2018
02

IWMI
International Water Management Institute

IWMI-TATA
Water Policy Program

DISCUSSION PAPER

Doubling Farmers' Income under Climate Change

Uma Lele

TATA TRUSTS
भाकृअनुप ICAR
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Swiss Agency for Development and Cooperation SDC
CGIAR RESEARCH PROGRAM ON Water, Land and Ecosystems
CGIAR RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security CCAFS

Doubling Farmers' Income under Climate Change[i]

Uma Lele[ii]

1. Introduction

Prime Minister Modi's dream of doubling Indian farmer incomes declared in February 2016[iii] is now India's national policy. Finance Minister Jaitley announced a variety of programs in support of the policy in the budget presentation (2016–17), including increased allocations to irrigation and crop insurance. The central government has also launched an electronic National Agriculture Market, or e-NAM, connecting 21 markets from eight states in the first phase, and by March 2018, e-NAM will be extended to 585 mandis across India. The policy has stimulated considerable debate, including on "what income"—whether farm income or all income, nominal or real. Following Chand (2016) we assume the focus is on farm income, i.e., income from cropping and livestock. Chand (2016) and Swaminathan (2016), among others, argue that the goal is realizable, provided policies change from patchy and sporadic to more firm reforms, e.g., nearly doubling government expenditures, vigorous implementation of the 2003 Agricultural Produce Market Committee (APMC) marketing act, secure land leases, among others (Chand 2016); and soil health care, water harvesting and management, appropriate technology and inputs, credit and insurance, opportunities for remunerative and assured marketing, knowledge, skill, credit and land ownership and empowerment of women farmers (Swaminathan 2016). Most of these require states to act. Others are more skeptical (Gulati and Saini 2016*a*, *b*; Desai 2016; Sharma 2016). Gulati and Saini (2016*b*) argued that it would be a "miracle of miracles" without major reforms, calling for massive investments in research and development (R&D), and stressing the role R&D and Minimum Support Prices (MSPs) have played in China. Most importantly, India has lacked structural reforms in the clarity and security of land tenure and investment in physical and human capital that is badly needed. Waghmare (2016) argued that MSPs are irrelevant in case of most crops and regions in India. In the case of pulses, Joshi *et al*. (2016) noted that MSPs help traders more than farmers, leaving open the role of MSPs, India's favorite tool, in pulse production. A conference of the National Bank for Agriculture and Rural Development (NABARD 2016) summarized these arguments and presented recommendations, strongly emphasizing institutional credit, farmers' organizations in value chains and processing, and the role of investments in infrastructure such as cold storages. Which of these recommendations should be prioritized to double farmer income on a sustained basis and where should the actions come from?

2. Challenges and Policy Implications

This paper outlines determinants of farmer incomes under changing climate, i.e., growing risk and uncertainty from volatility in agricultural production, as well as in domestic and international commodity markets. It illustrates the challenge of determining the appropriate blend of public and private sector actions going forward and the challenges in scaling up and replicating some of the successful pilot innovations in India's vast and diverse agriculture under a decentralized democracy. There are well documented differences among Indian states in agricultural productivity and incomes, and several paradoxes: e.g., mountains of food and rising food prices with a large presence of undernourished people; huge unexploited potential in eastern India, with the presence of abject poverty, weak institutions and human capacity. The new policy is moving towards correcting some of these anomalies, e.g., rightly moving towards more cash transfers and less public sector physical distribution of inputs and outputs. There are multiple reasons for these paradoxes, however, and no silver bullets. Historically, India has had a mixed record of political commitment to agriculture, and its implementation record is also mixed. India's challenge is to generate the necessary political commitment and develop administrative capacity over its vast agricultural lands, at multiple levels ranging from farm households, panchayats, districts, and states, in order to establish strong, pluralistic institutions and a functioning physical infrastructure. Those institutions need the necessary skill mix and incentives to build a transformational, scientific approach to agriculture, make governance of agriculture accountable to farming communities, and deliver more and better results uniformly across states. This will call for a broadly consultative, participatory "adaptive management" style to the policymaking process, with an emphasis on implementation, routine monitoring, and evaluation of results to learn by doing and make results-based improvements. Environmental transitions, such as rising temperatures, more frequent droughts and floods, growing water scarcities, increased incidence of pests and diseases, and land degradation require an adaptive approach with skill mixes in the public, private, and civil society to deal with them.

