

The Urban Transition: Implications for Global Food Security

By the DuPont Advisory Committee on Agricultural
Innovation and Productivity for the 21st Century

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EXECUTIVE SUMMARY

Urbanization is one of the most defining global trends of our time. By most accounts, an increasing majority of the population will reside in urban settlements around the world. While much of this transition can be attributed to rural-urban migration, the pace and drivers of urbanization vary widely across regions and countries.

Amid global urbanization, we are facing a population expected to reach over 9.6 billion by 2050, a growing middle class, extreme weather variability impacting global crop production, unsustainable levels of food waste and loss, the double burden of under- and over-nutrition, and increasingly limited natural resources. Each of these challenges compounds the other, leaving no single solution to meeting our growing food demand.

Advancing global food security will require recognizing and addressing the impact of urbanization on our global food system. While urban centers are often associated with economic growth and development, they also present unique economic, social, and environmental opportunities and challenges to sustainably feed the world in the decades ahead. In particular, urbanization will require new approaches to feeding people further away from where their food is grown and whom, therefore, rely on a global food system that produces food surpluses outside of urban centers.

In this white paper, the DuPont Advisory Committee on Agricultural Innovation & Productivity explores the urban growth landscape, the opportunities and challenges of global urbanization, and the implications of urbanization on food and nutrition security. The last section of the white paper focuses on the following areas we recommend the global community should focus to address urbanization as part of food and nutrition security:

- **Embrace continued and rapid innovation and investment in agriculture;**
- **Identify and develop solutions to address urban food system challenges;**
- **Promote global trade to advance food security;**
- **Identify and leverage new opportunities to incentivize the next generation of farmers; and**
- **Embrace governance structures and policies that support investment and innovation.**

THE URBANIZATION GROWTH LANDSCAPE

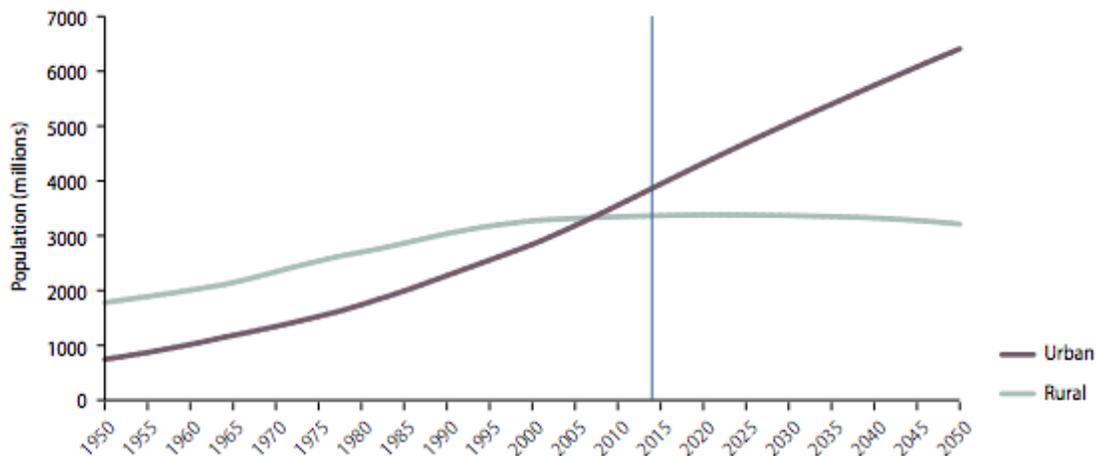
The concept of urbanization is not a new one. Throughout history, rural areas have evolved into cities, transforming the development of countries and regions around the world. The current pace of urban growth, however, has become a key phenomenon affecting how we will feed a growing planet.

By 2050, over 60 percent of the world's population will live in urban areas.¹ As discussed herein, this urbanization will take place primarily in developing countries and be driven by a number of factors.

Trends and Projections

Generally, urbanization refers to a population shift from rural to urban settlements.² The rate of urbanization refers to the rate at which this transition occurs over time.³ Prior to 1950, more than two-thirds of the population lived in rural settlements and less than one-third lived in urban areas. Since 1950, the world has experienced a rapid shift in the balance between rural and urban populations. Today, roughly half of the global population is urban. By 2050, one-third of the world will live in rural areas and the remaining two-thirds will reside in urban regions – a complete reversal of the urban-rural distribution prior to 1950 (Figure 1).⁴

Figure 1: Global Urban and Rural Populations: 1950 - 2050



Source: United Nations, World Urbanization Prospects, 2014 Edition.

¹ United Nations, World Urbanization Prospects, 2014 Edition.

² International Institute for Environment and Development, Urbanization Concepts and Trends, June 2014.

