



Feeding a Hungry *(and growing)* World

A Special Report from BioResource International, Inc
www.briworldwide.com

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INTRODUCTION

Talk about spooky! On October 31, 2011 as children around the country dressed in costumes, and went door-to-door asking their neighbors for candy, the United Nations Population Division determined that the world population had officially exceeded **7 billion people**. And the world keeps growing – estimates from the US Census Bureau place the world population at **8.2 billion by 2030** and **9.2 billion by 2050**.



So, one might ask, how is the global food chain keeping pace with population growth? It turns out the answer is: not that great...and not that simple. While studies by the Food and Agriculture Organization of the United Nations (FAO) indicate that enough food is being produced to feed the world, other factors are affecting distribution costs, keeping healthy food sources from much of the world's population. According to the FAO, nearly 1 in every 7 people suffers from chronic hunger, an estimated 925 million people worldwide (that's almost three times the population of the US!). Perhaps the greatest contributing factor impacting world hunger is that many people in the world lack access to arable land or resources with which to feed themselves and their families. For more important facts about world hunger, [the United Nations World Food Programme just published a list of 10 reasons](#) why hunger is the single biggest solvable problem facing the world today.

As food and oil prices continue to rise, the need for nutrient-rich, cost-effective food is growing as well. At BRI, we believe that these issues can be addressed through a strong and sustainable food chain, built upon the principles of environmental sustainability, long-term viability, and balanced production and distribution. In the following chapters, we examine the environmental, nutritional, economic and social objectives for creating a globally sustainable food chain.

ENVIRONMENTAL IMPACTS

I. Improving Access to Healthy Food

When sufficient food is produced to feed the world, why is it that nearly 1-in-7 people still suffer from chronic hunger? Is it their diet? Cheap food is normally not known for being nutrient dense. Perhaps it is where they live? Many in developing countries do not have suitable places to grow their own food or suffer from poor food distribution due to civil strife. As with any global crisis, the causes are complex and inter-related, but here are just a few reasons why a significant percentage of the world population still lacks access to adequate nutrition.



1. Rising food costs

As the global population and economies grow, especially in emerging countries, the demand for food drives prices higher. For example, a recent report from the CME group stated that “from January 2002 to their individual peaks in 2008, prices rose more than 250% for corn, nearly 300% for soybeans, 330% for wheat and over 400% for rice (CME, 2010).” While the global economic recession has somewhat abated the meteoric rise of feed grain prices, they still remain high.

2. Rising livestock production costs

According to a recent USDA report, “agricultural prices are estimated to remain above pre-2006 levels. Over the next decade there will be an increase in demand for grains, oilseed and livestock products. Furthermore, energy prices will remain high and biofuel production will continue to grow. These combined factors contribute to higher agriculture prices (USDA, 2010).” And even with the expiration of the federal subsidy for ethanol in the US at the end of 2011, the price of corn will likely remain high due to high demand for feed and food.

One part of the solution: Chickens

“When comparing all sources of protein, poultry is one of the most efficient, economical sources on earth. Poultry will grow at a higher rate than the protein industry as a whole over the next decade because of the lower production cost per kg and the lower consumer price point (Gasperoni & Bentley-Beal, 2010).”

II. A World of Hungry and Thirsty People...What are We to Do?

"I can promise that if there is not sufficient water in our region, if there is scarcity of water, if people remain thirsty for water, then we shall doubtless face war."

This sobering quote is from Meir Ben Meir, Former Israeli Water Commissioner, in a BBC news article from 2000. As if there are not enough global conflicts, to have one over water is a dubious prospect. In fact, [the Pacific InSTITUTE](#) already tracks where access to water is playing a key role in violent conflicts.

Water and energy resources are becoming increasingly limited, and fears of a sustainable supply increase.

Already we have seen the havoc around the globe as a result of competition for energy resources like oil. As the global population grows, its impact on the environment will be substantial. Water and energy resources are becoming increasingly limited and fears of a sustainable supply increase. Greenhouse gases and global warming dominate world headlines. There are many issues the world faces as the population grows.

Consider for a moment how access to water and energy is also critical to the world food supply. One might ask, "How can food production keep up with the world's population without overburdening the water and energy supply?" Simply stated, technology and innovation will need to lead the way. Just as the ["Green Revolution"](#) introduced improved agriculture production around the world in the 1960's through the development of high-yield grains and

improved agricultural practices, our current situation calls for a "Second Green Revolution" to help meet the global demands for food and fuel. This revolution will need to embrace the latest scientific advances in order to develop, on the plant side, higher yielding crops with various beneficial traits, and on the animal side, optimization of the nutrition and genetics of livestock animals.