The paper does not include the impact of demonetization. In the short run, the impacts in remote rural areas seem to be negative.

In the long run, it seems to be accelerating digitization, beneficial for the economy (New Indian Express 2017). More systematic research will be needed to know the impacts. Suggesting that India is moving in the right direction is the Global Competitiveness Index of the World Economic Forum (2016–17) report of sharp improvement in India's ranking, which stood at 39 in 2016 among 140+ countries (WEF 2016), down from a rank of 79 in 2012 (World Bank 2014). This progress on competitiveness needs to be accelerated.

Past Indian agricultural policy focused on farm productivity, food security (mainly viewed as cereal self-sufficiency) and poverty reduction, with the heavy hand of government doing rather than guiding. Sixty per cent of Indian agriculture is rainfed, with consecutive drought years in 2013–14 and 2014–15. As many government commissions and experts have noted, however, even though productivity in well irrigated areas is stagnating and resource degradation is all too evident, barring "*Har Khet ko Pani*" (i.e., proposed expansion of irrigation to all lands), rain-fed agriculture or weather shocks have not received the attention deserved in the discussions on India's long-term agricultural policy or performance.

3. Determinants of Farmer Incomes

Coherent, climate-smart, integrated, national- and state-level agricultural policy and strategy frameworks are needed, not just "bringing different mission mode initiatives together," as NABARD (2016) suggests. All too evident, despite much progress, is that India lags behind neighboring countries, including the early Asian Tigers, (South Korea, Taiwan, Malaysia, Singapore), as well as China, Indonesia, and lately, Vietnam. To understand these cross-country differences and the challenges of increasing Indian household incomes, we first need to define household income and its strategic implications for an appropriate balance between national, state, and local actions. Again, following Chand (2016), increasing farmer incomes can be thought of as consisting of farm and non-farm income components, each with the following determinants:

Farm Income = f [Output x prices – cost of production].

Annual Output per Farm Household determined by: (1) yields per unit of land per crop, (2) double or triple cropping per unit of land, (3) shift from low to higher value crops, and (4) income from livestock and fisheries.

Farm Size = f [Share of population in agriculture, land distribution, land access to hire in or out more land and other factors of production].

Prices determined either by Government Minimum Announced Procurement prices (MSPs) for scheduled crops or Market Prices for crops, livestock, and fisheries, for which there are no declared scheduled prices and market access.

Cost of Production determined by Input Costs (including Input Subsidies).

Non-Farm Income = f [(Non-Farm Employment and wages) + (Entrepreneurial income from trade) + (Transfer Payments/Social Safety nets such as Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) – Debt)].

