Introduction

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India's recent performance in agriculture has been favorable. With agricultural production growing over the past 30 years, India has stepped into the ranks of the top five countries in key agriculture products: wheat, rice, cattle, eggs, vegetables, and melons. It has become the world's leading producer of milk and pulses. And it has been a net exporter of agriculture products every year since 1990–91. Smallholder farmers are shifting toward high-value outputs. Agriculture investment as a share of agriculture GDP rose from 13 percent in 2004–05 to over 18 percent in 2008–09; private investment increased significantly even while public investment was stagnant; and the private sector has moved into agricultural research and extension services. Retail in food products is modernizing rapidly.

Yet there is widespread consensus that, relative to the rest of the economy, agriculture is lagging and that it can and must do much better to support India's overall high economic growth and dynamism.

An earlier Centennial Group study published in 2010[1] postulated that continuing rapid economic growth could transform India into an affluent country by 2039, with average living standards comparable to those in many European countries (such as Portugal). Indeed, with average per capita incomes of USD20,000 a year, India could transition from poverty to affluence in one generation. But such rapid economic growth will require bold and sustained policy and institutional reforms, and success at the economy-wide level will lead to major challenges for India's agricultural sector.

India will face a rapid expansion of food demand and major shifts in its composition, thereby requiring an acceleration of agricultural growth rates beyond the current 4 percent target rate, or a rise in imports. With limited land and water resources, the acceleration of agricultural growth requires a significant acceleration of productivity growth, and much higher water use efficiency in the context of continued irrigation growth. The public and private institutions responsible for research and extension and for irrigation will have to adapt to these requirements. Rapid agricultural and rural non-farm growth is important and will be driven by a combination of agriculture and spillovers from the urban economy. Subsidies will need to be reformed to be more efficient and will ultimately need to be accommodated within India's fiscal headroom. India's numerous

1 India 2039: An Affluent Society in One Generation.

agricultural and rural development programs will need to be streamlined and reformed to deliver higher impact. Such major reforms will challenge both the central government and the states, which have the major responsibility for implementing agricultural and rural development programs. Effective implementation will overshadow new policies as the decisive factor.

The vision of Indian agriculture in 2040 spelled out in this book addresses these challenges. The vision is that of a more efficient sector supplying the food needs of an affluent, highly urban India. Under this scenario, India would remain a top world producer in most agricultural products and could strengthen its export performance in some of them. Such a scenario can be achieved only with bold institutional, policy, and program changes encapsulated by four necessary, interlinked, and simultaneous sub-transformations: (i) from traditional grains to high-value crops and livestock products; (ii) from production based on low labor costs, widespread subsidies, and price support to efficiency and productivity-driven growth; (iii) from wasteful to efficient water use; and (iv) from public support and protection to ever greater involvement of the private sector throughout the value chain.

This vision is based not on mechanical projections but on what we believe Indian agriculture must transform into in order to match the economy's progress as a whole. This vision is not a fantastic construct; it is based on the experiences of other successful developing and developed economies, as well as India's own experience and planning documents.

Our review indicates that with a few notable exceptions—such as the lack of progress in making national markets for agricultural inputs and outputs more vibrant and efficient, and the persistence of high and often inefficient, inequitable, and environmentally damaging subsidies—India currently has most of the policies and strategies necessary to achieve the vision of an affluent and modern agricultural sector.

The worry is that even though good policies exist, they are often accompanied by others—notably hefty subsidies for water, electricity, and fertilizer—that prevent the proper development of a national market for agriculture inputs and outputs and slow the modernization of the value chain between farmers and consumers. More fundamentally, India's well-designed and well-intentioned policies have not delivered the expected results because of shortfalls in their on-the-ground implementation. The encouraging news is that, in numerous instances, a number of states have carried out successful initiatives that showcase desired reforms. The challenge now is to replicate these experiences and scale them up across the country, and thus reap the full benefits of these policies nationally.

With that in mind, this book proposes a set of recommendations that should be implemented on a priority basis. These recommendations are as follows: (i) make public programs much more focused and effective; (ii) recognize water as a critical, long-term constraint to India's agricultural growth and give top priority to significantly improving the efficiency of water use; (iii) promote new high-yield seeds and related technologies, including mechanization, to improve yields and

productivity; (iv) improve the effectiveness of agricultural research and extension; (v) support further improvements of the farm-to-market value chain and reduce spoilage; and (vi) improve markets and incentives related to agriculture through reforms of prices, trade, and subsidies.