³ *Id.*

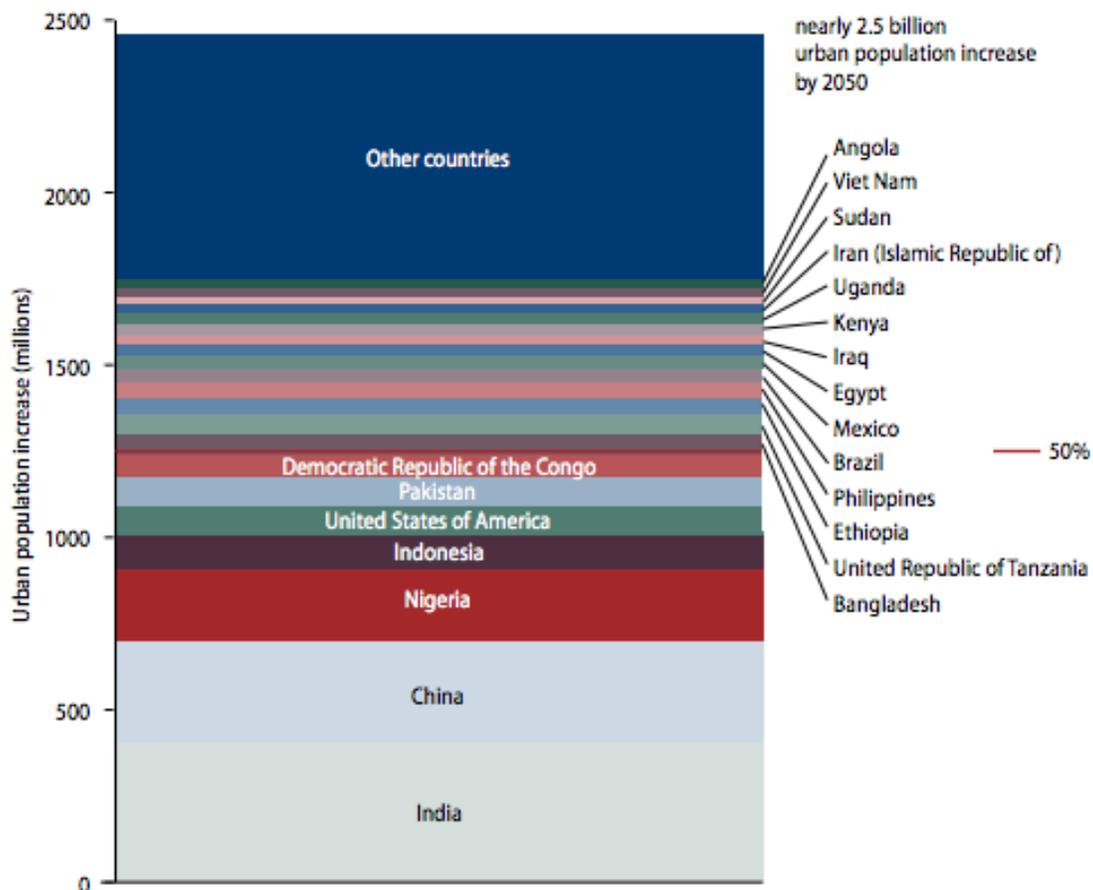
⁴ United Nations, Population Facts, Our Urbanizing World, August 2014.

While the rate of urbanization varies across regions and countries, urban populations are expected to grow most rapidly in emerging markets. Ninety percent of the 2.5 billion new urban dwellers expected by 2050 will live in Africa and Asia.⁵ In Africa, almost half of the continent is expected to reach a level that is at least 60 percent urban. Likewise, over 60 percent of Asia is expected to be at least 60 percent urban and the rest of the continent is expected to be 80 percent urban. China, India, and Nigeria alone will support more than one-third of global urban population growth (Box 1), but will remain the least urbanized regions in the world.

Box 1. Urbanization Growth in China, India, and Nigeria

Urban population growth will be concentrated in a handful of countries. By 2025, China, India, and Nigeria are expected to account for 37 percent of the estimated 2.5 billion people living in urban settlements. Urban areas in India are expected to grow by 404 million people, by 292 million people in China, and by 212 million people in Nigeria.

Distribution of Urban Populations by Country: 2014-2050



Source: United Nations, Population Facts, Our Urbanizing World, August 2014.

⁵ United Nations, World Urbanization Prospects, 2014 Edition.

Despite the rapid urbanization in developing countries, Northern America, Latin America, and the Caribbean remain the most urbanized. In 2014, 80 percent of the populations in these regions were living in urban areas. By 2050, over three-quarters of Latin America and the Caribbean will be at least 60 percent urbanized and nearly half will be 80 percent urban.⁶ Meanwhile, in Europe, with the exception of a handful of countries and regions, at least 60 percent of the continent is expected to be urban with half of Europe reaching 80 percent urban.⁷

The Oceania region is expected to face varied levels of urbanization. Australia and New Zealand will reach urbanization levels of 80 percent, while smaller countries like Papua New Guinea and Samoa will experience rates of urbanization below 20 percent.⁸

By contrast, certain countries and regions will experience declines in their urban population. Over the next four decades, Japan's urban population will lose 12 million people and the Russian Federation will lose 7 million.⁹

The Rise of "Megacities"

Expectedly, urbanization has led to dramatic city growth and development. In 1990, less than 7 percent of the urban population resided in 10 "megacities" or cities with more than 10 million inhabitants.¹⁰ That number has almost tripled, reaching 28 megacities – home to now 12 percent of the world's urban population. The largest of these cities includes Tokyo with 38 million people, Delhi with 25 million, Shanghai with 23 million, and Mexico City, Mumbai, and São Paulo, each with an estimated 21 million people.¹¹

Most urban growth will occur in megacities and large cities in the southern part of the world (Figure 2). China alone has six megacities and ten cities with populations between 5 and 10 million. By 2030, China will add an additional megacity and six additional large cities. India is expected to add four megacities to reach a total of seven megacities by 2030. And, three new megacities in Africa – Dar es Salaam, Tanzania, Johannesburg, South Africa, and Luanda, Angola – are expected to emerge, bringing the continent's total to six megacities by 2030.