4. Current Landscape and Issues Going Forward

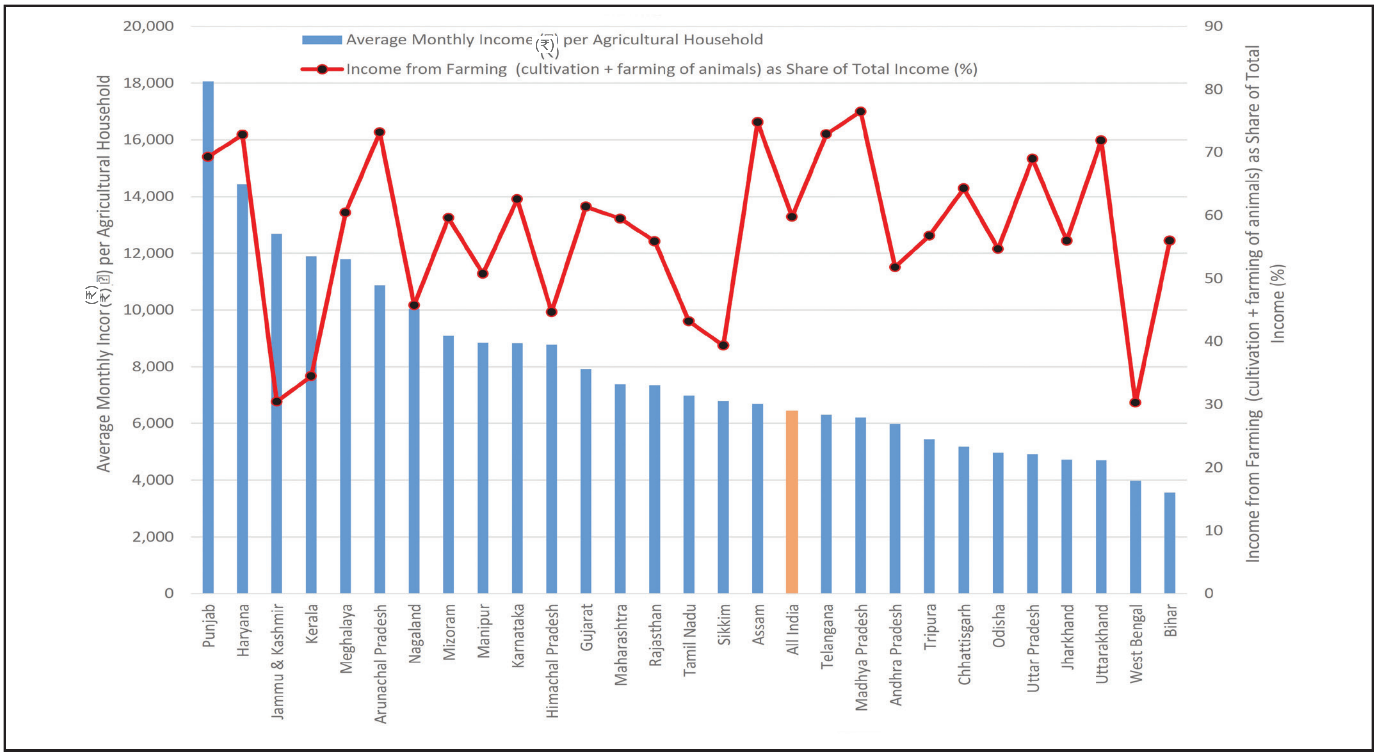
Of the 156 million rural households, GOI surveys classified 58 per cent, about 90 million, as "agricultural" households[iv], and 40 per cent with farming (cultivation + farming of animals) as principal income source for the agricultural year, July 2012–June 2013. At the all-India level, average monthly income (cultivation + farming of animals + salary/wages + non-firm business) per agricultural household was ₹6,426, with farming (cultivation + farming of animals) income accounting for about 60 per cent of the average monthly income (Figure 1) (GoI 2014).

The "doubling farmer income" policy must address both farm and non-farm income, and this is why comparisons with neighboring countries are of interest, because in those countries, both agricultural and non-agricultural income have increased, on balance, because of more and greater productive investments relative to subsidies and safety nets.

Second, India's agricultural household (agricultural and non-agricultural) income ranges from ₹3,558 in Bihar, to ₹18,059 in Punjab (Figure 1). Poverty rates are more than double the national average of 22.5 per cent in Jharkhand in 2011–12, compared to only 0.5 per cent in the state of Punjab.

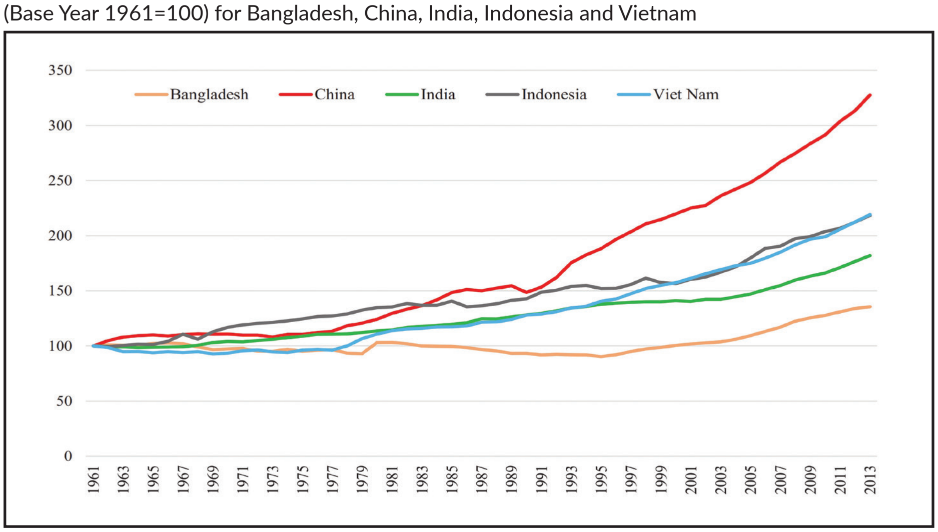
South Korea, Taiwan, Malaysia, Singapore, China, Indonesia and Vietnam each started with similar or less favorable human, institutional, and physical capital and resources in the 1960s, but now outstrip India using several performance measures (Lele *et al*. 2017). Agricultural Total Factor Productivity (TFP) in Figure 2 captures some of the key indicators including land intensification, diversification to higher value crops or animals, and value added beyond the farm through value chains (Fuglie 2012). Further details on these indicators are available (Lele *et al*. 2013; World Bank 2014; Lele *et al*. 2015). As a result of their better overall agricultural performance, barring Vietnam, India's neighbors in East and South East Asia are ahead in the growth of agricultural value added per worker and in the process of structural transformation, i.e., shift of labor from agriculture to non-agriculture. Yet, except for Brazil and Indonesia after the 1997 Asian crisis, the ratio of non-agricultural productivity to agricultural productivity

