



“Equitable Access to Technology”

José Falck Zepeda

Senior Research Fellow

Environment and Production Technology Division
International Food Policy Research Institute (IFPRI)

and

David J. Spielman

Senior Research Fellow

Environment and Production Technology Division
International Food Policy Research Institute (IFPRI)

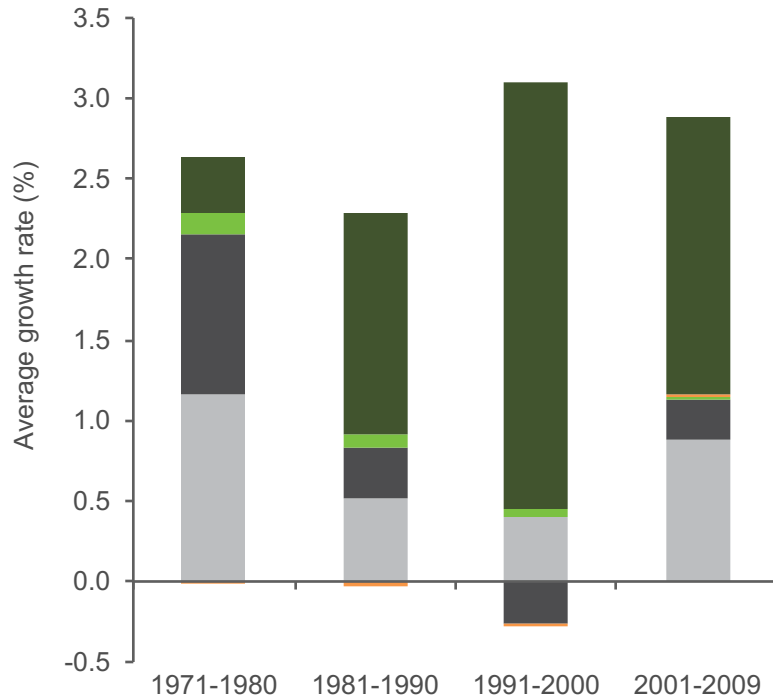


RESEARCH
PROGRAM ON
Policies,
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Global agricultural growth has been broadly driven by increased productivity – but has been heterogeneous

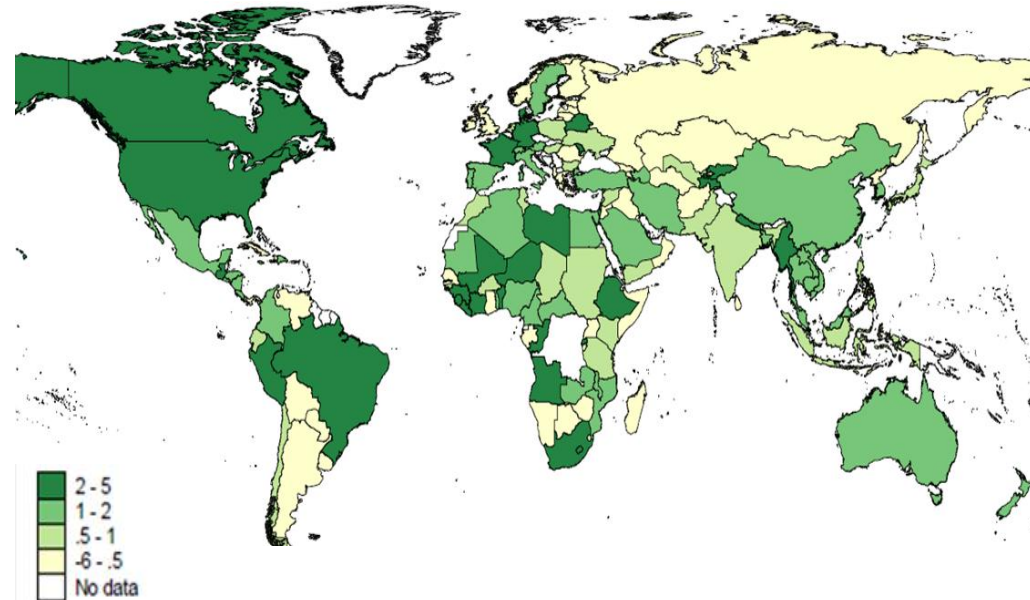
Growth in global agricultural output per worker



