

As global food supply faces increasing threats, new strategies will need to be employed to ensure that the world population can be reliably sustained. Some estimates indicate that global food production will need to increase by at least 60% and up to 110% to reliably feed the global population by 2050 (Albino Maggio, 2015). In order to ensure the health of the global food supply 3 key solutions will need to be employed, better food policies, management of agriculture, and better integration of Genetically Modified Foods.

Food Policies

As climate change causes an increase in weather events like droughts, better management of food supply will be critical to ensuring global food security. Increasing global reserves of staple foods will be a critical component of managing food shortages that may arise due to loss of crops. In addition to ensuring a consistent food supply, reserves also help to mitigate against price increases in the cost of food during times of shortage. The impacts of climate change on food security are compounded by domestic market structures need to be changed to ensure that food prices maintain a minimum 'floor' price that will make staple crops accessible to individuals in developing countries (Fritz, 2014). Many developing countries suffer disproportionately from the effects of price volatility as their marketing boards, organisations mandated to monitor and control food prices, were forced to restructure and stripped of many key roles following pressure from international financial institutions after the 2008 food crisis (Fritz, 2014). Many market boards were forced to privatize and these new organizations have not invested in food storage and reserve capacity due to profit motives.

While developing countries are recognizing the need for greater autonomy and development of food reserves to feed their populations, trade rules developed by the World Trade Organization (WTO) create barriers to these efforts. Policies that encourage building food reserves also border on trade distorting measures that can carry heavy fines (Fritz, 2014). Additionally WTO rules about state- trading enterprises limit the efforts that governments can make in creating effective marketing boards that could have an impact on domestic food policies. As food security becomes an increasingly global concern organizations like the WTO will need to consider how policies need to be adapted to ensure domestic and international food security can be maintained.

Management of Agriculture:

Increasing global food supply of food will need to be complimented with an effort to optimize resources and improve agricultural efficiency through better management of agriculture. Ensuring that sustainable farming practices are used to optimize resources will be a key contributor to global food security. These measures include growing regionally appropriate crops that will thrive in local environments. Growing crops like Almonds, which require high water content, in drought prone areas like California highlight the concerns of resource allocation (Akhtar, 2015). A global effort to account for water management in agricultural planning is key to ensuring a resilient global food supply (OECD, 2010). While subsidies and market indicators can help to signal shifts in agricultural planning, without comprehensive policies around water management these shifts will be limited. Water management policies need to be developed to promote the market conditions whereby agricultural land is allocated to grow the most efficient crops while ensuring the best use of resources.

Increasing genetic biodiversity will also be a key component in ensuring a more adaptable and resilient food supply (Food and Agriculture Organization of the United Nations, 2008). Crops like Sorghum and

Millet that are resistant to adverse conditions and can adapt in harsher climates will need to be reintroduced as staple crops. Organizations like the CGIAR consortium are promoting research in international agricultural issues including the impact of crops like Sorghum (CGIAR, 2016). These efforts focus on the need to increase production of drought resistance crops by 50% to satisfy their growing demand by 2050 (CIGAR, 2016). While crops like Sorghum will become an increasing part of the food supply, new challenges will be faced by crops like rice which is a staple part of the diet in much of Asia. Rice is a water intensive crop that is largely grown by small scale farmers in low income countries. As water scarcity continues to grow the impacts on rice harvests will add increasing strain to the food supply and the economic condition of over 1 billion farmers in rural areas (Food and Agriculture Organization of the United Nations, 2008). New varieties of rice will need to be developed that have lower water intensity and are more resilient to external conditions.

Genetically Modified Organisms (GMOs):

GMOs are another crucial element in ensuring the resilience of a global food supply. GMOs are foods that have been created from organisms whose DNA has been modified through the introduction of genes from a different species in a way that does not naturally occur (World Health Organization, 2016). These foods can be engineered to increase the nutrient content of crops, increase their reliance to pests and droughts and help create crops that have higher yields. While traditionally an increase in food demand could be by using more land for agriculture, land use for agriculture will increasingly compete with land used for urbanization and human development (H. Charles J. Godfray¹, 2010). While developed countries enjoy open access to local food markets, many developing countries are facing the crucial challenge of climate change, increased populations and food scarcity. GMOs have already proven to be a key component of the solution when viewed within the context of global grain production. While grain production over the last 5 decades has almost doubled, land use has only increased by approximately 9% (H. Charles J. Godfray¹, 2010). Growing foods that have higher yields will require both new management of the food chain and also new crop breeds that have been engineered to yield more food with fewer resources.

While GM technologies offer many advantages, there are considerable social and market challenges that need to be overcome to ensure they are contributors to the solution of global food scarcity. One key issue that needs to be addressed is regarding the ownership of the science and food supply and infringement of patents. A key contributor to the distrust around GM technologies has been cases against companies like Monsanto that invest largely in GMO technologies and the development (Katiraei, 2016). While organizations like WHO speak to the safety of GMO foods (World Health Organization, 2016), the association of GMO technologies with companies that have lost public good will has had a damaging impact on the industry. It is important to begin distancing the market practices of private enterprises from the established scientific knowledge of GMO technologies. GMO research in private organizations raises questions about patents and ownership of technologies that are crucial to the integrity of global food supply. Education about the true impacts of GMO technologies along with international efforts to study and modify patents around GMO technologies are crucial steps that governments need to take to begin to alleviate the distrust against GMO technologies.

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