

Can The World Feed Future Generations?

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Background

The food and agriculture landscape has changed dramatically over the last several years. The food marketplace has shifted from a supply-driven to a demand-driven environment. This demand-driven environment will continue to intensify as the world population continues to grow. World population is expected to grow to 8.4 billion in 2030, and by 2050 the population may reach 9.5 billion. This growth poses several questions regarding the future of food and agriculture.

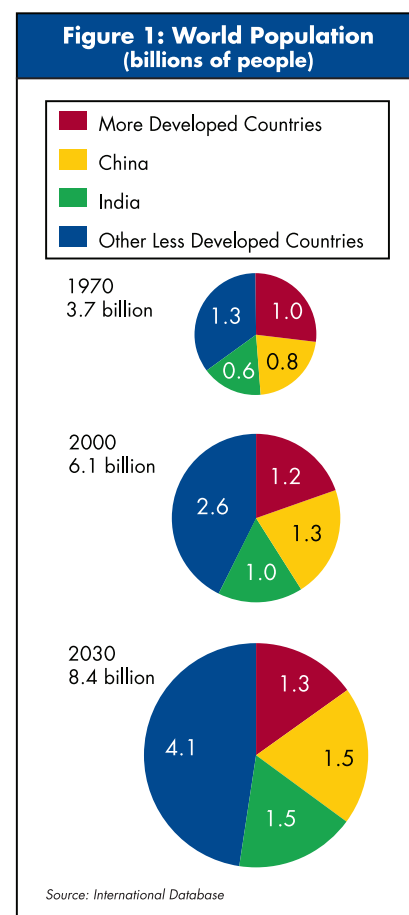
- Can the world produce enough food for future generations?
- What will happen to the cost of food production?
- Where will the majority of population growth occur?
- Beyond population growth, what additional factors may alter the marketplace?
- What regions of the world have adequate resources to produce the required amount of food?
- What type of improvements should be made in food distribution systems?
- What opportunities will result from the changing food and agriculture landscape?

The Hale Group and SIAM Professionals recently conducted a study to better understand our ability to handle the projected population growth as well as identify other major trends and issues that may impact food and agriculture markets. The information below provides an overview of our findings.

Food Demand Factors

Population Growth

The world population is projected to increase substantially in the next twenty years. Between 2005 and 2030, world population is expected to increase from 6.5 billion to 8.4 billion. This increase of 1.9 billion people will create new demand for food and agriculture markets.



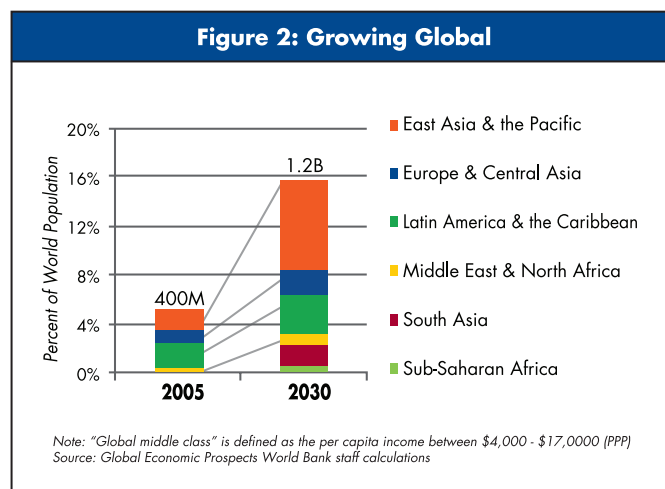
- India, China, Indonesia, and other Asian countries will account for much of the population growth.
- Asia will experience the largest population increase, estimated at 942 million people, with India accounting for almost half of the increase in the region.
- Simultaneously, several regions will see a reduction in population including Eastern Europe, the Baltics, and the Commonwealth of Independent States.

Future growth in food demand will occur primarily outside the United States – mainly in Asia.

Rapid Growth of the Middle Class

The global middle class is attracting unprecedented attention. The February 14-20 issue of "The Economist" contains a special report on the "Burgeoning Bourgeoisie." Different economists define middle class differently, but all agree that the global middle class has been growing rapidly. While the current economic downturn may slow its growth, most people agree that the middle class will again create ripple effects throughout the global economy.

- Prior to the global economic slowdown, the World Bank projected the middle class of developing countries would triple by 2030 from 400 million people to over 1.2 billion.
- East Asia and the Pacific regions will experience the largest middle class growth, with China contributing 305 million people.
- Rising incomes of the middle class will shift food consumption habits increasing the demand for meat, fruits and vegetables.
 - One estimate by the Centre for World Food Studies estimates that as incomes rise by 10%, meat consumption increases by 15%.