The purpose of this book

This book explores the future and presents the audacious question: what could the agricultural sector in India look like 30 years from now and how should it look if it is to successfully meet the needs of the country's affluent society? To answer this question, Centennial Group, with financial and technical support from the Syngenta Foundation for Sustainable Agriculture, commissioned a group of experts on Indian agriculture to produce a series of thought-provoking background papers. These papers ranged from an examination of specific, resource-focused concerns (such as water for irrigation), to institutional issues affecting the performance of agriculture.

The papers were presented and thoroughly discussed at a three-day conference ''The Long-term Future of Indian Agriculture and Rural Poverty Reduction" in New Delhi, 27–29 April, 2011. The conference was attended by eminent policymakers from the Planning Commission and the Ministry of Agriculture; researchers and academics from Indian and international universities and research institutes; and representatives from the private sector and non-governmental organizations. While based on these papers, the book offers a bold vision for the longer term development of the sector. It presents the ideas developed in these various papers in a cohesive whole in an attempt to link Indian agriculture with the overall economy.

Looking back to gauge the future

In order to contemplate the book's underlying question about the future of Indian agriculture, it is helpful to look back to the past 30 years, partly because the backward look underlines how dramatically India's agricultural sector has already changed. Further, it helps focus the analysis because more than three decades ago, India's agricultural sector similarly stood at an important juncture at which point it was about to experience a significant transformation.

Today, India is no longer synonymous with crushing poverty, recurring famines, and starving people. It has become a country that has attained food self-sufficiency—and actually has done one better than that: it has become a net exporter of agricultural production. On the global front, it has become a leading agricultural producer. In terms of cereals production, it holds third place after the US and China; second after China in both wheat and rice production (all 2007 data), and first place in milk production.

Beginning in the mid-1960s, the Green Revolution led to the transformation of parts of India's agricultural sector. The Green Revolution utilized more readily available inputs (e.g., seeds, fertilizers, mechanization, including irrigation) to make technology more widespread, and also promoted

agricultural research and extension messages. Agricultural growth took off: the sector grew at an annual rate of roughly 3 percent.

Where is the agricultural sector today?

The Green Revolution helped jumpstart a process of structural transformation of the agricultural sector.

Trends that bespeak of such transformation are very much in evidence today: agricultural production is diversifying—away from traditional crops and staples such as wheat and rice, towards horticultural and animal food products. Their share in the value of output of the agricultural sector, including animal husbandry and fisheries, is now close to 50 percent, which is 17 percentage points higher than in the early 1980s. The private sector is becoming an increasingly important participant in both agricultural production and agricultural marketing.

As India's economic growth continues and its prosperity increases, the country will experience a rapid, historically unprecedented rise in the demand for food. Even if the agricultural sector has performed sufficiently over the past decades, the looming question is whether it can supply at the levels necessary to keep abreast of the anticipated demand. Simply stated, agricultural performance that is doing ''well enough" might not be good enough.

According to Dev (2011), increasingly persistent food inflation figures from the past several years indicate that the supply of these higher-value agricultural commodities is lagging compared to demand. It may be argued that these inflationary trends are a transitory phenomenon, but the Reserve Bank of India (2011) has posited that food inflation is on its way to becoming a structural problem in the country. It goes even further by hypothesizing that protein inflation—the price inflation of pulses, milk, eggs, meat, and fish—is, and will continue to be, especially acute (Reserve Bank of India, 2011).

The recent inflation in non-cereal food is a serious concern. India's poor still get more than 55 percent of their daily calories from cereals. Despite positive developments in the agricultural sector, the nutritional standing of many Indians remains weak. There is still a need for diet diversification to improve nutrition among the poor, which, in turn, requires deeper agricultural diversification, particularly among small and marginal farmers and those in resource-poor areas.

Another serious concern is the realization that India is reaching its physical resource constraints—thereby severely limiting the scope to expand agricultural production without significant improvements in productivity. India's water availability is especially worrisome. Water availability is already constrained, and is likely to worsen, as groundwater stores are depleted and the effects of climate change negatively impact India's hydro-geological situation. Land degradation has reportedly increased, in the form of depleted soil fertility, erosion, and waterlogging.

As the structural transformation of India's economy proceeds, the share of agriculture in GDP will likely continue to decline. Already it has declined significantly from above 40 percent in the 1960s to around 9 percent in 2010. And yet the agricultural and non-agricultural rural economy continues to provide a significant share of total employment, estimated at around 52 percent in 2011.

Hence, the livelihood of a significant share of Indian households depends on the performance of the agricultural and non-agriculture rural economy, both now and in the foreseeable future.

