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International Food and Agribusiness Management Review
Volume 15, Special Issue B, 2012

Can Agribusiness Feed 3 Billion New People...and Save the Planet? A GLIMPSE™ into the Future

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Abstract

The challenge of feeding another three billion people within the next 40 years clearly meets the definition of a ‘wicked problem’. Agribusinesses have been seen as part of the problem, pursuing short-term gains at the expense of human development and the environment. We argue that private sector, market-driven solutions are an essential component to meeting this challenge. Combining a literature review with interviews from a panel of 24 agribusiness ‘experts’, we identify seven key barriers which impede our ability to feed nine billion people on earth. Collected under the acronym GLIMPSE, they help to frame the obstacles and identify the opportunities. This is an important step towards harnessing the power of the marketplace so that agribusinesses can bring together the creativity, determination, and technology similar to the ‘miracle of the cerrados’ in Brazil to bear on the challenge of feeding the three billion additional people that will join our world by 2050.

Keywords: agribusiness, food, wicked problem

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“We in agriculture must think differently from how we have in the past, by adopting new technology at a faster pace and communicating in a way we never have before. We must find the balance for sustainable food production and protection of resources while satisfying consumer demands.”

—T.P. Lyons

Introduction

The challenge of feeding another three billion people within the next 40 years clearly meets the definition of a ‘wicked problem’s (Australian Public Service Commission 2007).¹ Indeed, it qualifies as a ‘super-wicked’ problem, because time is running out; there is no central authority to take charge; those who are seeking to solve the problem are also part of the problem, and public policies are generally myopic (Levin et. al 2009).

Agribusinesses have been seen as part of the problem, pursuing short-term gains at the expense of human development and the environment. Greenpeace is on record as saying that Sustainable agriculture can deliver for 9 billion people if governments listen to people, not big agribusinesses (Oran 2012). We argue instead, that private sector market-driven solutions are an essential component to meeting the challenge. Using a modified Delphi approach, we asked a range of experts from all sectors of agribusiness to identify the barriers that they see in meeting the challenge of feeding nine billion people. Through an iterative research and feedback process, major barriers to the necessary level of agricultural development were identified. In turn these were encapsulated into the GLIMPSE™ framework, which provides a useful way of identifying both the obstacles and the opportunities of meeting this global challenge of feeding 3 billion more people.

The Challenge to Agribusiness

It has been assumed that “solving” agricultural challenges is the role of governments, NGO’s, the United Nations and charities. Indeed, many organizations, often government funded, are diametrically opposed to private sector solutions, and have a deep distrust of agribusiness.²

However, the involvement (or interference) of governments reflects competing priorities at best, and corruption at worst. NGO’s, the UN and numerous charities are all doing substantive, important work, but the last 40 years has demonstrated the limitations of institutional approaches. Moreover, the solutions that emerge from conventional thought processes are unwieldy and often unrealistic. One researcher argues that the solution to the wicked problems of food and the environment is an integrated policy for agriculture, R&D, the environment, energy, climate change, trade, health and consumer policy.³ Another allows for more private sector investment in R&D, as long as it is “...carefully designed, adequately funded and politically backed” (Naseem et al.).

¹ The complex, interdependent nature of the problem resists resolution because of incomplete, contradictory, and changing requirements, and the effort to solve one issue creates or reveals other problems.

² Damien McLoughlin

³ Patrick Cunningham, Brussels, Sept. 14, 2010.

These improbably high standards reflect just how wicked the problem is, and why agribusiness expertise could prove to be valuable. One of the few points of consensus among the many researchers and organizations attempting to find solutions, is that the private sector will be a critical part of finding ways to get more food to more people more sustainably. Agribusiness leaders are recognizing both the moral and practical dimensions of their role. One noted that ‘in the last couple of years, the private sector has really come to grasp its responsibility about sustainable production. They realize that it’s not just about profits and it’s not just about keeping shareholders happy. It’s really about having a license to produce and being acceptable in society and investing in the long term.’⁴ Another, perhaps optimistically, pointed out that the “...private sector, I think, is today seen as part of the solution; ten to fifteen years ago it was seen by some people as part of the problem.”⁵ A bank reiterated that point in its report on the principles of Food & Agribusiness (F&A), pointing out that the ‘first priority of F&A chains is to feed the world with healthy and safe products at reasonable prices. This production should not endanger the food supply of future generations.’⁶ There are now a small but growing number of active partnerships between agribusiness organizations and NGOs (Lucas 2012).