An additional 800 million people in the global middle class by 2030 will significantly alter the food and agriculture marketplace.

Dietary Trends

Numerous food consumption trends are occurring that are altering the food and agriculture landscape. Consumption trends differ across the spectrum when comparing developed and developing countries. In developed countries, daily caloric intake is above necessary levels causing consumers to begin to demand healthier food to combat the rapid rise of high body weight and obesity. The opposite issue is occurring in developing countries where the lack of caloric consumption is causing severe malnutrition.

- According to the Food and Agriculture Organization (FAO), there were 830 million people suffering from undernourishment in the developing world in 2002 – 2004.
- The number of overweight people in the world varies based on the definition of overweight. The International Obesity Task Force and World Health Organization estimate that as many as 1.7 billion people could be considered overweight.

The number of people impacted by malnutrition and obesity will greatly influence the type of food consumed.

Food Supply Factors

Natural Resources – Land & Water

The growing population – with emphasis on the growth of the global middle class – begs the question:

Does the world have adequate agricultural resources to feed this growing segment of the world's population?

When analyzing agricultural capacity the two most critical variables are: (1) available land and (2) available water.

1. Is adequate land available for future agriculture needs?

- The FAO estimates that by 2030 an additional 121 million hectares (300 million acres) will be needed for global agriculture. This represents an area that is larger than the amount of U.S. land currently devoted to the production of our nation's four largest crops – corn, soybeans, hay, and wheat. However, the overall consensus among industry experts is that enough arable land exists to meet this need.
- Though potentially arable land exists, it is unevenly distributed. The majority of available land is concentrated in two regions, Latin America and Sub-Saharan Africa.
- In these two regions, more than half of the available land is located in just seven countries: Brazil, Democratic Republic of the Congo, the Sudan, Angola, Argentina, Colombia, and Bolivia.

Figure 3: Available Land in Select Countries

Country	Very Suitable and Suitable Land (million hectares)	Agriculture Land in Use (million hectares)	Available Land for Potential Development (million hectares)
Angola	47	4	43
Argentina	77	30	47
Bolivia	27	3	24
Brazil	200	67	133
China	104	156	(52)
Colombia	20	4	16
Democratic Republic of the Congo	55	8	47
India	160	170	(10)
Sudan	76	20	56
United States	173	177	(4)
Total	941	639	302

Note: Very suitable and suitable land excludes land that could be used for agriculture but is currently dominated by forests. Source: FAOSTAT, IIASA

Figure 4: Water Resources in Select Countries

Country	Total Internal Renewable Water per capita (m ³ /inhab/yr)	Freshwater withdrawal as a % of total renewable water resources
Australia	23,964	4.9%
Brazil	28,618	0.7%
China	2,117	21.8%
India	1,094	34.1%
Indonesia	12,400	2.9%
Pakistan	342	75.2%
Saudi Arabia	99	936.1%
United States	9,246	15.6%

Source: AQUASTAT

- Three of the countries listed in Figure 3 have more land currently in agricultural production than the total land that is considered suitable or very suitable for agricultural production. China is the most extreme example of this phenomenon, but India and the U.S. are also in this category.
- ### 2. Are adequate water resources available?
- Water availability is a greater concern than land, but with intensive water management, the consensus among experts is that enough water will likely be available.

- Similar to potential arable land, water resources are unevenly distributed and some countries may experience severe water shortages.
 - Less than 2,000 m³/inhabitants/year of internal renewable water is used by some water experts as an indicator of water scarcity.

Some countries will have ample resources to produce the required food demands over the next several decades, while other countries may have problems feeding their people from domestic production.

Weather - Global Warming

Global temperatures have risen slowly and steadily over the last 140 years; however, the continued rise will certainly impact the state of global agriculture.