- Total factor productivity
- Land
- Irrigation
- Fertilizer
- Capital

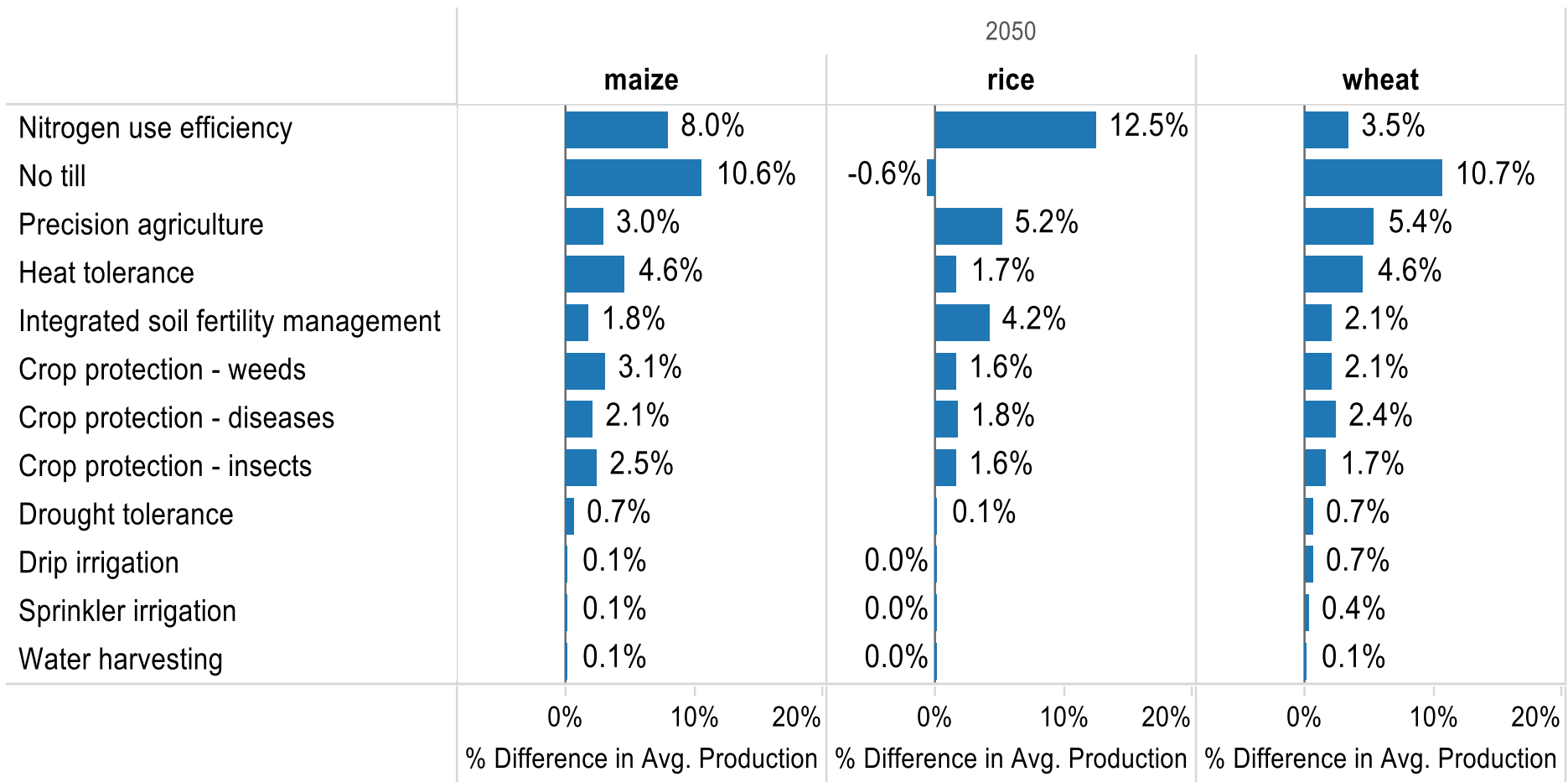
BUT total factor productivity growth varies across countries