This paper examines the barriers that are preventing agriculture and agribusinesses from growing and providing food more efficiently, more sustainably, and at a scale and cost that can solve the ‘wicked problem’ of feeding 9 billion people on this planet.

The Challenges

Twenty two experts were invited to answer a simple question: what are the biggest barriers facing agribusinesses ability to feeding three billion more people? These experts represent producers, agribusiness firms, policy makers, consultants, researchers and academics. Many have substantial experience in more than one of these areas. Although a simple, single question was asked, in every case the experts contributed a wealth of opinions, examples, and expertise. They also provide research, articles, presentations and other material⁷. All of the material provided was collected, sorted and analyzed.

There is some agreement within the agribusiness community in general and the panel of experts in particular as to the key barriers to being able to meet the need for food. Some of these externalities are no more tractable for agribusiness than they are for governments, NGOs or charities such as volatile weather (including the issue of climate change),⁸ changing eating habits⁹, and political or economic instability.¹⁰ However, there are other challenges for which agribusiness can play a limited, but important role, or even lead the way (such as regulations, resources, and infrastructure). And finally, there are some challenges for which agribusiness is perhaps the best hope for progress (such as food chain management, markets and innovation).

⁴ Louise Fresco, New Agriculturalist.

⁵ Paul Conway, New Agriculturalist.

⁶ Rabobank. Food and Agribusiness Principles.

⁷ The analysis was done using a grounded theory approach.

⁸ Judd Larned, David Byrne, Patrick Wall, Joel Newman, Patrick Cunningham

⁹ Daniele Giovannucci

¹⁰ Patrick Wall

The discussion below draws on a range of views and sources, groups the challenges with particular relevance for agribusiness into the GLIMPSE™ framework.

- G** = Government
- L** = Losses in the food and ingredient supply chain
- I** = Infrastructure (trains, trucks, ports, cold storage, supermarkets etc.)
- M** = Markets
- P** = Politics & Policies
- S** = Science & Innovation
- E** = Environment

This framework provides a look at both the challenges and opportunities for agribusiness, and is briefly described below.

Government

“...governments will be the biggest barrier.....”¹¹

Government bureaucracy, policies and regulations contribute substantially to the challenge of feeding the 9 billion.^{12,13,14,15,16} The rules, fees, and costs of establishing and operating a business act as barriers to growth, and are frequently most burdensome in the regions where growth is most needed. For example, the World Bank estimates that African farmers could grow enough food to feed the continent—and generate an estimated \$20 billion in earnings for the government if policy makers agreed to lift cross-border restrictions, simplified the rules and fees involved in food trade, and permitted uncultivated land to be put into use.^{17,18} To do something as simple as finding out what types of documents are needed to ship a container abroad or what the fees are requires a meeting with an official in most African countries.¹⁹ Even to set up a business in Brazil takes 119 days, whereas in Australia it takes just two.²⁰

It has also been argued that there is “a fundamental misunderstanding of the scope of the looming hunger problem and an unrealistic faith ... [about] regulation of conventional food production ...”²¹ and that judging new technologies challenges the resources of government officials and panels.²²

¹¹ Mary Shelman

¹² Judd Larned

¹³ World Food Prize Conference, 2012

¹⁴ Mark Rosengrant

¹⁵ Simon Shane

¹⁶ Mary Shelman

¹⁷ Lesley Wroughton

¹⁸ Bloomberg, November 2012.

¹⁹ The World Bank, October 2011.

²⁰ The World Bank. Time required to start a business.

²¹ Joel Brandenberger

²² Dennis Conley

Finally, there is the issue of corruption²³, which is endemic in many regions. Whether it takes the form of requiring bribes to conduct normal business, controlling with whom or on what terms contracts are made, or to whom the benefits of any contracts or deals accrue, corruption is costly to all concerned. Moreover, while agribusinesses may see themselves as victims of corruption, deals made at the expense of either the local citizenry or the environment reinforce the negative views of multinational agribusiness firms.

While there are limits to how much agribusinesses can affect government regulations and corruption, participation and pressure from the business community can make a difference. One of the reasons that approvals for new technologies can take four to seven years is that the complexity of the science leads to uncertainty on the part of the regulators, who then find it easier to defer making a decision. The scientists in the agribusiness community are at the cutting edge of innovation and can help to reduce the scientific gap between industry, academia and government, in turn reducing the delay in getting innovations into the marketplace.²⁴

For example, 108 economies implemented more than 200 regulatory reforms in 2011-2012, mostly in the areas of starting a new business, increasing the efficiency of tax administration and facilitating trade across international borders²⁵.