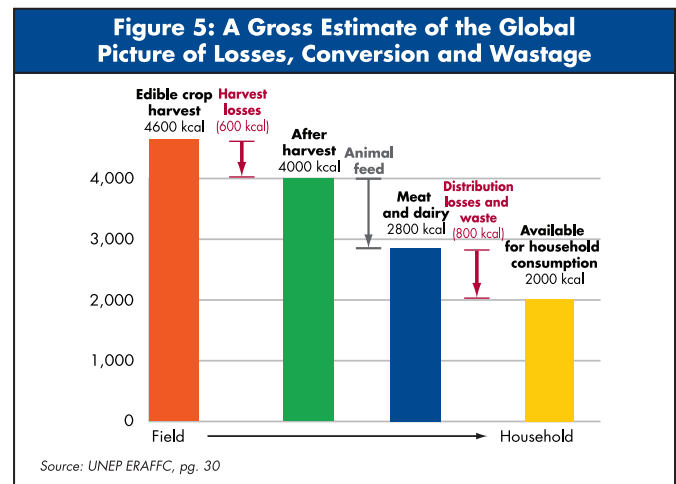
- The majority of experts believe that global warming will minimally impact agriculture over the next decade or so. Longer term, the impact could be more significant.
- Developed countries will experience fewer problems due to their ability to make financial and social adjustments.
- Developing countries, primarily in Sub-Saharan Africa and Latin America, will experience numerous problems including longer droughts, shorter growing seasons and possible loss of rain-fed land.

Global warming will impact countries around the world very differently.


Food Distribution Factors

While all countries will benefit from liberalized trade, “free trade” by itself will not lead to food security. A lack of adequate infrastructure – particularly roads, ports, telecommunications and marketing infrastructure – constrains countries’ ability to participate in and benefit from trade.

The United Nations Environment Program (UNEP) published a report in February 2009 titled, “Environment’s Role in Averting Future Food Crises” (ERAFFC). Evidence in that report suggests that roughly 30% of our food supply is lost. According to the UN Under-Secretary-General and UNEP Executive Director Achim Steiner, “We need to deal with not only the way the world produces food but the way it is distributed, sold and consumed...”. The implication is that incremental improvements in how food is produced, distributed and disposed of can have a major impact on reducing world hunger. Figure 5 provides a global picture of losses throughout the food chain and estimates the loss of kcal/capita/day at harvest, 600 kcal, and distribution losses/waste, 800 kcal.



Everyone agrees that improving rural infrastructure and non-farm employment is important for increasing rural income, particularly in low-income areas. However, compared to the existing body of research dedicated to increasing food production through greater crop yields and animal productivity, it appears there is relatively little research on cutting agriculture loss and food waste through rural infrastructure development. Consequently,



government policies and programs in both developed and developing countries focus on subsidizing production, isolating farmers from market forces, restricting imports and as we saw in 2008, instituting export bans during times of high prices. More research and public funds might be better allocated to government supported private sector investments in physical infrastructure that will create non-farm jobs, improve farmers' access to urban markets, and increase rural community access to imported food. Refocusing attention in this area may lead to new strategic initiatives and policy choices for how we address food security and poverty in the future.

While food waste cannot be eliminated, much more attention should be paid to reducing food loss.

Food Cost Factors

Input Costs & Availability

Agricultural input costs have risen sharply over the last several years due to higher energy costs and rising demand from developing countries.

- Prices for fertilizer, seed and pesticides increased 175 percent, 72 percent and 20 percent respectively in the U.S. between 2002 - 2007.
- Currently input costs are declining but will likely remain higher than previous lower levels due to the continued enhancements in biotechnology and higher energy costs.

In the future, high costs of agricultural inputs will have a greater impact on developing countries and will impact the amount of food produced.

Competition with Alternative Uses

Rising food prices have impacted countries around the world. Price increases can be attributed to numerous factors including: adverse weather conditions, rise in biofuel production, increased food demand, more speculation in commodity markets and increased energy costs.

- Low income countries are disproportionately affected by higher food prices because a greater portion of a person's disposable income is spent on food.
 - In 2007, the Economic Research Service estimated that people in Indonesia and China spend 32.4% and 34.9% respectively of their household income on food consumed at home while the U.S. spends only 5.7% (all estimates exclude expenditures for food-away-from-home).
- Even though raw commodity prices have fallen from recent highs, they will almost certainly continue to remain above historically low levels.
 - The FAO estimated that before the economic slowdown prices for meat, sugar and wheat would increase an average of 20 percent, 30 percent and 40 percent respectively over the next ten years as compared to the previous decade.

Rising food costs disproportionately impact low income countries and will require developed countries to provide additional assistance to ensure an adequate food supply is available globally.

Comparative Advantage & The Importance Of Trade

Eliminating hunger through food self-sufficiency is often a critical component of many countries' long-term food security policies, even if contrary to the concept of comparative advantage. Yet, many developing countries rely heavily on agricultural imports to feed their people. Over the past four decades, developing countries' share of global agricultural imports increased from less than 20% to about 30% (FAO, 2005). Developed countries have always been the major net exporters and Asia has become the major net importer (FAOSTAT, 2009). This trend by developing countries to satisfy rising food demand through increased imports is expected to continue as populations grow and incomes rise.