The premise of this book is that Indian agriculture must undergo an important transformation on both the demand and the supply side, along three primary directions by: (i) emphasizing higher-value outputs; (ii) increasing productivity; and (iii) redefining the roles of the public and private sectors.

The organization of this book

The book is divided into two parts. Part I "Transforming India's agriculture: productivity, markets, and institutions—an overview" was discussed at a high-level policy dialogue in New Delhi in January 2012. Part II, on the current state of Indian agriculture and areas of reform for its transformation, consists of six chapters, which were chosen because they each represent the "building blocks" that we refer to in Part I of the book.

These six chapters are the necessary foundation of the agenda that will transform India's agriculture to meet the needs and challenges of the future. On one end of the spectrum, they concern issues related to inputs, specifically the crucial input of water/irrigation for agriculture. On the other end of the spectrum, they represent institutional concerns: specifically addressing the institutional weakness of agriculture services provided by public institutions and enhancing the role of private sector players.

Chapter 1 "India 1960–2010: Structural Change, the Rural Non-farm Sector, and the Prospects for Agriculture" is written by Hans P. Binswanger-Mkhize, Adjunct Professor at China Agricultural University's College of Economics and Management in Beijing. This chapter examines past and likely future agricultural growth and rural poverty reduction in the context of the overall Indian economy, and notes that while the growth of India's economy has accelerated sharply since the late 1980s, agriculture has not followed suit. Additionally, the chapter draws attention to the rise of the rural population and especially the rural labor force in absolute terms. Despite a sharply rising labor productivity differential between non-agriculture and agriculture, limited rural-urban migration, and slow agricultural growth, urban-rural consumption, income, and poverty differentials have not been rising. This is because urban-rural spillovers have become important drivers of the rapidly growing rural non-farm sector—the sector now generates the largest number of jobs in India. Rural non-farm self-employment has become especially dynamic with farm households rapidly diversifying into the sector to increase income. Binswanger-Mkhize identifies this growth

of the rural non-farm sector as a structural transformation of the Indian economy, but concludes that it is a stunted one. Nevertheless, non-farm sector growth has allowed for accelerated rural income growth, contributed to rural wage growth, and prevented the rural economy from falling dramatically behind the urban economy. The chapter further discusses how the bottling up of labor in rural areas means that farm sizes will continue to decline, agriculture will continue its trend to feminization, and part-time farming will become the dominant farm model. It also presents factors on which continued rapid rural income growth is contingent, such as continued urban spillovers from accelerated economic growth, and a significant acceleration of agricultural growth based on more rapid productivity and irrigation growth.

Chapter 2 "Agricultural Diversification in India: Trends, Contribution to Growth and Small Farmers' Participation" presents a positive story on the current state of India's agriculture. It is written by P.K. Joshi, the Director for South Asia at the International Food Policy Research Institute (IFPRI), and Pratap S. Birthal and A.V. Narayanan, researchers at the International Crops Research Institute for the Semi-Arid Tropics, and describes the current trend of diversification—out of traditional grains and into higher-value crops. The authors conclude that it is the transformation of the production portfolio (along with technological change) that has sustained India's agricultural growth in recent decades. The share of horticultural crops in overall growth of the crop sub-sector increased from 26 percent in the 1980s to 47 percent in the 1990s, but declined to 39 percent in the 2000s. Most of the increase came from the diversification of land away from less profitable crops, mainly coarse cereals and pulses. Diversification contributed one-third to the agriculture growth in the 1990s, marginally more than in the 1980s and 2000s. Most remarkably, the authors find that India's success with agricultural diversification has come from the small farm sector. Increased demand for high-value food commodities has become a very important opportunity for small farmers. The challenge for the future will be to assure that the opportunities related to production are not undermined by smallholder disadvantages where marketing and the value chain between farmer and consumers is concerned.

Chapter 3 addresses one of the most important areas of reform to increase agricultural growth: how to improve water use efficiency. Written by Richard Ackermann—a noted water economist with a distinguished career in academia and international development organizations—the chapter "Improving Water Use Efficiency: New Directions for Water Management in India" takes a purely evidence-based and pragmatic approach to identifying practical and demand-driven ways to resolve some of the deep-seated problems in the water sector. There is now a large enough body of irrefutable evidence of what works and what does not work in the Indian institutional environment related to water, and how farmers have responded—whether by design or by default—that allows one to make robust recommendations going forward. The chapter argues that past emphasis on the development of surface water resources must be changed to greater reliance on groundwater sources and on development of water markets.