Average annual agricultural total factor productivity growth, 1995-2009 (%)



Source: Nin Pratt and Yu 2012

Percent change in total cereal production, developing countries 2050 with technology vs. 2050 baseline (IMPACT)



The global food system is still vulnerable to long-term pressures, short-term shocks



Population growth, rising incomes, urbanization



Climate change, extreme weather events



Agriculture-related risks, food safety risks



Growing land, water constraints

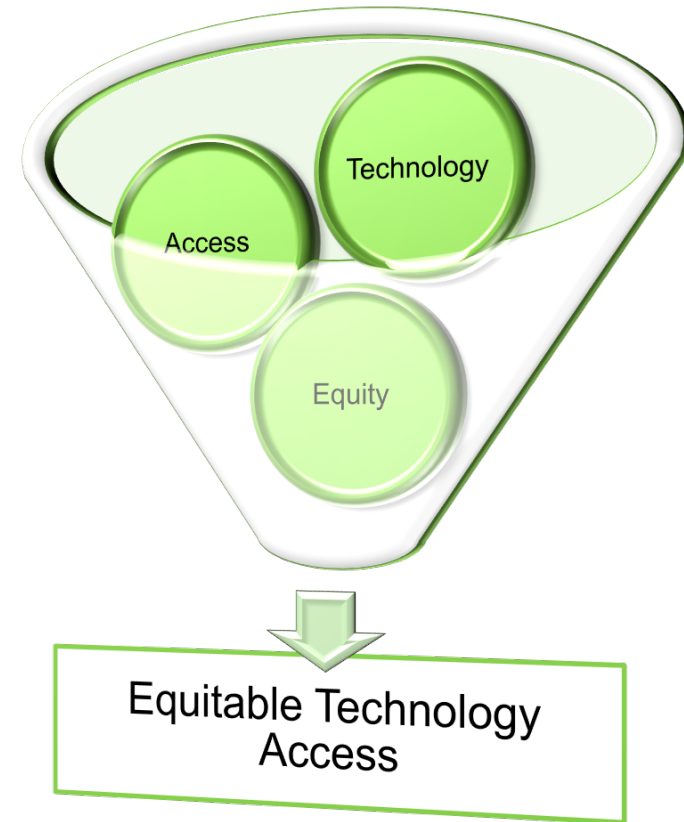


Persistent conflicts

The global food system is needed to play bigger role in economic and social development

Technological change involves multiple equity dimensions and types

- Definition
 - Access to, control of resources and opportunities
 - Including assets, inputs and services such as land, labor, education, extension, financing and technology
- Dimensions
 - Equality expenditure per capita
 - Distribution according to “need”
 - Equality of access
- Types
 - Gender
 - Sociodemographic “classes”
 - Economic sector
 - Cultural