⁶ *Id.*

⁷ *Id.*

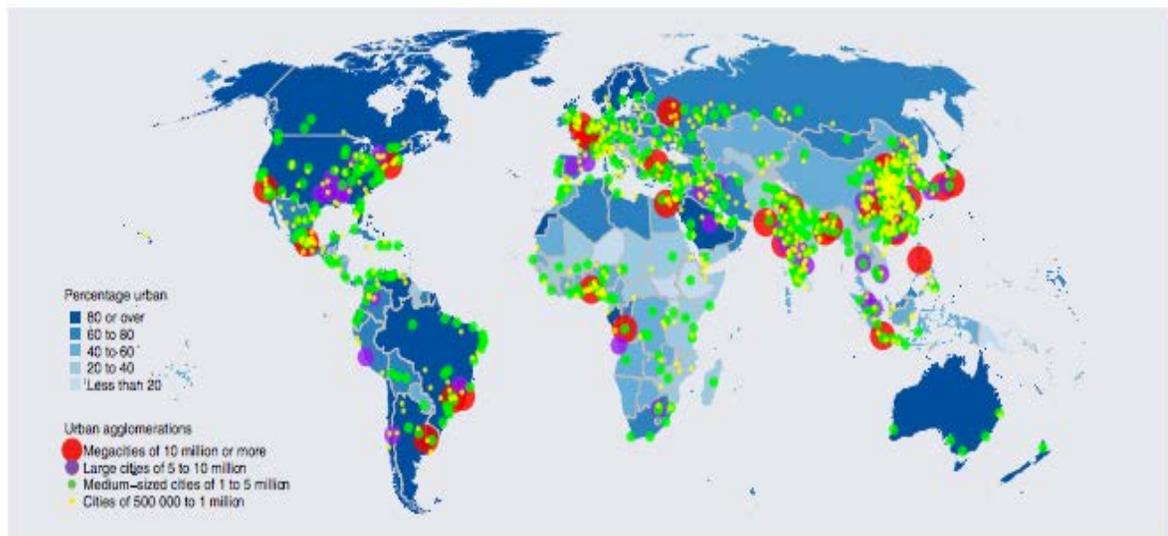
⁸ *Id.*

⁹ *Id.*

¹⁰ *Id.*

¹¹ *Id.*

Figure 2: Distribution of Cities with at least 500,000 Inhabitants Worldwide



Source: United Nations, World Urbanized Prospects, 2014.

Drivers and Pathways

Urban centers are emerging rapidly around the world due to a combination of complex pushes and pulls. Key among these trends include – 1) the natural migration from rural to urban settlements; 2) government-initiated efforts to create new and larger cities; and 3) global demographic changes.

Rural-Urban Migration

Rapid urban growth is largely the result of people transitioning from rural to urban livelihoods. Increasingly, people are leaving farms and villages to seek new opportunities in cities. With three-quarters of all hungry people living in rural areas, economic and social pulls, such as jobs, educational opportunities, and greater access to public resources and services (*e.g.*, transportation, housing, and health care) lure people to new and expanding urban centers.¹² This is also true of the farmers in developing countries who represent roughly half of the world's hungry.¹³

Relatedly, the unpredictability of life on the farm can push rural dwellers to cities. From increasingly volatile weather conditions affecting crop yields, to low commodity prices and wages, to the degradation of land over time, smallholders are particularly susceptible to food system crises and changes in crop productivity. As a result, many migrate to cities expecting to improve their livelihood away from the

¹² World Food Programme, *Who Are the Hungry?* available at <https://www.wfp.org/hunger/who-are>.

¹³ *Id.*

farm. Land grabbing resulting from political unrest and poor governance is another trend pushing rural dwellers to cities. In addition, with increasing mechanization and greater efficiency on the farm, the need for labor becomes less, further driving urban migration.

Rural-urban migration is particularly prevalent among young people. Unlike their parents and grandparents, many young people no longer see the appeal in farming or consider it to be a sustainable source of living. This trend is playing out around the world, including in less developed countries. In Thailand, young people are leaving their family rice farms for potential higher incomes in the city, threatening the country's ability to meet its domestic and global export demand for rice.¹⁴

As young people move to cities, the average age of farmers has risen rapidly. Worldwide, the average farmer is 60 years old.¹⁵ In the U.S., the average age of farmers rose to 58 years old.¹⁶ Aging farmers coupled with the migration of young people to cities have left less people on the land to farm – a trend that will only continue without ways to incent young people to be part of food and agriculture production.