Chapter 4, written by Marco Ferroni and Yuan Zhou, "Review of Agricultural Extension in India," is concerned with the manner in which agricultural extension in India can be improved. During the Green Revolution period, extension—along with improved seeds, fertilizers, and irrigation—increased productivity and enhanced agricultural development. In the period since then, the public provision of extension has fallen short of expectations. Research-extension-farmer linkages are absent or weak in many instances, while there are also duplications of efforts among a multiplicity of extension agents without adequate coordination. In order to boost total factor productivity growth in the agricultural sector in India, tailored extension solutions are needed. Ferroni and Zhou offer a list of recommendations for all providers of extension—NGOs, the for-profit private sector, and the public sector—that could revamp this important contribution to the agricultural sector.

Chapter 5, an essay by Partha R. Das Gupta, a practitioner who has devoted his life to agricultural development in India, and Marco Ferroni, is entitled "Agricultural Research for Sustainable Productivity Growth in India" and argues for a renewed commitment to agricultural research in the country. Beginning in the 1960s, the national agricultural research system made historic early contributions by way of improved varieties of cereals, pulses, oilseeds, fiber crops, sugarcane, potato, horticultural, and plantation crops. Besides evolving high-yielding crop varieties, improved soil and water management technology, and pest and disease control techniques to name but some of the solutions that were developed, the national system played a significant role in taking new technologies to farmers' fields. Despite these successes, by the mid-1990s, a sort of 'technology fatigue' set in, even in the agriculturally progressive regions that practiced intensive agriculture. According to policymakers, this was partly due to a 'business as usual' attitude that had crept into the public research system. Today, the aim is to rediscover ways to put public-sector research back on its path of former progress, and supplement it with private sector research and product development.

Finally, Chapter 6 discusses ways in which the efficiency of the farm-to-market value chain can be improved. In "The Quiet Revolution in India's Food Supply Chains," Thomas Reardon and Bart Minten, from Michigan State University and the International Food Policy Research Institute (IFPRI), respectively, show how modern and traditional supply chains are rapidly transforming rural areas. The authors assert that it is the private sector (with participants from both the modern and traditional sectors) that is the most important actor in this 'quiet revolution' that is shaping food security in India. The common perception is that India's agricultural markets are largely publicly-driven—the government's direct role, as a buyer and a seller, is only 7 percent of the food economy of India. Despite important policy changes that have spurred a quiet revolution, a number of constraints still prevent supply chains from operating at their optima.

Concluding thoughts

Given its continental size and diversity, India experiences great inter-regional differences from the national average; there is considerable variation in the trends and contributions of different parts of the country to agricultural growth.

The Green Revolution helped parts of Indian agriculture to prosper, but, in retrospect, it appears that the boost from the Revolution mainly benefited the high potential areas, such as Punjab and Haryana. The dry lands and rain-fed areas, and those areas that might be called the 'periphery', such as the Eastern states of Bengal, and Orissa, did not benefit to the same extent—they continue to lag behind the other regions. There is, however, the example of Gujarat, the positive outlier. Its agricultural sector has prospered—and continues to outshine any of the other Indian states—despite its natural resource limitations.

India's Green Revolution represents a process by which public resources were used to create the foundation upon which private actors were able to flourish. Fifty years later, people are calling for a Second Green Revolution—to jumpstart a similar process, but with the added objective to benefit the parts of India's agricultural sector that were bypassed during the first round. This would serve the needs of a society that is becoming increasingly middle class and more urban.

The challenges for the sector's future are both complex and daunting. Most observers of Indian agriculture believe that its problems have less to do with policies than with actual policy and program implementation. Fortunately, at all links of the agricultural value chain—from extension services to storage facilities and marketing arrangements—private actors have started to complement public institutions, and are often providing better services. While the private sector is moving quickly to transform research, extension, and value chains according to its comparative advantage, most public sector institutions and programs for agriculture require urgent reforms, often along lines long recognized but not yet implemented. The public sector institutions must also concentrate more on areas that are not of interest to the private sector, and collaborate more with the latter.

Equally important, the enormous challenges of agricultural growth, natural resource management, and social services for rural areas must be resolved with greater citizen empowerment and decentralization. Such reforms have long been discussed in India, but initiatives have so far failed to bring them about. Reforms will have to be driven primarily by the states, with support from strong incentives and perhaps further legislative interventions from the center as well.

The reforms will not come about without pressures from below as well as from the very top. Once again, like two generations ago, India's agriculture stands at an important crossroad.

The leadership must make the critical decision about which direction to take, then follow up that decision with effective implementation of the necessary policy and institutional reforms. Hopefully, this book will make a contribution, however modest, to this process.