III. Watching Our "Waste Lines"

If you ever wanted to get a idea of what a crowded planet might look like someday, you need only look at pictures from the Times Square New Year's Eve celebration, with the sheer numbers of people crammed into that city space. The conservative estimate was that 1.5 to 2 million people crowded into Times Square for the party. Afterwards, City officials indicated that nearly 150 sanitation workers began the cleanup. They needed almost two-dozen dump trucks and mechanical street sweepers, and 37 backpack blowers. The total amount of waste cleared was between 40 to 50 tons. That is a lot of confetti and party hats. When crowds gather, invariably a lot of waste is generated.

Consider that 7 billion people now inhabit the earth, and that number is rising. The amount of waste being generated is continuing to grow. It can be found on city streets and in the ocean. Plastic bags are visible in American landfills and blowing across African plains like tumbleweed. As a global community, we need more innovative solutions to waste management problems, whether they be focused on the front end of the waste stream with recyclable and biodegradable materials, or on the back end with waste to energy projects such as biomass and biogas energy.

The waste problem is complex and multi-layered, and thus so are the solutions. As we continue to research and learn, we must always be aware of the challenges and opportunities. At BRI developing sustainable innovation to meet industry challenges is one of our core values. In fact, the foundational technology behind BRI's first enzyme products was derived from groundbreaking waste management research by BRI Co-founder Dr. Jason Shih over 30 years ago.

>> Read more about the story of BRI's founding and how a [holistic approach](#) to farming has been core driver of our innovation.

NUTRITIONAL IMPACTS

I. A Deep Dive on Global Hunger and Poverty - Low Income Food Deficit Countries

The United Nation's Food and Agriculture Organization (FAO) uses certain criteria to identify a Low-Income and Food Deficit Country (LIFDC). According to [the FAO website](#), these criteria include a per capita gross national income of less than US \$1,855 and a net negative food trade position (gross imports minus gross exports) for a broad basket of foodstuffs in the preceding three years.



The current list for 2012 contains 66 countries. The complete list is available at the FAO link cited above. The countries one might expect are on the list: **Somalia, Sudan, Nigeria, Bangladesh, Haiti**, but there are also ones you might be surprised by: **India, the Philippines, Egypt, and Indonesia**, for example. The good news is this is a drop from 70 in 2011. However, the reality is that there is still much that needs to be done to fight hunger and poverty around the world. While the need is great and we as a company can only do our small part, we remain committed to doing things that support both the local and global community.

At BRI, we support organizations that are making a difference in the community through unique and effective means. At a local level we support the [Inter-Faith Food Shuttle](#), a Raleigh-based non-profit organization that redistributes perishable foods in the local community. On the global level we support [Heifer International](#), a US-based group working with communities around the world to end hunger and poverty through the gifts of livestock and training. Please consider joining us in support of one of these organizations or one that you think could make an impact in your own community or around the globe.

II. One Billion Hungry People, One Billion Overweight

In a previous post, we talked about the fact that 925 million people will not get enough to eat this year, or nearly 1 in 7 of the world population. This is one side of the so-called "Food Chain Double Burden." The other side of that equation is that an equal number of people in the world have a Body Mass Index (BMI) of over 25, which is deemed overweight (a BMI greater than 30 indicates obesity). How is it that we live in a world that has nearly

one billion people who are undernourished and an equal number who are overweight or obese?

FOOD CHAIN DOUBLE BURDEN

- **925 million** will not get enough to eat this year.
- **925 million** have a Body Mass Index over 25 (deemed overweight).

There are a few reasons for this. First, a lack of access to healthy foods results in either poor nutritional choices or an absence of food altogether. Poverty has a significant influence on food choices. Many high poverty neighborhoods in the United States lack access to a grocery store with healthy food options, which are generally more expensive. However, they do have access to cheap, processed, high fat and high caloric snack and fast foods, according to [this report from the US Department of Agriculture](#).

In fact, during a recent visit to the [Inter-faith Food Shuttle](#), we were told that hunger in America actually looks like obesity as a result of the access to cheap, high caloric foods.

Second, many poorer countries are in a food deficit, leading to under-nutrition. It would be a mistake to generalize obesity and under-nutrition problems as existing mutually exclusive of one another. In many developing countries, the two exist side by side where those with access to resources are purchasing new processed foods that have entered the global food chain and those without access are hungry.