Figure 1: Average Monthly Income (₹) and Income from Farming (cultivation + farming of animals) as Share of Total Income (%) by Agricultural Household by States (July 2012–June 2013)



Source: Based on data from GOI (2014).

Figure 2: Agricultural Total Factor Productivity (TFP) Index Growth (1961-2013) (Base Year 1961=100) for Bangladesh, China, India, Indonesia and Vietnam



Source: Based on data available at https://www.ers.usda.gov/data-products/international-agricultural-productivity/

per worker has increased much more in China and Vietnam than in India (Lele *et al*. 2013; World Bank 2014). Asian countries have taken longer to achieve structural transformation (i.e., decline in the share of labor in agriculture relative to the decline in the share of agriculture in aggregate GDP) than their industrial counterparts, but India is still behind with a larger share of India's population depending on agriculture relative to agriculture's contribution to GDP. Labor productivity in agriculture is lower than in China, even taking into account the debate about China's labor in agriculture.

FAO data suggests much slower labor transfers out of agriculture in China than for example do International Labor Organization (ILO) data. In a follow-up study of structural transformation using ILO data, which also provides sectorial breakdown of employment for 139 countries, Lele *et al*. (2017) show that agricultural labor productivity is directly related to the growth of employment in the service and the industrial sector. Again, East Asia has done better on labor productivity, particularly in the industrial sector, than South Asia. India's ratio of labor productivity growth in the service sector relative to agriculture is by far the best, compared to the East Asian countries, but India's industrial labor productivity is by far the lowest against agriculture.

As elsewhere, agricultural household incomes in India are closely related to the share of irrigated area in the state. Yet there are significant differences in irrigation efficiency across countries and Indian states. Using Fuglie data, Indian agriculture has been shown to be less efficient than agriculture in China and Indonesia (World Bank 2014). Using state and district level data, Kshirsagar and Gautam (2013) show that whereas a few lagging Indian districts "caught up" with better-performing districts, a substantial number fell further behind, despite registering positive but low levels of growth. These differences across districts are rooted in strategy and the enabling environment. Improved seeds, the other key element of the Green Revolution technology, have spread faster and wider, but alone, have not narrowed the productivity differentials across districts. Market density has fallen more in the low-yield/stable districts, constraining producer incentives. In the “growth” districts, irrigation and fertilizers have contributed to significant changes in productivity. In others, cropping patterns need to be more attuned to the environment. Crop management practices need to improve. This means effective improved extension, input delivery, and market access are critical.

The Government of India (GOI) has proposed rapid expansion in irrigation and promotion of solar energy as policy priorities, but experience to date suggests that groundwater extraction, has been a double-edged sword. Growth of rural electrification, combined with subsidies, has led to unsustainable use of water. Rapid decentralized growth of solar energy making water exploitation easier, but it can further contribute to unsustainable use of water, if not accompanied by other policies. The GOI’s investment in mapping of all aquifers, an important initiative, will make it possible to quantify the relationship between rainfall and groundwater levels under alternative modes of irrigation and farming, which should enable prioritization of prospective water and irrigation investments. Nevertheless a combination of rewards for conservation and effective regulatory institutions at different administrative levels are essential to resolve growing water conflicts, and formulate and enforce rules.