Losses

“Waste of food either pre-harvest or further along the food chain is a major issue preventing maximum return from the existing food supply.”²⁶

Loss and waste occur at every stage of agricultural production, processing, distribution and use. The Food and Agriculture Organization of the UN estimates that one-third of food is lost or wasted. Consumers in Western Europe and North America waste upwards of ten times as much food as consumers in sub-Saharan Africa and Southeast Asia. In low-income regions the loss is largely due to harvesting techniques, food management systems (poor post-harvest storage can result in the loss of half the crop from mold and insects)²⁷, packaging and marketing. These are all areas in which agribusinesses have substantial expertise and resources, and are therefore great opportunities. In higher income regions some of the food waste occurs early in the food supply chain (at harvesting or in coordination between sections of the supply chain), but most of the loss is at the consumption stage: food that is still fit for consumption is discarded.

The challenges of managing the feed and ingredient supply chain are significant, but this is an area in which agribusiness can succeed from a business perspective while also making a genuine contribution to ensuring that there is enough food to feed an additional 3 billion people.

²³ Simon Shane, Mary Shelman

²⁴ Dennis Conley

²⁵ World Bank & International Finance Corporation.

²⁶ Patrick Wall

²⁷ Simon Shane

Infrastructure

“...having sufficient infrastructure to move product....to deliver effectively”²⁸

Infrastructure is the tracks on which a supply chain runs. From the truck, trains, and other conveyances, to the roads and rails on which they travel, to the ports and transit points along the way, infrastructure sets the limits as to how quickly feed, ingredients and food products can move through the supply chain to the end consumer. The infrastructure also plays an important part in the condition in which it arrives, directly (through climate control, for example) and indirectly (spoilage rates are reflected in journey time). Successive US governments have failed to reinvest in the existing infrastructure, leading to a relative loss in this competitive advantage.²⁹ The amount of control that agribusiness has over infrastructure varies considerably. Large firms can sometimes build the necessary infrastructure themselves, or can use their influence to encourage government or public-private investment. Firms in a supply chain can work together more closely to streamline the process.

Markets

“...trade not aid will help developing countries become self-sufficient in terms of food security”³⁰

Markets demonstrate both how ‘wicked’ the problem of feeding three billion more people is, and how much agribusiness can do to help. It is highly complex, as each of the elements links to at least one other factor. Barriers to trade are inextricably linked to both Government and Policies, but Infrastructure (or lack thereof) can also be a barrier to trade.³¹ Volatility of supply and demand³² is often exacerbated by Policies, and aggravated by opaque pricing mechanisms.³³ Barriers to investment for marginal cost suppliers³⁴ are linked to market volatility as well as Government and Policy interference. In many regions fragmented markets³⁵ and dependence on middlemen³⁶ make it difficult for agribusinesses to develop efficient operations and act as a constraint on growth and maximization of the resources involved.

There are examples of agribusiness operations working together, such as when farmers in France and McDonalds join in multi-year contracts that act to reduce volatility and stabilize the markets for the farmer, but there are too few of these.³⁷ In part this is due to behavioral constraints in markets, whether from old antagonisms, poor communication or simply the resistance to change

²⁸ Judd Larned

²⁹ Judd Larned, Simon Shane, Michael Boehlje

³⁰ Patrick Wall

³¹ Simon Shane, Clare Thorp

³² Judd Larned

³³ Simon Shane

³⁴ Judd Larned

³⁵ World Food Prize Conference

³⁶ Simon Shane

³⁷ Marc Larousse

found at every level from producer to consumer.³⁸ Changes that are now familiar, such as pasteurization, were once viewed with suspicion by the markets.³⁹ More transparency by agribusinesses about both the risks and the benefits from innovative approaches may help ameliorate some of these factors.

Policies

“Government policy plays a significant role in the ‘market efficiency’ of the global Ag markets”⁴⁰

Moving beyond bureaucracy, there is also the challenge of policies that support wasteful use of resources or subsidized environmentally destructive practices⁴¹ or other perverse incentives. Fertile land in Russia and Argentina lies fallow because of volatile government policies while price supports, subsidized fuel and water encourage crops and herds that would otherwise be unsustainable.⁴² The US and the EU spend more than €200Billion annually on agricultural subsidies, distorting both the crops that are grown and the markets for those crops⁴³. Biofuel subsidies skewed the use of corn crops away from food and into a form of expensive fuel⁴⁴. Moreover, food is often caught up in political issues. For example, a dispute on tires led to China banning the import of chicken from the US (Bradsher 2009).