Malnutrition is bigger than hunger or famine related issues – it is also an excess of high calorie and high fat foods. A part of the solution is to make high protein, nutrient dense foods available. And do you know what fits that description? Chickens!

III. Fostering Healthy Food Production and Consumption

As we continue to expand our food production systems to meet demand in the US and worldwide, it is important that consumers are educated about healthy food production and consumption. It is no secret that easy access to over-processed foods, poor dietary habits and a sedentary lifestyle have led to record levels of obesity in the United States.

Production and consumption are inextricably linked because healthy eating habits affect more than the shape of our bodies – our public health, global environment, and economy are impacted by the entire cycle of food production, processing, retailing, and consumption.

As identified by the [American Planning Association](#), ensuring a sustainable and healthy food system requires several components:

- Promotion of good health
- Environmentally sustainable production
- Environmentally resilient production
- Diversified producers and consumers
- Economical fairness
- Transparent system

So what does sustainable food production mean on a practical level? It serves as a renewable source of healthy food with lower exposure to chemicals and antibiotics, while providing sustainable livelihoods for food producers. Promoting good health through production and consumption increases the quality of lifelong health. This cycle positively impacts local and global economies through better healthcare and employment opportunities. The nutritional impacts of healthy and sustainable production and consumption extend beyond what we put into our bodies- it impacts how we feel mentally, physically and emotionally.

At a global level, this production and consumption cycle is critical to improving living conditions of the poor and malnourished. By teaching local farmers innovative and sustainable methods of food production and using resources available to them, farmers can provide healthy options at affordable prices to their communities. This provides economic opportunity while improving the health of those who previously may not have had access to healthy foods.

ECONOMIC IMPACTS

I. Nutrition and Its Impact on Economic Sustainability

The idea that a sustainable food chain is connected to global economic stability is often not considered. According to a 2005 overview by the World Bank, the two are inseparable:

“Malnutrition slows economic growth and perpetuates poverty through three routes – direct losses in productivity from poor physical status; indirect losses from poor cognitive function and deficits in schooling; and losses owing to increased health care costs. Malnutrition’s economic costs are substantial: productivity losses to individuals are estimated at more than 10 percent of lifetime earnings, and gross domestic product (GDP) lost to malnutrition runs as high as 2 to 3 percent. Improving nutrition is therefore as much – or more – of an issue of economics as one of welfare, social protection, and human rights.”

While adequate nutrition is a global issue, the statistics in the United States highlight the other side of this growing problem. Health issues associated with an overweight and obese population are on the rise, including heart disease, cancer and kidney disease, to name just a few. These are preventable healthcare and economic costs. A study by the American Dietetic Association indicates that for every dollar spent on nutrition interventions, \$3.25 is saved in health care costs (Nutrition Screening Initiative: Malnutrition in the Elderly; www.aafp.org).

The economic costs are noticeable in the health care industry, but what about other hidden costs? People suffering from malnutrition have shorter life spans, increased rates of lost work time and a decreased quality of life. For emerging countries to build stable economic futures, a healthy population is critical. For developed countries to combat the disease of excess, a healthy population is critical. BRI will continue to work towards breakthrough discoveries and contribute to the economic stability of the global population. Our scientists and innovations are currently leading the way towards greater global health.

II. Helping Farmers Be Successful

If you are in poultry production, you know how hard it is out there. While it has never been easy to make a living growing and selling poultry, the “perfect storm” of factors including high feed costs without a substantial in-

crease in meat prices, combined with mounting consumer concerns about animal welfare and health, creates a uniquely difficult environment for farmers to be successful today.

But, as it has often been noted, in every crisis lies the opportunity for real change. One of those tools for change in the animal feed industry and an area of rapid growth is feed enzymes. Whether it is using [phytase](#) to improve the availability of phosphorus in the animal's diets or [carbohydase](#) to improve energy utilization in feed, enzymes have become an increasingly viable and valuable tool for poultry growers to cost-effectively increase feeding efficiency on their farms.

BioResource International has introduced a ground-breaking new product to add to the farmer's toolkit for improving animal productivity. Our Versazyme feed additive is a protease feed enzyme that is helping farmers succeed on multiple levels. Studies have shown that farmers using Versazyme see better meat yields in poultry broilers and better egg production in layers. Other studies have shown that adding Versazyme to the feed improves the digestibility of lower quality proteins or extracts more nutritional value from less protein. Hence, more live birds are produced for harvest at lower feed costs when Versazyme is added to the feed. Furthermore, Versazyme also offers a potential natural alternative to antibiotics. By growing bigger, healthier animals, farmers are increasing their revenues while reducing their costs and losses.

