

# THE ROLE OF AGRICULTURAL TECHNOLOGY IN THE ALLEVIATION OF POVERTY

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## Abstract

With world population projected to exceed 9.2 billion by 2050, natural resources are proving to be unsustainable, creating areas of extreme poverty and malnutrition. Agricultural technology has the potential to alleviate such poverty by increasing crop production efficiency and output. A trend analysis will project the influence that changes in population growth, malnutrition, and available land will have on poverty, and from these projections, outline an expected future. Uncertainties, such as climate change, technological advancements, and government cooperation, require alternative futures to be considered. From these alternatives, a preferred future will be determined, realization of which will require the public and private sector to work together to achieve successful implementation of technological innovations.

## Background

- Stakeholders: Impoverished persons, welfare groups, governments, businesses, scientists, & farmers
- Currently 830 million people malnourished.
- Nearly 1 billion people living in extreme poverty
- Food Security—“When all people at all times have access to sufficient, safe, nutritious food to maintain a healthy life” (WHO)
- Population expected to exceed 9.2 billion by 2050
- Potential Future Agricultural Technologies:
  - o Wireless applications
  - o Biotechnological Advances
  - o Vertical Farming
- Private investment in agriculture is focused in developed nations, whereas the public sector finances 90% of agricultural research in developing countries (Byerlee & Fischer, 2002).



Photo courtesy of Mario Singh



Photo courtesy of Agriculture & Industry Survey

## Possible future scenarios

“Cooperation Fights Poverty”

- Resources decline but government works to reverse the trend

“Agriculture Meets Demand, But Not Consumer”

- Resources are ample but government restricts distribution/application

“Government Meets Efficiency”

- Government uses ample resources to fight poverty

“Government Deepens Poverty”

- Resources decline and government takes no action

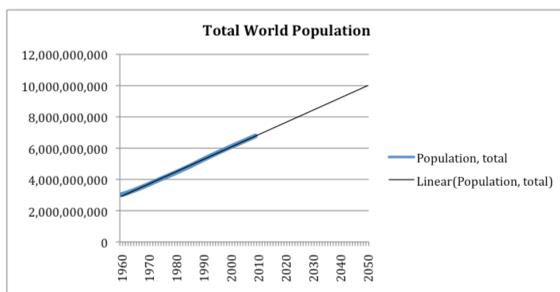
## Sources of future uncertainty

- Fertility rates
- Mortality rates
- Natural disasters
- Government cooperation
- Global conflict
- Greenhouse gas output
- Technological advances & applications

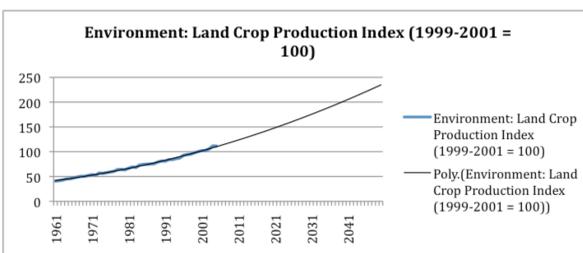
## Results

### Expected future

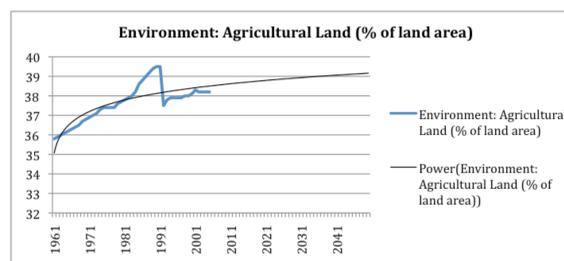
- Population growth will increase the strain on natural resources
- Crop production will prove insufficient to meet demand
- Number of those suffering from malnourishment will increase
- Need for innovations in agricultural technologies
- Opportunities for business investment