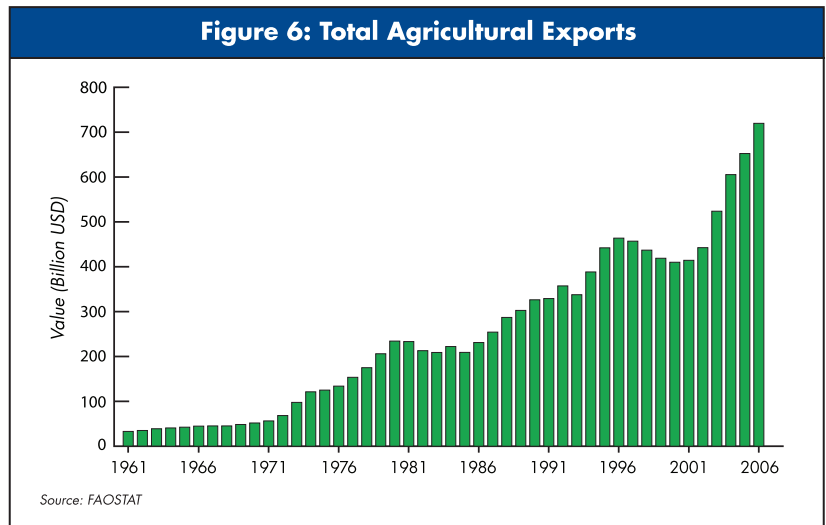
Trade in agricultural products has risen sharply since the early 1970's (as depicted in Figure 6), and is continuing on an upward trend after a brief decline in the mid to late 1990's when Asia was going through a severe financial crisis.

Recent FAO reports consistently identify trade liberalization as a critical goal that will increase access to food by the world's most needy people. However, it is also recognized that "safety nets" must accompany trade reforms during the short-term transition period. Overall domestic policy must also be conducive to private investment and activity so that safety nets can eventually be removed as economies develop, new jobs are created and poverty is reduced.

The theory of comparative advantage makes sense in the theoretical world. However, agriculture is often an important part of the economy in many developing countries with high levels of poverty. So government support for "inefficient" farmers is needed in the short to medium term in order for rural economies to prosper. For the long term, investments in rural infrastructure and human capital are essential to the poor. Likewise, improvements to food transportation, handling, and storage facilities will benefit foreign exporters as well.

Global trade of food and agricultural commodities is an important component of ensuring long-term food security for the human community. However, trade must be accompanied by other initiatives – especially in the short to medium-term – so that trade does not exacerbate malnutrition in the short-term.

Figure 6: Total Agricultural Exports



Conclusions & Potential Opportunities

In summary, we believe the outlook for feeding the world over the foreseeable future can be summed up as follows.

1. World population growth and growth of the middle class in developing countries (especially in Asia) will be the primary drivers of increasing global food demand over the next three to four decades.
2. World demand for fruits, vegetables, meat and other animal products will grow faster than demand for food grains and tubers over the next 20 years as the middle class in developing countries triples from 400 million to 1.2 billion by 2030.
3. Brazil by itself has enough suitable land for development and renewable water resources to meet the FAO estimate of an additional 121 million hectares of land needed for agriculture by 2030.
4. Advances in increasing food production are sustainable partly because private sector investment and research in production inputs is happening with minimal support from the public sector (i.e., new seed biotechnology, pesticides/herbicides, and fertilizer).
5. Sustainability in private sector investment and research into improving and expanding postharvest food distribution, handling, marketing, and storage infrastructure is lagging behind other areas of improvement.
6. With the overweight population of the world significantly larger than the undernourished population, and approximately 30% of the world's food production being lost, wasted or discarded, the current supply of food is probably more than adequate to meet the caloric needs of the world's 6.8 billion people.
7. More dialogue, research, policy and government programs should focus on improving the access side of the food security equation *vis-a-vis* increasing the availability or supply of food.
8. Due to the disparity between where food is produced and where it is needed, efforts to liberalize trade and remove restrictive barriers are critical in striving for food security. But those efforts must be coupled with investments to increase and improve inland/rural transportation, storage and marketing infrastructure in developing countries.

Now that we have reviewed several key trends and issues that may impact the future of food and agriculture, what countries offer the greatest opportunity for U.S. exporters? Also, how can U.S. Government policies and programs be used to exploit those opportunities?

Over the next several months, The Hale Group and SIAM Professionals will publish a detailed review of specific countries to provide insight on potential areas of opportunity.

To discuss this information further or learn how The Hale Group or SIAM Professionals can assist your organization, please contact Bob Ludwig or Kent Sisson.



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