Beyond such “traditional” development challenges, all countries face new challenges of climate change, with agriculture contributing to climate change and being affected by it (IPCC 2014). This increases the importance of managing a range of environmental transitions. Some transitions are a result of natural, external forces, emanating from climate change, such as the increased frequency of floods and droughts and soil degradation. Others are a result of policy or policy failures, from excessive use of water, pesticides, and chemicals, leading to adverse impacts on productivity, biodiversity, and human health, well documented Asian countries, (e.g., increase in the incidence of cancer; see Rola and Pingali 1993). These transitions call for a fundamentally different process of policy formulation and implementation, away from rigid, uni-directional, top-down segmented targets to an iterative process of “learning by doing” and “adaptive management.” It calls for considerable investment in human capital, embracing a culture of working with multiples stakeholders in different sectors at multiple levels, posing a coordination challenge (Loorbach and Rotmans 2006; Shove and Walker 2007). India’s areas under conservation agriculture, using three principles, minimal soil disturbance, permanent soil cover and crop rotations is for example, of 1.5 million hectares, out of about 74 million hectares under rice and wheat, illustrating the challenges in scaling up.

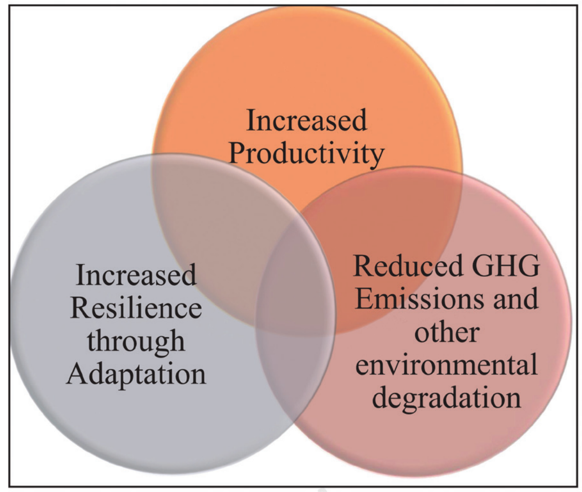
Aggarwal (2016) demonstrated the increasing trend in extremes of rainfall, drought, short-term floods, heat events, and greater coefficients of variation and multiple weather-related risks in the same season, as well as declining rainy periods and more variable rainfall in India’s breadbasket in Northwest India since 1960. Kshirsagar and Gautam (2013) showed the strong relationship between trend deviation in rainfall and trend deviation in agricultural productivity. Covering a long period of 1961–2009, through simulations, they also demonstrated a sharp deviation between actual and counterfactual trends had rainfall been normal. Impacts of the post–1990s reforms were eroded by poor rains in consecutive years, starting from the mid-1990s. They further explore the current levels of state wise actual yields of wheat and rice during 2004–2010, relative to potential yields and attainable yields. A counterfactual shows how much higher rice and wheat yields would have been if all the required inputs were available at the right time in the right place. This not only calls for a better delivery system, but substantially greater investment in research to develop multi-resistant crops. Figure 3 shows the vastly greater investment in agricultural research in China, compared to India; agricultural research expenditure as share of agricultural GDP is declining in India, but increasing in China. Furthermore, in a bold move China recently acquired Syngenta, one of big five private research companies for $40 billion. While differing on specifics, particularly on pricing policy issues, Swaminathan (2016), Chand (2016), and Gulati and Saini (2016 *a*,*b*), among others, are all arguing in favor of more investment in India’s agricultural and rural sector, ranging from research, education and extension to public– private–civil society partnerships.

Public policy also continues to under-provide for livestock development. The sector has been growing rapidly and offers multiple wins: increased resilience to climate change, increased income, greater employment particularly of women and socially marginal households, and better nutrition. Although China is the largest emitter of Green House Gases (GHGs), relative to the size of its agriculture, China’s emissions from agriculture, are small: 0.712 billion tonnes CO2eq in 2014 compared to India’s 0.627 billion tonnes CO_2eq. In India, enteric fermentation accounted for 45 per cent of the sector’s total GHG outputs in 2014; manure left in the field was 10 per cent. Emissions from the application of synthetic fertilizers accounted for 18 per cent of agricultural emissions in 2014. GHG resulting from biological processes in rice paddies make up 15 per cent of total agricultural methane emissions. With the spread of Ration Balanced Program, huge gains in GHG emission reductions are possible (Figure 4). The National Dairy Development Board (NDDB) (2016) reports that 1.5 million herd of cattle were brought under the Ration Balancing Program, with about 12 per cent reduction in cost of feeding per kilogram of milk and 12 per cent reduction in methane emission. With 120 million breedable cattle, including cows and buffalo, this suggests that only 1.25 per cent of the cattle are covered by the Ration Balanced Program. Livestock’s potential for doubling farmer incomes is immense. It will also help to scale up the 2000 climate-smart villages India has established with the help of the CGIAR (Aggarwal 2016).