The level and potential for participating in the development of government policies varies significantly by region, but leaders in the agribusiness arena could do more to help develop ‘best practice’ policies that reflect both the specific needs of a given sector and the impact on the larger environment. These ‘best practice’ policies can then made available more broadly.

Science/Innovation

“The biggest block....is failing to recognize, adopt, pursue or research [appropriate] technologies”⁴⁵

The effectiveness of the chemical arsenal is declining⁴⁶; disease factors are an increasing challenge in animal husbandry⁴⁷; and the “Green Revolution” of the 1970’s appears to have hit a plateau. Antagonism between society and scientists, due in part to environmental and humanitarian concerns, and in part to scares such as BSE, has created barriers to the acceptance

³⁸ Dennis Conley

³⁹ Norman Borlaug

⁴⁰ Patrick Wall

⁴¹ Water and Food in the Bio economy

⁴² Judd Larned

⁴³ Michael Marshall

⁴⁴ Marc Larousse

⁴⁵ Clare Thorp

⁴⁶ David Byrne

⁴⁷ Nick Rosa

of genetically modified organisms (GMOs).⁴⁸ Biofuel technology has led to the diversion of food to fuel⁴⁹ and competition for farmland,⁵⁰ creating a backlash that may obscure the value of the second generation work that is now being done. And finally, the recognition of patents and ability to protect intellectual property is challenging in many regions.

These obstacles are not new. As Nobel Laureate Norman E. Borlaug, one of the leading scientists behind the ‘green revolution’ noted⁵¹:

...we confronted bureaucratic chaos, resistance from local seed breeders, and centuries of farmers' customs, habits, and superstitions. We surmounted these difficult obstacles because something new had to be done. Who knows how many would have starved if we had delayed commercializing the new high-yielding cereal varieties and improved crop management practices until we could perform tests to rule out every hypothetical problem, and test for vulnerability to every conceivable type of disease and pest? How much land for nature and wildlife habitat, and topsoil would have been lost if the more traditional, low-yield practices had not been supplanted?

....the skeptics and critics of the new biotechnology wish to postpone the release of improved crop varieties in the hope that another year's, or another decade's, worth of testing will offer more data, more familiarity, more comfort. But more than a half-century in the agricultural sciences has convinced me that we should use the best that is at hand, while recognizing its imperfections and limitations. Far more often than not, this philosophy has worked, in spite of constant pessimism and scare-mongering by critics.

Innovation is a challenging area in which agribusinesses—individually and collectively have a tremendous amount to contribute: the research that leaders in all agribusiness sectors are already pursuing contain the seeds of the next “green revolution” – one that is likely to be green in both senses of the word.

Environment

“The biggest barrier is access to water and managing scarce water supplies.”⁵²

Resource issues, and the implications for the environment, are one of challenges most often cited by the agribusiness community. According to sources and the UN, agriculture needs “...to produce more food per unit of land, water and agrochemicals”⁵³ Land—availability of arable land,⁵⁴ security of tenure on the land,⁵⁵ degradation and erosion of land⁵⁶ is one of the biggest

⁴⁸ Judith Capper

⁴⁹ Simon Shane

⁵⁰ AFIA, Global Food Security

⁵¹ Norman Borlaug

⁵² Ray Goldberg

⁵³ Gordon Butland, UN Food and Agriculture

⁵⁴ UN Report on Food: China; AFIA: Future Patterns, David Byrne, Patrick Wall

resource issues. For example, it has been estimated that there is a need for 30% more grain from the fast reducing stock of arable land.⁵⁷ Greater productivity is one answer. Another is making better use of marginal land, as with the ‘miracle of the Serra’, in Brazil. In both cases, agribusiness has a lot to contribute. These are areas where pro-active agribusiness interests are already making a difference⁵⁸, but the scale of the challenge, and the fear of risk and/or low returns can act as a brake on investment.⁵⁹

Similarly, water, an issue that was typically associated with specific regions, has recently been recognized as a global issue⁶⁰, it has been called the “silent crisis”.⁶¹ Agribusinesses are often seen as part of the problem, through over-fishing, over-harvesting, use of chemicals and pesticides, wasteful use of natural resources, waste management and so on. The other side is the challenge of creating more food from more difficult environments. These are areas in which innovation, creativity and the desire to succeed that are characteristic of the private sector can be used to advantage.