Government-Initiated Urbanization

In some countries, urbanization is occurring less organically. Instead of the natural migration to cities, country governments are implementing national urbanization plans intended to stimulate economic development throughout the country. China is one of the most recent examples of this trend, whereby the government has prioritized urbanization in an effort to boost economic growth.

In just four decades, China has gone from a 17 percent to over 55 percent urban population.¹⁷ By 2020, the Chinese government intends to have 60 percent of its population living in urban areas – an increase of roughly 260 million people.¹⁸ The government's urbanization plan aims to transition China away from its reliance on overseas investment to increased domestic productivity and consumption. If successful, China's urban growth could help return its gross domestic product (GDP) to the double-digit growth the country experienced during the last three decades.

Global Demographic Changes

¹⁴ Thomas Fuller, Thai Youth Seek a Fortune Away From the Farm, *THE NEW YORK TIMES*, June 4, 2012.

¹⁵ Rob Vos, Is Global Food Security Jeopardized by an Old Age Timebomb? *THE GUARDIAN*, Feb. 4, 2014.

¹⁶ Daniell Kurtzleben, The Rapidly Aging U.S. Farmer, *U.S. NEW & WORLD REPORT*, Feb. 24, 2014.

¹⁷ Joel Kotkin, The Unrest in Hong Kong and China's Bigger Urban Crisis, *FORBES*, Oct. 13, 2014.

¹⁸ Dexter Roberts, China Wants Its People in the Cities, *BLOOMBERG BUSINESSWEEK*, March 20, 2014.

Rapid urban growth can also be attributed to global demographic changes. The nearly doubling of the urban population by 2050 is due in part to overall population growth trends. High rates of population growth can contribute to population shifts from rural to urban areas, particularly if the urban economy can support the influx of new residents.¹⁹ Moreover, as populations are living longer due to innovations in medicine and health care technologies, urban centers will only continue to expand in the coming decades, despite overall declines in population growth rates.²⁰

IMPACT OF GLOBAL URBANIZATION

Urban growth is inextricably linked to the economic, social, and environmental sustainability of cities. While urban growth is often a driver of economic development, it can also exert added pressures on the availability of social services and natural resources. The section below highlights many of the opportunities and challenges that are relevant to our ability to achieve food and nutrition security in a rapidly urbanizing world.

Urbanization Opportunities

Cities are instrumental to economic development. For centuries, the growth of cities has been a catalyst for stronger and more stable economies.²¹ The reverse has also proven true whereby economic development has stimulated rapid urbanization. It is not surprising, therefore, that most of the world's largest economies can be found in the world's largest cities. Cities spur such economic growth through providing economies of scale, agglomeration, and localization. In doing so, cities enable more efficient access to infrastructure and services and become a magnet for skilled labor and innovation.²²

As a result, in comparison to rural areas, cities are disproportionately responsible for countries' economic growth. Urban centers represent half of the global population, yet they generate over 80 percent of global GDP.²³ By 2025, the top 600 cities by GDP growth are expected to generate roughly 65 percent of the world's economic growth.²⁴ Perhaps even more striking is that of the 600 cities, 440 emerging markets will account for nearly half of the expected global GDP growth by 2025. The 440 emerging markets, which include Shanghai, China, San Paulo, Brazil, Istanbul, Turkey, and Lagos Nigeria, are expected to reach an annual growth rate of 7.6 percent – nearly double the growth rate for the global economy.²⁵

¹⁹ International Institute for Environment and Development, Urbanization Concepts and Trends: Working Paper, June 2014.

²⁰ *Id.*

²¹ UN Habitat, The Global Urban Economic Dialogue Series: The Economic Role of Cities, 2011.