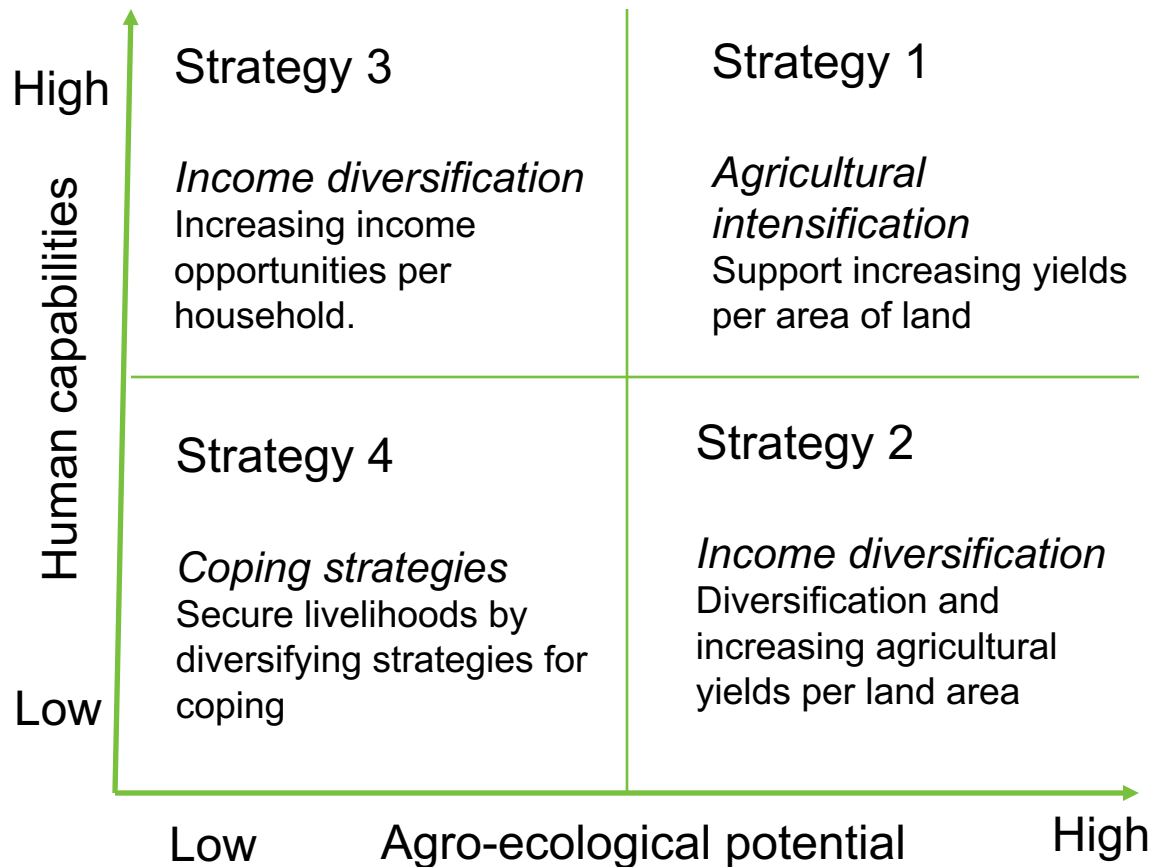


The Gatzweiler – von Braun 2016 conceptual framework

- Two distinct dimensions
 - Human capabilities - realized freedoms for people to do and be what they value including trade-offs among choices
 - Agro-ecological potential - potential provided by the land and all value derived
- Types of well-being improving innovations
 - Technological: increasing efficiency in the production process and reducing labor costs.
 - Institutional: Improved access to land, better land use rights, or alternate non-agricultural income opportunities



Potential strategies, technological and institutional innovations



Heterogeneity

- **Significant heterogeneity:** Within each of the four segments due to gender, income, age, health and other sociodemographic classes
- **Targeted and purposeful strategies:** to address existing variability and complexity
- **Agents for equity and change:** approaches, roles, and funding
- **Competitive advantage:** agents for change and potential dilution of capabilities



Building on FAO's food security pillars to build technology pillars

- **Availability** - ensuring adequacy of technology supplies in terms of quantity, quality and variety of food
- **Access** - optimizing stability in the affordability and allocation of technology, as well as the preferences of individuals and households
- **Utilization** –ensuring technology used is safe and efficacious and is sufficient to meet needs of individual or household needs. Elements include food safety, nutritional values, access to healthcare, sanitation and education
- **Stability** - the ability to consistently produce technology over time. Technology insecurity can be transitory (temporary decline in access), or chronic (constant failure to access technology).

Based upon FAO. (2014). The State of Food Insecurity in the World 2014: Strengthening the Enabling Environment for Food Security and Nutrition. Rome: FAO.