BRI's bio-based solutions boost profits, whether it is through improved animal nutrition, improved weight gain in animals, greater feed efficiency, or increased protein availability. The result is that our customers see better performance at lower costs.

TOOLS FOR CHANGE:

Feed enzymes have become a valuable tool for increasing feed efficiency on farms.



III. Ensuring Sustainable Food Supplies and Prices

The [United Nations Food and Agricultural Organization](#) reports that for the period between July of 2010 to March of 2011, world food prices were on an extreme rise, and that high prices were likely to continue through 2011. One solution that the FAO offered was for countries to invest in new agriculture and agricultural advancements. Sadly, world events contributed to the disruption in many food supplies, contributing to the rise in prices. Global food economics essentially boils down to supply and demand. Even if demand were to remain the same,

which it cannot as world population increases, the supply chain continues to be constrained.

The challenges that crop producers face are shaping the challenges that animal producers face. As more global consumers are incorporating animal protein into their diets, the increasing demand for protein such as poultry will lead to higher food prices if supply does not keep pace. Farmers face increasing pressure to produce poultry at a sustainable rate to match demand and maximize profit. They also face increasing pressure to deliver high-quality foods products at a reasonable cost.

A part of the cost that farmers face is energy related. As the global rise in fuel prices causes commodity prices to increase, farmers need every advantage available to keep their costs down. BioResource International offers products like Versazyme® and Valkerase® that help farmers lower their production and energy costs.

To that end, BRI signed a global exclusive distribution agreement in 2008 with St. Louis-based animal nutrition company [Novus International](#) to market Versazyme® under the Novus brand [CibenzaDP100™](#). Novus is a global leader in animal feed additives and one of the largest amino acid suppliers in the world.

SOCIAL IMPACTS

I. Food Security

Most people are aware of food safety, but food security is probably not an issue on many people's minds. So just what is food security?

According to the World Health Organization (WHO), "[food security](#)" is built on three pillars:

- Food availability: sufficient quantities of food available on a consistent basis.
- Food access: having sufficient resources to obtain appropriate foods for a nutritious diet.
- Food use: appropriate use based on knowledge of basic nutrition and care, as well as adequate water and sanitation."



To learn about what some countries and organizations are doing to ensure food security, the [UK's Guardian](#) recently featured a few examples of how food security is being promoted around the world. For example, farmers in Ethiopia are working with crop research institutes Icrisat and Eiar to test new drought and pest-resistant varieties of chickpea. And in another part of the world, the Gates Foundation recently pledged \$200 million for projects researching drought-tolerant products and training for farmers in emerging countries.

The ramifications are global, and the United States is not exempt. The WHO indicates that 800 million people do not have access to enough food to eat each day. According to the US Department of Agriculture, one out of every six Americans is "[food insecure](#)."

Just as food insecurity is a multi-faceted and multinational issue, the solutions must also be diverse in scope and come from all sectors of society, from non-profits to government agencies to large and small private enterprises. Fortunately, The World Bank's [Global Agriculture and Food Security Program](#), the [USAID initiative](#) and the United States Government's [Feed the Future campaign](#) offer glimmers of hope for each human to have access to healthy food. But solving food insecurity in the near future requires a commitment from each citizen and organization today. BRI understands this need and we operate out of a commitment to provide innovative solutions to global food production challenges. In addition, we support and work with local and international organizations providing food security through food redistribution (Interfaith Food Shuttle) and through livestock donations (Heifer International).

II. Improving the Quality of Life for Producers and Consumers

Food prices peaked in February of 2011. That is the good news. However, food prices in 2011 still exceeded 2010 prices by 24%. The outlook for 2012 is that prices will continue to decline, according to the [Food Price Watch of the World Bank](#). While most of us focus on the cost to the consumer, and with good reason, it is easy to overlook the burden on the food producer. Farmers face increasing production costs associated with rising feed ingredient prices and energy prices. Because of the commoditized nature of animal protein production, farmers are constrained in how much they can pass on their increased costs to the customer and still be competitive. As a result, the industry goes through cycles of expansion and consolidation to maintain razor thin margins.