²² *Id.*

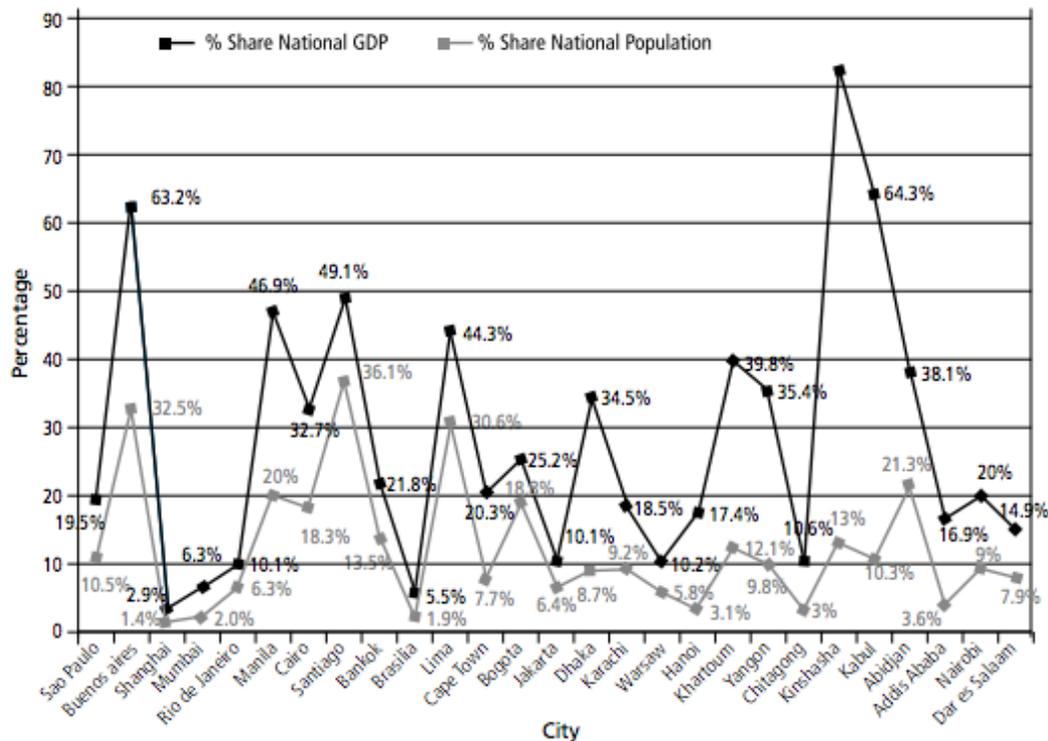
²³ *Id.*

²⁴ McKinsey Global Institute, Urban World: Cities and the Rise of the Consuming Class, June 2012.

²⁵ *Id.*

Interestingly, while urban productivity in developed countries is generally greater than in developing countries, typically, developing country cities contribute more to their national economies as compared to developed countries. In India, for example, cities are estimated to contribute from 60 to 80 percent of the country's GDP.²⁶ And, some cities in developing countries generate as much as five times their population share (Figure 3), highlighting the critical role of urban growth in emerging markets.

Figure 3: Share of National Population and GDP in Key Cities in Developing Countries



Source: UN Habitat, The Global Urban Economic Dialogue Series: The Economic Role of Cities, 2011.

In addition to the economic gains associated with urbanization, there are also social gains from living in the city. Urban dwellers benefit from the convenience and proximity to commercial activity, access to public services, and participation in social and cultural opportunities. Cities provide greater access to markets and products and, for some, a higher standard of living. While not universal, particularly in low-income countries and cities, urbanization is also associated with improved health and longer life expectancies as compared to life in rural areas due to greater access to health care services and providers.

²⁶ UN Habitat, The Global Urban Economic Dialogue Series: The Economic Role of Cities, 2011.

Urbanization Trends and Challenges

Urban growth, however, is not without its challenges. In many urban centers, the economic growth generated is unequally distributed, impacting the health and wellbeing of urban dwellers. Unplanned urbanization can result in an influx of people to cities unable to find work and affordable housing, leading to high rates of unemployment, drug abuse, homelessness, and crime. In the developing world, one-third of urban residents live in slums – an estimated 860 million people.²⁷ And, while generally the risk of death under the age of five is higher in rural areas, beyond those averages, the urban poor can sometimes fair far worse. In addition, the higher cost of living in cities can often price the middle class out of the market. Creating a new layer of urban poverty. Brazil’s “favelas” represent one example of some of the challenging consequences of urban growth (Box 2).

Box 2. Brazil’s Rapid Urbanization

Beginning in the 1950s, Brazil urbanized at a rate of 2.5 percent each year. Coupled with equally rapid population growth, Brazil’s urban population grew at a rate of roughly 5 percent each year. By 1991, the country’s urban population accounted for 75 percent of its total population, due, in part, to the migration of workers from rural to urban areas.

However, Brazil’s rural-urban migration led to a proliferation of urban slums. Without adequate resources and infrastructure to accommodate the country’s urban growth, rural migrants were forced to live in informal settlements or “favelas.” Favelas, known for their poor access to water, electricity, sanitation, and a proclivity to crime, are home to 6 percent of Brazil’s population – roughly 11 million people. The government has since launched efforts to address the socio-economic issues facing those living in favelas. Through these efforts, the conditions of many favelas have improved significantly. But, these communities are a reminder of the ongoing economic and social challenges of rapid urban development.

Sources: BBC News, Favela Life: Rio’s City Within a City, June 9, 2014; International Institute for Environment and Development and United Nations Population Fund, Briefing: Learning from Urbanization in the BRICS, Dec. 2012.

Urbanization also raises a number of environmental issues that are associated with city living. Cities, for example, are key contributors to global warming, emitting as much as 70 percent of human-induced greenhouse gases.²⁸ Cities also depend heavily on fossil fuels – as much as 95 percent of urban transport uses petroleum. And, because 40 percent of the urban population lives within 100km of coastlines, cities are particularly vulnerable to climate change-related disasters.

²⁷ Save the Children, The Urban Disadvantage, State of the World’s Mothers, 2015.

²⁸ UN Habitat, Sustainable Urbanization in the Post-2015 UN Development Agenda, Feb. 2012.

Likewise, urbanization also increases our competition for the planet's resources, particularly water and energy. While over half of the world lives in cities, the urban population consumes 60 to 80 percent of commercial energy. By 2035, this level of consumption is expected to increase by one-third.²⁹ And, by 2050, global water demand is expected to increase by 55 percent with over 40 percent of the global population living in areas of depleting water sources. Further, it is estimated that 20 percent of the planet's aquifers are over-exploited and the deterioration of wetlands is impacting the ability of ecosystems to purify water.³⁰ With agriculture accounting for 70 percent of the planet's fresh water and the industrial sector accounting for 20 percent, the availability of water for domestic uses, such as drinking and sanitation, will only place added pressure on an already strained water supply in expanding cities.

