average consumer regards technology as something that shouldn’t be associated with food. Shoppers look for non-GMO labels, believing that eating genetically modified foods must carry some sort of risk. To ensure a market for vertically farmed produce, companies can use campaigns such as food-tasting events to teach consumers about the nutritional and environmental benefits of vertical farming while giving them a chance to sample the quality of the produce.

- **From grow house to table**
  Though traditional farming is likely here to stay, vertical farms are a counterpart we need to put to use today if we are to meet the food needs of tomorrow. If the future of agriculture is to be a growth market, then vertical farming is where it must be headed.

About the Authors

Mark Esposito is a Socio- Economic Strategist and bestselling author, researching MegaTrends, Business Model Innovations and Competitiveness. He works at the interface between Business, Technology and Government and co-founded Nexus FrontierTech, an Artificial Intelligence Studio. He holds appointments as Professor of Business and Economics at Hult International Business School and Grenoble Ecole de Management and he is equally a faculty member at Harvard University since 2011. Follow him on Twitter: **(@Exp_Mark)**

Terence Tse is an Associate Professor at ESCP Europe London campus and Co-founder of Nexus FrontierTech, an Artificial Intelligence Studio. Terence has also worked as a consultant for Ernst & Young, and served as an independent consultant to a number of companies. He has published extensively on various topic of interests in academic publications and newspapers around the world. He has been interviewed by television channels including CCTV, Channel 2 of Greece, France 24, and NHK. Follow him on Twitter: **(@terencecmtse)**

Khaled Soufani is Professor of Management Practice (Economics) and Director of the Executive MBA in the Judge Business School at the University of Cambridge, where he also directs the Center for Middle Eastern Studies and the Circular Economy Center. He has published extensively in the area of financial management and economic affairs of small and medium- sized enterprises. His current research interests relate to fast-expanding markets and the economics of innovation.

Lisa XIONG is a candidate to the Executive Doctorate of Business Administration at Ecole des Ponts Business School. She works as Teaching Associate for business schools in Europe, UAE and China. Her research interests cover inequalities, Chinese economic development, entrepreneurship and open innovation. Lisa is a linguist and social science investigator. Her ability to navigate both the east and west cultures allowed her to serve different communities, enterprises and clients in different parts of the world.

Mark Esposito Follow

Dr. Mark Esposito is Professor at Hult International Business School and at Thunderbird School of Global Management where he co-directs the 4IR Initiative. He co-founded Nexus FrontierTech and advises national governments. He has written over 150 articles and edited/authored 11 books. His next book, The Great Remobilization will be published by MIT University Press in 2022.