The CGIAR as “Agencies for Equity Change”

- Ethical imperative but also a productivity change determinant
- Modes and mechanisms
 - Development of global public goods
 - Freedom to operate and public access of tools and technologies
 - Supporting public-private & public-public partnerships
- Continued public sector presence in areas where private sector is dominant
 - Many areas where public sector presence may be positive agent for efficiency and equity purposes



There is no shortage of novel ideas in the agricultural and life sciences



Super hybrid rice



**“Prescription”
agriculture**



**High-iron and
high-zinc rice**



**Laser land
leveling**



**Apomixis in field
crops**



Gene editing

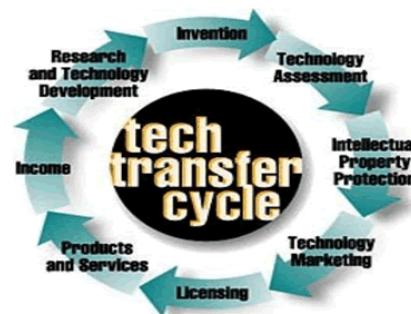


C4 rice

Science in today's food system is built around narrow principles and objectives



Technology is the first-best solution to today's problems



Technology transfers alone will advance local science



Increased yields from crop improvement will end hunger



Agricultural science is scale-neutral and gender-neutral

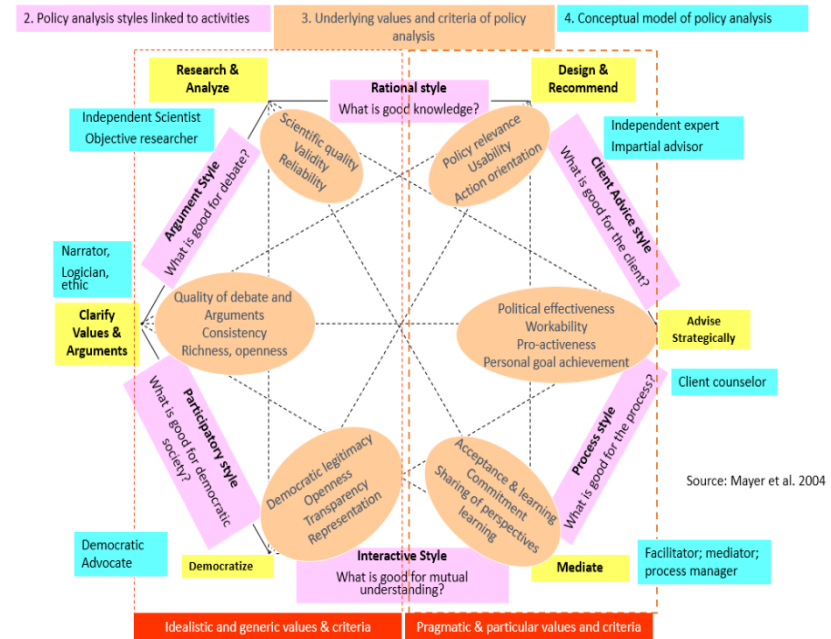
Improving Equity within Technological Change Processes (1)

- Novel investment and financing incentives (R&D prizes, PPPs, science parks, etc.)
 - Push mechanisms: incentives that reduce the costs of R&D and promote basic research to encourage spillovers
 - Pull mechanisms: incentives that increase the expected returns to R&D by improving or creating favorable market conditions



Improving Equity within Technological Change Processes (2)

- Engagement in complex and non-linear policy influence networks and change processes
 - Recognize that we have “wicked” problems in developing agriculture
 - “...wicked problems are those due to incomplete or contradictory knowledge, the number of people and opinions involved, the large economic burden, and the interconnected nature of these problems with other problems...”