IMPLICATIONS FOR FOOD AND NUTRITION SECURITY

The opportunities and challenges unique to urban centers will require new approaches and solutions to ensuring the availability, access, and utilization of food in cities and surrounding rural areas. From rising per capita incomes, to changing diets, to moving food and agricultural products surpluses further away from where it is grown, urbanization presents an important lens through which to address global food and nutrition security.

A New Middle Class Driving Food and Agriculture Demand

By all accounts, the world's population will reach over 9.6 billion in 2050. As noted, two-thirds of those people will live in urban areas, primarily in developing countries. With this urbanization, the global middle class will expand from 50 to 70 percent by 2050, again, primarily in developing countries.³¹ And, annual per capita incomes in developing countries will increase by 4.4 percent as compared to 1.7 percent in developed countries until 2022.³²

This increased urban growth and wealth in the developing world is already unleashing an increasing demand for food and agricultural products. As illustrated below (Figure 4), it is estimated that by 2022, developing countries will consume 12 percent more dairy, 22 percent more grain for feed, 52 percent more meat and chicken, and 32 percent more vegetable oils for food and fuel.³³

²⁹ UN Water, The United Nations World Water Development Report 2014: Water and Energy, Vol. 1.

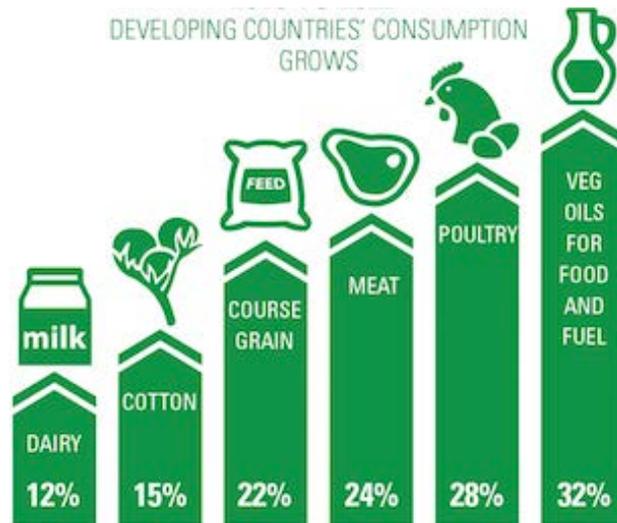
³⁰ *Id.*

³¹ Global Harvest Initiative, 2015 GAP Report: Building Sustainable Breadbaskets, 2015.

³² *Id.*

³³ *Id.*

Figure 4: Food Demand in Developing Countries: 2013-2022



Source: Global Harvest Initiative, 2015 GAP Report: Building Sustainable Breadbaskets, 2015.

The positive correlation between income wealth and changing diets is playing out around the world. In China alone, food demand for animal protein is expected to increase by 37 percent for meat, 44 percent for eggs, and 55 percent for milk.³⁴ However, many of these developing countries, including China, are not expected to meet this growing food, feed, fiber, and fuel demand through domestic production.

As a result, global trade will play an increasingly important role in moving food and agricultural products from countries of surplus to deficient. Multilateral and bilateral trade agreements that address tariff and non-tariff barriers to expand trade will, therefore, be critical to sustaining the global food supply for food insecure countries. This will prove true even despite the increasing impact of climate change and the growing migration of refugee populations from conflict regions on the ability of high crop yielding countries to sustain the global food supply.

Changing Diets and Health Impacts

As consumer diets change in more urban environments, the double burden of undernutrition and overnutrition continues to place a significant human and economic toll on cities in developing and developed countries. While the most recent estimates of the undernourished has dropped to 795 million people around the world – 780 million people in developing countries – hunger and poor nutrition remain global challenges.³⁵

³⁴ Professor Zhengzia Dou Presentation, Urbanization & Food Security in China: Trends Projections, Challenges, and Opportunities, University of Pennsylvania, School of Veterinary Medicine, March 12, 2015.

³⁵ Food and Agriculture Organization of the United Nations, State of Food Insecurity in the World: In Brief, 2015.

Unlike food security in rural areas, urban food security is largely dependent on the ability to purchase food. Undernutrition has become increasingly prevalent in urban areas as people spend on average 30 percent more on food than in rural areas.³⁶ Cities are also more dependent on food imports. In many African cities, 30 to 50 percent of food staples in markets are imported into the country.³⁷ Collectively, the limited ability to grow food, the cost of purchasing food in the store, and the inability to store food at home, forces many urban dwellers to purchase food on the street or reduce their caloric intake. This has led to poor diet quality and diversity with long-term health consequences. Indeed, today, one-third of children suffer from hunger or a form of nutrient deficiency, which has life long implications for a child's physical and mental development.