Figure 3: Agricultural Research Expenditure as Share of Agricultural GDP (%) (2000-2014)

Source: Based on data from https://www.asti.cgiar.org/*Note:* China's data available until 2013.

Figure 4: Doubling Farmer Income Calls for Climate-Smart Agriculture



Author's Depiction of FAO's definition of Climate Smart Agriculture (CSA), "*agriculture that sustainably increases productivity, enhances resilience (adaptation), reduces/removes GHGs (mitigation) where possible, and enhances achievement of national food security and development goals*" (FAO 2010).

5. Conclusion

The incremental changes adopted thus far by the GOI and state governments are insufficient in a country with such a wide range in agricultural productivity growth performance and dependence on agriculture. The myriad fragmented policy initiatives need to be replaced by a comprehensive, integrated, climate-smart strategy at the central level and in each of the states. The current approach should be followed by a transformational process of agricultural policymaking and implementation, building ownership among all key stakeholders—the scientific community, private sector, civil society and farming communities, and taking advantage of India's powerful IT industry—who must play their part. The central and state strategies need a clear, state-specific set of priorities, strong focus on a science based agriculture and implementation, and routine monitoring and dissemination of broadly agreed upon performance indicators and their determinants. Adaptive learning within and across states, with accountability for results, should become the hallmark of development culture, replacing rigid, top-down targets. As former Chief Minister (CM), Prime Minister Modi, like some other CMs, had a strong record of implementation and demonstrated results in agriculture. He may need to lead this paradigm shift of change in the culture of accountability for sustainable results.

References

Aggarwal, P. 2016. “Climate-Smart Agriculture: Addressing Weather-Risks Related Agrarian Distress.” CGIAR Research Program on Climate Change, Agriculture and Food Security, Borlaug Institute for South Asia, CIMMYT, New Delhi.

Chand, R. 2016. “Doubling Farmer’s Income: Strategy and Prospects”. Presidential Address. The Indian Society of Agricultural Economics, 76th Annual Conference, Assam Agricultural University, Jorhat, Assam, November 21–23.

Desai, A.V. 2016. “Budget 2016: Jaitley’s Promise to Double Farmers’ Income in 5 Years Is Next to Impossible.” First Post, March 2. http://www.firstpost.com/business/budget-2016-jaitleys-promise-of-double-income-for-farmers-in-five-years-is-next-to-impossible-2651358.html

FAO 2010. “Climate-Smart” Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation. Rome: Food and Agriculture Organization (FAO).

Fuglie, K.O. 2012. “Productivity Growth in the Global Agricultural Economy and the Role of Technology Capital.” In *Productivity Growth in Agriculture: An International Perspective*, edited by K. O. Fuglie, S. L. Wang, and V. E. Ball, p. 335. Wallingford, UK: CAB International.

GoI (Government of India). 2014. Key Indicators of Situation of Agricultural Households in India. NSS 70th Round, Ministry of Statistics and Programme Implementation, National Survey Sample Office (NSSO), New Delhi.

Gulati, A. and S. Saini. 2016*a*. “Farm Incomes: Dreaming to Double”. *Indian Express*, July 28. http://indianexpress.com/article/india/india-news-india/farm-incomes-dreaming-to-double-2939405/

Gulati, A. and S. Saini. 2016*b*. “From Plate to Plough: Raising Farmers’ Income by 2022.” *Indian Express*, March 28. http://indianexpress.com/article/opinion/columns/from-plate-to-plough-raising-farmers-income-by-2022-agriculture-narendra-modi-pradhan-mantri-fasal-bima-yojana/

IPCC (Intergovernmental Panel on Climate Change). 2014. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. New York: Cambridge University Press.