Improving Equity within Technological Change Processes (3)

- Focus on gender and other equity issues as the starting point for technical change
 - Significant upfront expenditures
 - Lack of information
 - Access to complementary inputs locally
 - Limited capacities in implementing improved practices
- Use a two-tier approach to technology development
 - Make technology people-ready
 - Make people technology-ready



Improving Equity within Technological Change Processes (4)

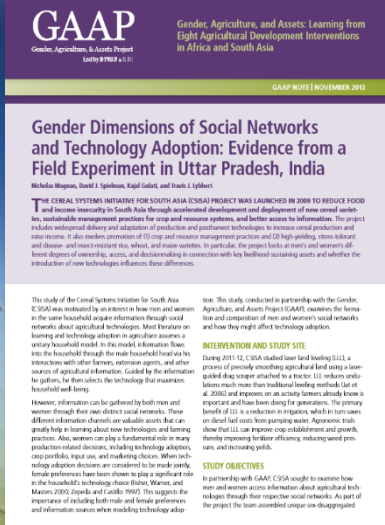
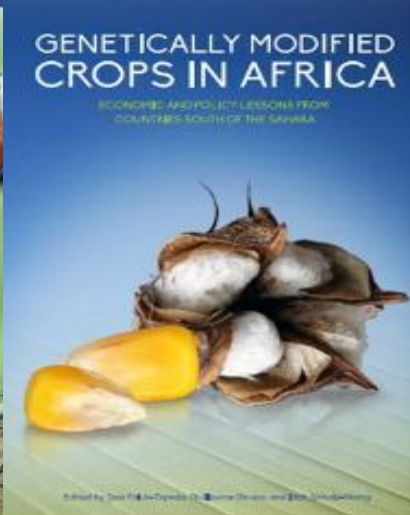
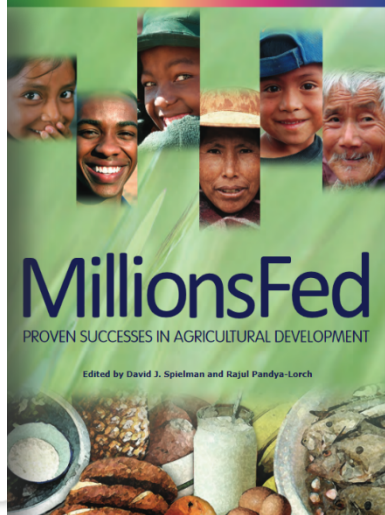
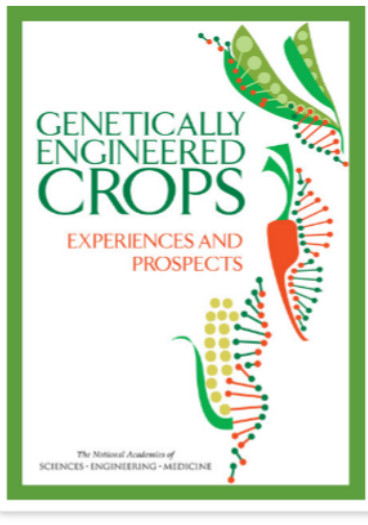
- Design policy, legal and regulatory frameworks that encourage innovation
 - Legal frameworks for resource rights
 - Regulations to encourage scientific inquiry and exchange (biosafety and genetic resources)
 - Markets and trade regimes that are more open, transparent, and fair
- Build innovative capabilities at the organizational level
 - Public agencies, private firms, civil society organizations
 - Increased use of information and communication technologies
 - IP regimes
 - Building sustainable private-sector-led input markets



In conclusion:
**A new, knowledge-based
global food system focused on ensuring equity**

- **Advancing scientific frontiers**—investing in R&D
- **Designing better policies**—evidence-based decision-making
- **Integrating gender and ensuring equity**—in both policy and technology design
- **Linking to health and nutrition**—yield gain is not enough
- **Ensuring sustainability**—synergies in agriculture and environment





Thank you for your interest!!!