The other side of malnutrition – overnutrition – and its related comorbidities is of equal concern, given the adoption of westernized lifestyles and diets. Today, nearly one-third of the world's population is obese or overweight.³⁸ In the U.S., over a third of the population is living with obesity.³⁹ The U.S. and nine other countries, including Mexico, China, India, Brazil, and Indonesia, are home to over half of the 671 million people living with obesity.⁴⁰ Obesity accounts for 5 to 20 percent of U.S. health care expenses, 2 percent in Brazil, and 2 to 4 percent in Europe. Meanwhile, obesity-related conditions, such as diabetes, impacts 29 million people in the U.S. and 9 percent of people around the world.⁴¹ And, as of 2012, treating diabetes in the U.S. alone costs over \$300 billion a year.⁴²

Urban Food Systems

Feeding a growing urban population will require food systems that can adapt to urban markets and sustainably and efficiently move food and agricultural products along the value chain, while reducing waste. At the production level, rural-urban migration will result in a smaller number of people on the farm. Meanwhile, the

³⁶ Eugenie L. Birch Presentation, Urbanization & Food Security: Setting the Table, Co-Director, University of Pennsylvania Institute for Urban Research, Oct. 7, 2014.

³⁷ Center for Strategic & International Studies, Nutrition and Food Security in the City, Feb. 21, 2013.

³⁸ Marie Ng, et al. Global, Regional, and National Prevalence of Overweight and Obesity in Children and Adults during 1980-2013: A Systematic Analysis for the Global Burden of Disease Study 2013, LANCET, vol. 384;9945: 766-781, Aug. 30, 2014.

³⁹ Centers for Disease Control and Prevention, Adult Obesity Facts, *available at* <http://www.cdc.gov/obesity/data/adult.html>.

⁴⁰ Marie Ng, et al. Global, Regional, and National Prevalence of Overweight and Obesity in Children and Adults during 1980-2013: A Systematic Analysis for the Global Burden of Disease Study 2013, LANCET, vol. 384;9945: 766-781, Aug. 30, 2014.

⁴¹ World Health Organization, Diabetes: Fact Sheet #312, Jan. 2015, *available at* <http://www.who.int/mediacentre/factsheets/fs312/en/>.

⁴² Dall Timothy, et al. The Economic Burden of Elevated Blood Glucose Levels in 2012: Diagnosed and Undiagnosed Diabetes, Gestational Diabetes, and Prediabetes, DIABETES CARE, 2014; 37:3172-3179.

sprawl of urban centers into rural areas will impact the availability of land on which to farm. Both of these trends will affect our ability to double agricultural productivity, requiring farming models that can respond to agricultural demand. Farming models, such as farmer producer organizations that enable smallholder farmers to sell to wholesalers and supermarkets, contract farming arrangements involving smallholders growing products to sell to purchasers at set prices, and larger scale “super” farms are emerging in response.⁴³

From a distribution perspective, one of the challenges compounded by rapid urbanization in developing countries is the lack of infrastructure and logistics needed to bring food and agricultural products, particularly fresh food and agricultural products, to market. The movement of products from farms and villages will require connecting farmers, particularly smallholders, more effectively to the market. Improved infrastructure, such as roads, bridges, and ports, will be key to achieving this goal. And, solutions to address postharvest loss and waste, such as cold storage, will be critical to curbing the 12 percent of food loss and waste at the distribution level.⁴⁴

In addition, the emergence of supermarkets in the developing world has transformed the access and availability of food for urban dwellers in Asia and Africa.⁴⁵ The proliferation of supermarkets also highlights the role of globalization in supplementing countries’ food supplies through imports and exports. Other distribution sites common to urban centers in more developed countries include farmers’ markets and food coops that enable greater access to local food and agricultural products, satisfy the growing consumer demand of knowing where their food is produced, while being part of the local food supply chain.

Finally, the delivery component of the food system relates to the price, safety, and quality of food.⁴⁶ Despite the convenience and access that is characteristic of urban living, food deserts are common to cities around the world. Typically found in lower-income communities, food deserts are areas that lack sufficient access to local markets and grocery stores that can supply fresh food and agricultural products to the community. Instead, these areas are often overrun by corner stores that specialize in unhealthy food options, contributing to the unhealthy s of those living in low-income cities.

With continued urban center growth, it will be important that these communities have greater access to an affordable, nutritious, and culturally-appropriate food supply. As evidenced by the events around the world, including the Arab Spring of 2010 and 2011, food insecurity in fragile urban centers is often the catalyst for

⁴³ University of Pennsylvania, Feeding Cities: Food Security in a Rapidly Urbanizing World, Conference Report, 2013.

⁴⁴ *Id.*

⁴⁵ *Id.*

⁴⁶ *Id.*

political and social unrest. In the years ahead, urban populations will only become more powerful as these populations grow, making it increasingly important to ensure their food security.

SUSTAINABLY FEEDING CITIES

With over 9.6 billion people inhabiting the planet and an unprecedented number living in cities by 2050, the issue of urbanization will remain increasingly important to sustainably feeding the world. Indeed, addressing *urban* food security has become as significant as addressing the need to improve the livelihoods of smallholders on the farm. As we look ahead, the section below highlights key areas where the global community should focus to ensure that our urban centers can contribute to a food and nutrition secure world.