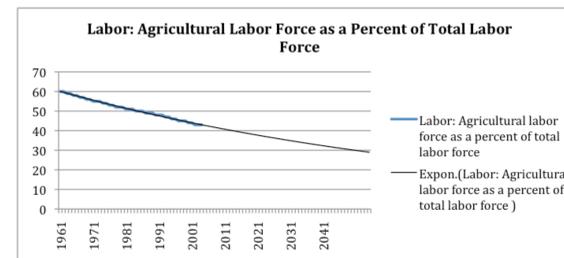
This graph shows the total world population growth over the past 50 years and projected into the next 50 years. (World Bank (2009). “Population”, World Development Indicators[data file]. WebCEO, LexisNexis Statistical Datasets (10/10/2010).)



This graph shows the agricultural crop production for the past 50 years relative to the base period 1991 to 2001, projected into the next 50 years. Source: World Bank (2009). “Environment: Land”, World Development Indicators[data file]. WebCEO, LexisNexis Statistical Datasets (10/10/2010).



This graph shows the amount agricultural land as a percentage of total land area. Agricultural land refers to any land that is suitable for any agricultural production. (World Bank (2009). “Environment: Land”, World Development Indicators[data file]. WebCEO, LexisNexis Statistical Datasets (10/10/2010).)



This graph depicts agricultural labor force as a percentage of total labor force, referring to all of those who are active in agriculture, hunting, forestry, or fishing. Source: World Resource Institute (WRI) (2008). “Labor: Agricultural labor force as a percentage of total labor force”, Population, Health, and Human Well-being[data file]. WebCEO, LexisNexis Statistical Datasets (10/10/2010).

## Preferred Future

### High government cooperation

- Developed nations cooperate and assist developing and least developed countries

### Innovations in agricultural technology

- Biotechnology increasing yields
- Wireless networking to increase efficiency
- Vertical farming for all

### Farming grows up

Growing food in vertical urban environments could be a solution to the world's exploding population and diminishing resources.

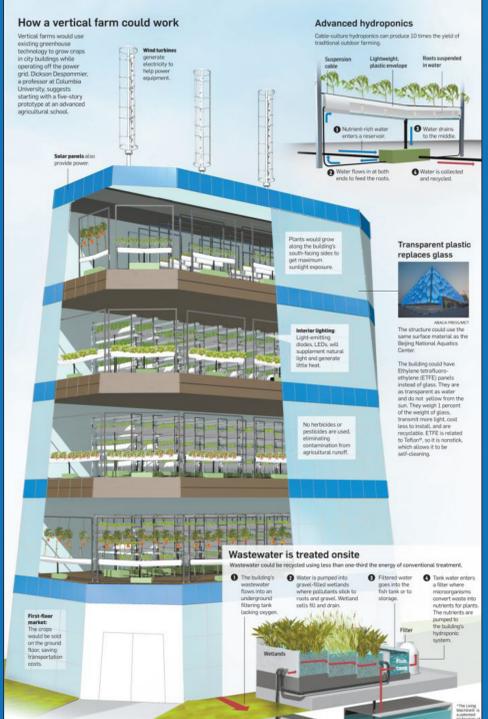


Photo courtesy of Anna Carrington

### Increasing agricultural resources and output

- Agricultural output will be sufficient to meet demand
- Effective distribution programs to move food to where it is most needed
- Private and public sectors cooperate to achieve preferred future

### Implications for Business

- Profitability in vertical farming
- Research & development
- Government credits & subsidies
- Decreased transport costs
- Global markets
- Lower labor costs

#### Further information:

Byerlee, D., & Fischer, K. (2002). Accessing modern science: Policy and institutional options for agricultural biotechnology in developing countries. World Development, 30(6), 931-948. doi:10.1016/S0305-750X(02)00013-X.

Despommier, D. D., & Ellingsen, E. C. (2008). The vertical farm - the origin of a 21st century agricultural typology. CTBUH Journal, III, 26-34.

Mueller, A. (2009). Investment in agriculture. Finance High Level Panel, 5th World Water Forum.



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