The Opportunities

Agribusinesses can play a crucial role in addressing some of the major challenges, particularly some aspects of *loss*, *infrastructure*, *markets* and *environment*. The expertise and innovation required for agribusinesses to survive in the competitive marketplace can be applied to these challenges in ways that contribute to the both the organization and the greater good.

Agribusinesses can anticipate, recognize and work to overcome *government* bureaucracy and corruption. It can build credibility with consumers by being more open about the *science* of innovation and also by working to help shape *policy* in ways that are constructive to the larger goals, not simply narrow self-interest. By taking a long-term perspective, and developing working relationships across boundaries, agribusinesses can help reduce *losses*, by bringing supply chain expertise to areas where it is less developed and by helping with efforts to improve Infrastructure. The Environmental challenges will also require a long-term perspective to repair, protect and develop land and water resources. Working with *government and policy makers* will be an important part of meeting the *environmental* challenges, of developing the necessary Infrastructure and helping to ensure that *markets* are fair and open.

However, all of these pieces are reliant on having the people to do carry them out. Several of the experts noted that the importance of education, especially for women⁶², or cited lack of education as a barrier.⁶³ One noted “in my direct experience, the absence of management talent is

⁵⁵ Simon Shane

⁵⁶ Simon Shane, UN Food and Agriculture

⁵⁷ David Byrne: Safe and Sustainable

⁵⁸ Knowledge Based Bio-Economy, Private Sector Investment, Judd Larned

⁵⁹ Private sector investment in R&D

⁶⁰ David Byrne, UN Food and Agriculture, Knowledge Based Bio-Economy, Ray Goldberg, Patrick Wall, New Agriculturalist

⁶¹ Ban Ki-Moon. UN News Center. 2007.

⁶² Patrick Wall

⁶³ Clare Thorp, Mary Shelman

shocking. In countries as diverse as Russia, Pakistan and Uganda, from basic issues such as staff and management development right up to logistics both hard and soft investment is needed.”⁶⁴

Lack of education is a barrier at any time, but the historically conservative agribusiness sector is going through a period of disruptive change in technology, communications and global markets. As noted in the IFAMR Special issue on Human Capital (Shelman and Connolly 2012), “the glue” ... that will define the success of agribusiness organizations in this new environment is not physical resources or financial clout but rather human capital.”

Conclusions

“....the current assumption seems to be that the world can have a rising population, ever-higher per capita meat consumption, devote less land to food production to help hit climate change targets and eschew the advances in science that might increase yields. This is the stuff of fantasy. It is possible to have more intensive farming using the full range of technological breakthroughs in order to feed a bigger, meat-hungry population. Or it is possible to have lower yields from a more organic approach to feed a smaller population eating less meat, but not both.”

-Larry Elliott

Elliott’s quote captures the essential nature of wicked problems: there are no easy answers. The GLIMPSE™ framework makes it clear that the barriers and opportunities to achieving the necessary growth are often two sides of the same coin. It offers researchers, regulators and policymakers insights into the barriers that agribusinesses face in delivering on the promise of those productivity improvements. It also helps these groups and –crucially, agribusiness participants identify areas where there are opportunities to improve the quality of life for the next inhabitants of this planet.

According to a recent OECD-FAO presentation⁶⁵ the 3 billion new people—mostly urban dwellers will require 1 billion tons of cereals and 200 million tons of meat. Building on the evidence that agricultural productivity has improved by 2.6% per annum over the past 10 years; they estimate that productivity will increase a further 1.7% per annum for the next 10. Compounded over the next 35 years, that will allow agribusinesses to generate the requisite 70% increase in food production. These projections correlate closely with the view of the New Vision for Agriculture Project, which estimates that 20% improvement per decade in production, productivity and land expansion will be sufficient to meet the goal.⁶⁶ Clearly, it is possible to achieve the necessary growth, and given the creativity and determination within the agribusiness community, arguably the biggest barrier is not recognizing the opportunities within the obstacles.

⁶⁴ Damien P. McLoughlin

⁶⁵ Wayne Jones OECD Trade and Agriculture, Future Farm Europe, 26-28 June 2012

⁶⁶ World Economic Forum

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