Embrace continued and rapid innovation and investment in agriculture. As farmers navigate food and nutrition security challenges, such as rapid urban migration, population growth, changing diets, climate-related changes, and food waste, they will demand innovative tools to enable them to sustainably produce more with less or the same inputs. The global community should support and embrace the call for new technologies, solutions, and practices that continue to improve our ability to feed the world. From precision agriculture applications that better regulate the use of water and fertilizer inputs, to advancements in science-based seed technology, to new machinery to reduce the labor and time needed to produce the same or a greater level of output, doubling our agricultural productivity will require greater and more rapid innovation and investment.

Such innovation and investment will also be critical to adopting and scaling approaches to, for example, protect soil quality and health, better capture, manage and, reuse water in water-scarce regions, reduce food waste and postharvest loss along the food value chain, and address the infrastructure necessary to store and distribute food to markets, including infrastructure and cold storage.

Equally important will be using innovation to ensure greater access to nutrient-rich food in urban markets. With a growing middle class increasing their consumption of packaged food, the global community should more effectively collaborate to improve the nutritional quality of processed food. While many consumers are several generations removed from life on the farm, they are increasingly interested in how and where food is grown. The global community should leverage this opportunity and engage in open and constructive dialogues about the content and production of our food to help bridge the gap across agribusiness, academia, governments, and consumers. One way to address this challenge is by identifying pre-competitive issues around which stakeholders can align and share data both with each other and the public. This approach has been adopted in the sustainability space to address common sustainability challenges among competitors.

Identify and develop solutions to address urban food system challenges.

Sustainably feeding cities will require finding solutions to address the food and nutrition issues affecting the urban food supply. From identifying ways to curb postharvest loss and waste along the value chain to implementing policies and science-based solutions to ensure the safety of street food vendors and trucks, urban centers face unique challenges to an affordable, accessible, and safe food system. As mentioned, this includes preparing for and building the infrastructure necessary to connect farmers, particularly smallholders, to markets. This is particularly important for city dwellers with limited access to fresh agricultural products. The innovation and investment in approaches to better store and deliver food will be critical to enabling urban centers access to more healthy food choices. By strengthening linkages across rural and urban areas, rural farmers can benefit from new sources of income as a result of emerging urban markets, while city dwellers gain access to local farms and food.

Promote global trade to advance food security. Global trade remains a critical factor in closing the food, feed, fiber, and fuel gap in countries and regions unable to meet domestic demand. Every region, with the exception of Latin America and the Caribbean, will need to rely on increased productivity or increased imports to satisfy growing food demand.⁴⁷ Other regions, such as East Asia and Sub-Saharan Africa are facing gaps of 22 to 86 percent, respectively.⁴⁸ The global community should move forward in supporting ongoing trade agreements, such as the Trans-Pacific Partnership and the Trans-Atlantic Trade Investment Partnership, which would expand market access for food and agricultural products and address non-scientific barriers to trade.

Identify and leverage new opportunities to incentivize the next generation of farmers. As young people consider staying on the farm or moving to cities, the global community should find new opportunities to excite youth about farming and their role in feeding the world. Precision agriculture, mobile technologies, improved genetics, and mechanization are only some of the tools the global community could leverage to enable young people to realize the advancements that have transformed our ability to increase yields, while preserving the planet's resources. Moreover, it is critical that the global community encourage girls and young women to pursue STEM education to empower them to take on careers in food and agriculture.

In addition, the growing field of urban agriculture presents an opportunity to engage young people who are living away from the farm. While not the silver bullet to food and nutrition security, through various types of urban farming, young people can find new ways to contribute to their local food value chain and contribute to their local communities.

⁴⁷ Global Harvest Initiative, 2015 GAP Report: Building Sustainable Breadbaskets, 2015.

⁴⁸ *Id.*

Embrace governance structures and policies that support investment and innovation. While the need for private sector investment and innovation in agriculture remains, facilitating such investment in emerging markets requires that appropriate governance and rule of law frameworks be in place. The global community should support the regulatory and policy incentives and protections necessary to spur greater innovation and investment in agricultural development and research to address our food and nutrition security challenges around the world.

Facilitating such an environment would enable greater investment in the most vulnerable regions and in the untapped resource of orphan crops prevalent in many food insecure countries. Further, appropriate regulatory and policy frameworks would help address the distribution and processing challenges that are unique to urban centers, such as street food safety and the tampering of processed food, which affect the quality of our global food supply. Ultimately, achieving overall food security will require greater oversight over the urban food supply chain.

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The DuPont Advisory Committee on Agricultural Innovation and Productivity is a group of experts in global agriculture development, science, policy, and economics. The Committee includes former Senator Tom Daschle (chair); Jason Clay, Senior Vice President of Market Transformation at the World Wildlife Fund; Jo Luck, former President and CEO of Heifer International and World Food Prize Laureate; Ruth Oniang'o, Founder and Director of Rural Outreach Africa; J.B. Penn, Chief Economist for Deere & Co.; and Pedro Sanchez, Director of the Agriculture and Food Security Center at The Earth Institute, Columbia University and World Food Prize Laureate.