Socioeconomic Considerations in Biosafety Decisionmaking: Methods and Implementation

ReSAKSS asia
INTEGRATED RISK FRAMEWORK

Seed Industry Analysis in Asia
TOWARD BETTER METRICS AND POLICYMAKING

DAVID J. SPELTMAN AND ADAM KENNEDY

INTRODUCTION
Our ability to make desirable biological characteristics of plants through applications of modern science creates remarkable abundance in agriculture and is one of the unacknowledged reasons why many governments in industrialized and developing countries have historically invested in improving cultivated crop varieties ("cultivars") through applications of modern science. When combined with other modern agronomy and good crop management practices, improved cultivars can enhance crop yields significantly and substantially drive agricultural productivity growth (Dixon and Colfer 2002, Longstad and Rowland 2002, Ranganathan and Evanson 2002). Public investments in cultivar improvement have also yielded high rates of return (Bardhan and Byrnes 2002, Bardhan and Byrnes 2005, Altieri et al. 2000, Fan and Pandya 1997). In turn, the resulting productivity growth has also contributed to broader agricultural development and poverty reduction efforts among both small-scale, subsistence farmers and food-security consumers in developing countries (Kato and Mckenzie 2007, Heald and Heald 2005, Fan 2000, Fan et al. 2000).

While cultivar improvement is not the only element in a far-reaching agricultural development strategy, it is often presented as the "key win"—a readily packaged, easily measurable, and directly attributable intervention that many developing countries can readily pursue. Thus, governments, donors, international research centers, and non-governmental organizations throughout the developing world often promote the provision of disease, scale-neutral packages of improved cultivars and inorganic fertilizers that can be integrated into existing crop management practices.

However, the reality underlying these packages is far more complicated. There is significant consensus in building and maintaining a system that continuously supplies improved cultivars to resource-poor, small-scale farmers across diverse agroecologies and fragmented markets. A modern seed system requires long-term investments in science—plant breeding, agronomy, biology, and genetics—as well as in industrial systems for seed production and distribution that supply affordable quantities of high-quality seed of improved cultivars to farmers who often have limited access to competitive markets. Policy decisions on how to build a modern seed industry—the science and business of a seed system—must balance a complex set of societal and economic tradeoffs. This includes allocating appropriate roles for the public and private sectors in the industry, defining optimal levels of regulation, and distributing the gains from innovation across different industry actors. As a country's seed industry grows in size and value, these tradeoffs become increasingly important to all industry actors: plant breeders, entrepreneurs, seed companies, public research organizations, regulators, state extension services, farmers' organizations, farmers, and consumers.

In recent years, some thought has been given to these tradeoffs in light of rapid change in the fields of both technology and industry. These issues are raised in a series of published reports such as Seed Regulations (2003), Top and Cuddle (1997), Intellectual Property Rights (Kobayashi et al. 2012, Ehrenkraut et al. 2003), Technology Transfer (Spielman 2007, Byrnes and Fisher 2002), Public Sector Private Investment (Fugle et al. 2011, Odenaro 2003), and Industry Structure (Barbassov 2002), among others. All point to the urgent need to rethink policies that influence seed industry growth and development.

But the introduction, amendment, or reform of policies governing seed industry development have also led to emerge in many countries, resulting in significant cross-country variation. Part of the variation may simply relate to the possibility that policymakers are insufficiently informed about the industry, that when designing laws and regulations to govern seed industry development, as a result, their decisions—and the analytical inputs they rely on—tend to be bogged down by points of principle, rather than practical dimensions of seed industry development. Examples of principal perspectives include the following.

Daniela Homa, Patricia Zambrano, and Jose Falck-Zepeda

Genetically Modified Crops in Africa: Economic Analysis Lessons From Countries in the Savanna

ROSE FALCK ZEPEDA

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Genetically Modified Maize: Less Drudgery for Her, More Maize for Him? Evidence from Smallholder Maize Farmers in South Africa

MARNUS GOUSE, DEBIDATTA SENGUPTA, PATRICIA ZAMBRANO* and JOSE FALCK ZEPEDA**

* International Food Policy Research Institute (IFPRI), Washington, DC, USA
** University of Pretoria, South Africa