FOOD FOR THOUGHT:

- food prices peaked in Feb 2011
- prices in 2011 still exceeded 2010 prices by 24%

One strategy food producers have adopted to address the challenges associated with rising food costs includes embracing innovative new products and practices. This type of innovation is less about packaging and more about creating better nutrition and performance at lower cost. When the population has access to affordable, healthy foods, their quality of life increases. Healthy diets lower medical and insurance costs by addressing health issues associated with high fat and high sugar foods. Healthy foods contribute to healthy diets by delivering nutrient dense, protein rich products to the human body. In addition to financial quality of life issues, there are also benefits that come through better energy, focus and activity at home and work. There is growing research that a healthy diet contributes to better mental health as well.

We at BRI want to be part of the solution. Our products help lower food costs and provide increased profits for producers. We view this as a win-win situation. We invite you to read one story about a company, [Natural Nutrients](#), who found better performance and lower costs, benefitting both the producer and consumer.

III. Creating Sustainable Lifestyles

At the turn of the century, close to 80% of the US population was involved in farming. If you did not grow your own food, you likely knew the person who did. Fast forward to today, and only about 2% of the US population is directly employed in agriculture ([USDA NIFA website](#)). On the positive side, we enjoy more plentiful and economical food than ever before. For example, [a recent issue of Newsweek](#) compared prices of various commodities in 1965 with prices today. While the price of an ounce of gold has risen from \$252.70 to \$1,659.42 from 1965 to 2012, the price of a gallon of milk has fallen from \$6.84 to \$3.30, and the price of a pound of chicken dropped from \$2.81 to \$1.33. A key reason why food prices have remained the same or even decreased since the

60's is more efficient large scale agricultural production systems.

On the downside, industrial farms do concentrate the use of natural resources and pesticides. A post from Chris Rippes of [Building Sustainable Lifestyles](#) describes this perspective further:

“Until very recently, the worlds food systems were run by small farmers (less than 10 acres). Most large commercial farms are in the tens of thousands of acres. With this combination of resources; land, equipment, facilities, infrastructure, come inherent weaknesses and vulnerabilities. Crop failures due to flooding, insect infestations, molds and disease are only the beginning of the risks facing mega farms. The more decentralized the food system, the more capable it is to withstand these devastating events.”

While we can point to local community farms and collaboratives as a means for creating sustainable local food cycles, the reality is that large scale industrial farms are here to stay and will continue to play a key role for meeting the food needs of our country and the world. So while local buying habits are important, there is still a need for larger industrial farms that make food production more affordable and healthier for everyone.

We previously discussed the “Double Burden” of malnutrition on the global scale. The global population of 7 billion people includes 10% who are obese and 10% who are facing food shortages. These both comprise a malnutrition epidemic. At BRI we believe that technology and innovative solutions will provide options and solutions for addressing these critical challenges. At BRI we are driven by what we call the “Big Green Chicken” concept – developing products that help farmers grow healthier chickens in a more sustainable manner!

WHY IT MATTERS TO BRI

At BRI we believe there is not one solution that meets all the needs of an ever-changing world, but with our innovative enzyme technologies, we are doing our part in, as Steve Jobs famously espoused, “making a dent in the universe.” We all have the power to make a positive change in the world. At BRI, we call it the “Big Green Chicken Initiative.”

Malnutrition is bigger than hunger or famine related issues – it is also an excess of high calorie and high fat foods. A part of the solution is to make high protein, nutrient dense foods available. And do you know what fits that description? **Chickens!** BRI has developed a novel solution for growing healthier and bigger chickens, and remains committed to assisting the poultry production industry reach its full potential.

As a company, we are doing our part to address this need through research that is producing feed enzymes capable of reducing the cost of food production. Learn more about Valkerase® and Versazyme®. We are also doing it through strategic partnerships that make our products available globally. Read about how our partnership with Novus International is helping to feed the world affordable and wholesome foods.

Contact us today and let us help you grow, as together we make a dent in the universe.

FURTHER READING

CME, 2010 & USDA, 2010 as cited in Gasperoni & Bentley-Beal, 2010.

Gasperoni, G. & Bentley-Beal, T. (2010). Methionine Global Outlook: The Next Decade. Retrieved from <http://www.novusint.com/en/Media-Center/Whitepapers>.

United Nations World Food and Agriculture Organization: www.fao.org

The Pacific Institute: www.worldwater.org/conflict

Heifer International: www.Heifer.org

Interfaith Food Shuttle: www.foodshuttle.org

US Department of Agriculture: www.usda.org

American Academy of Family Physicians: www.aafp.org

World Health Organization: www.who.int

US Agency for International Development: www.usaid.gov

US Government's Global Hunger & Food Security Initiative: www.feedthefuture.gov



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