Summary.— Genetically modified (GM) crop technologies have made great strides since their introduction in 1996. Although there is consensus and growing belief in benefits of adoption on the economic impact of GM crops, both emerging and advanced economies have not only failed to realize that the technology has had any impact, but also have not undertaken any serious study of the genetic adaptation and performance effects of most resistant (R) and herbicide-tolerant (HT) maize produced by multinationals in the African maize producer and food consumer belts. The finding indicates that women farmers who the labor-saving benefit of HT maize through the reduced weeding which has been noted and labor saving. Higher yields on the main season hybrid maize crops, while small farmers and women often express their opinion, and those of farmers who have adopted (HT) crops, remain uncertain and unexplained. The authors investigate the impact of GM crops on the smallholder maize production and adoption of small farmers. The seven maize varieties were produced by both male and female farmers and tested to be high yielding by both groups. However, lack of GM seed availability in the open and poor market access were possible limitations to the adoption and spread of the technology.
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Key words.— women farmers, GM maize, gender, technology adoption, Africa

1. INTRODUCTION

Genetically modified (GM) crops have been one of the fastest adopted agricultural technologies in recent history (Laloux, 2012). Initial adoption in 1996 was limited to commercial producers in a handful of countries mainly the United States, followed by Argentina, and Canada. Over the years farmers in Latin America and Asia have been adopting the technology at a fast pace. However, commercial production of GM crops in Africa has been limited to South Africa, Egypt, Burkina Faso, and recently Sudan. Among them, South Africa is the only country where smallholder farmers have been producing a substantial food crop using GM technology for more than a decade.

A substantial number of scholarly articles assessing the impact of GM crops on developing and developing economies has been published in different journals (e.g. Odenaro et al., 2011, Kijng'or & Oden 2014). The majority of these published articles have not taken into consideration gender-differentiated aspects. However, with increased adoption of these technologies in developing countries, mainly South Africa and given the importance of female farmers and household members play in multihousehold production systems in some regions of the world, it has become apparent that gender-differentiated assessment of adoption and impacts of GM crops demands further attention.

While numerous studies have shown that the technology introduction in agriculture are gender differentiated and that these differences have relevant policy implications (Petrone, Barbassov, & Odenaro, 2010; Odenaro & Fungwe, 2010; Odenaro, 2011; Odenaro & Fungwe, 2010), few have looked at the gender differentiated impact of GM crops in detail. Subramanian and Qain (2010), 2009,

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Karinne Ludlow, Stuart Smyth, José Falck-Zepeda, Editors

Socio-Economic Considerations in Biotechnology Regulation

Subramanian, Kirves, Piel, and Qain (2010) and Zambunan, Smith, Madsen, and Minton (2012) have made some first advances suggesting that women and men farmers and household members derive differentiated benefits from the cultivation of GM crops. These studies have analyzed the impact on women farmers in cultivating Bt cotton in India and Colombia. The findings are context specific for the region studied and will require further analysis to make wider generalizations. Little of any gender-focused work has been done in Africa, although some authors (Moris & Bostant, 2000; Datta, Bostant, Jansen, & Rose, 2010) have mentioned some gender aspects in their evaluation of insect-resistant (Bt) cotton in South Africa. Recent work on GM maize in KwaZulu-Natal by Gouse (2013) and Ranganathan and Dabben (2013) have collected gender-disaggregated data for maize but there has not been any substantial analysis regarding the differentiated effects on men and women farmers. Determining the gender implications of the adoption of GM crops is thus a significant research task at hand.

There is also a critical gap in our understanding of the labor effects of different GM crop technologies and how that affects technology adoption and use among men and women farmers. Despite the fact that the assessment of herbicide-tolerant (HT) technologies was supported by a grant from the United States Department of State, The survey data collection and the quantitative research were conducted by the Department of Agricultural Economics, Extension and Rural Development at the University of Pretoria, South Africa and the International Food Policy Research Institute as an IFPRI-CIFPRI collaboration. The authors wish to thank the management and staff of the African Economic Research Consortium for supporting the project. Final revision accepted March 3, 2014.

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