Joshi, P. K., A. Kishore, and D. Roy. 2016. “Making Pulses Affordable Again: Policy Options from the Farm to Retail in India.” *Economic and Political Weekly* 52 (1): 37–44.

Kshirsagar, V., and M. Gautam. 2013. “Agriculture Productivity Trends in India: A District Level Analysis.” Background paper of the World Bank Report *Republic of India: Accelerating Agricultural Productivity Growth*, 2014.

Lele, U., M. Agarwal, and S. Goswami. 2015. “Growth of Land, Labour and Total Factor Productivity in Agriculture in Brazil, India, Indonesia and China.” In *World Scientific Reference on Asia and the World Economy*, Vol. 1, ed. J. Whalley and M. Agarwal. London: World Scientific Publishing Company.

Lele, U., M. Agarwal, P. Timmer, and S. Goswami. 2013. “Patterns of Structural Transformation and Agricultural Productivity Growth: With Special Focus on Brazil, China, Indonesia, and India.” Background paper of the World Bank Report *Republic of India: Accelerating Agricultural Productivity Growth*, 2014.

Lele, U., Sambuddha Goswami, and Gianluigi Nico. 2017. “Structural Transformation and the Transition from Concessional Assistance to Commercial Flows: The Past and Possible Future Contributions of the World Bank.” In *Agriculture and Rural Development in a Globalizing World: Challenges and Opportunities*, edited by Prabhu Pingali and Gershon Feder, Chapter 15. London: Routledge.

Loorbach, Derk, and Jan Rotmans. 2006. “Managing Transitions for Sustainable Development.” In *Understanding Industrial Transformation: Views from Various Disciplines*, *Environment & Policy*, Vol. 44, edited by Xander Olsthoorn and Anna J. Wieczorek, pp. 187–206. Dordrecht, The Netherlands: Springer.

NABARD (National Bank for Agriculture and Rural Development). 2016. “Doubling Farmers’ Income by 2022.” Monograph. https://www.nabard.org/Publication/NABARD%20Monograph%20%20Doubling%20Farmers.pdf

NDDB (National Dairy Development Board). 2016. Annual Report 2015–16. Anand. http://www.nddb.org/sites/default/files/NDDB_AR_2015-16Eng.pdf

New Indian Express. 2017. “Cash Crunch in Rural Areas to Normalize Soon, RBI Governor Tells PAC.” *New Indian Express*, January 20. http://www.newindianexpress.com/business/demonetisation/2017/jan/20/cash-crunch-in-rural-areas-to-normalise-soon-rbi-governor-tells-pac-1561802.html

Rola, A. C., and P. L. Pingali. 1993. *Pesticides, Rice Productivity and Farmers’ Health: An Economic* Assessment. Los Baños, Philippines: International Rice Research Institute and Washington, DC: World Resources Institute.

Sharma, D. 2016. “Hoping Against Hope, No Signs of Doubling Farmers’ Income in the Next Five Years.” Ground Reality blog, March 2. http://devinder-sharma.blogspot.in/2016/03/hoping-against-hope-no-signs-of.html

Shove, E., and G. Walker. 2007. “Commentary: CAUTION! Transitions Ahead: Politics, Practice, and Sustainable Transition Management.” *Environment and Planning* A (39): 763–770.

Swaminathan, M. S. 2016. “How to Double Farmers’ Income.” Financial Chronicle, March 23. http://www.mydigitalfc.com/op-ed/how-double-farmers-income-043

Waghmare, A. 2016. "Why It Is Hard to Double Farmers' Income by 2022." *IndiaSpend*, March 30. http://www.indiaspend.com/cover-story/why-it-is-hard-to-double-farmers-income-by-2022-2022

WEF (World Economic Forum). 2016. *The Global Competitiveness Report 2016–2017*. Geneva: World Economic Forum.

World Bank. 2014. Republic of India: Accelerating Agricultural Productivity Growth. Washington, DC: World Bank.

Endnotes

i. An earlier version of this paper was presented at XIII Agricultural Science Congress 2017, organized by University of Agricultural Sciences (Bengaluru) and National Academy of Agricultural Sciences (New Delhi), National Academy of Agricultural Sciences (UASB, GKVK Campus), Bengaluru, 21–24 February 2017.

ii. Formerly, Senior Advisor, the World Bank. President Elect of the International Association of Agricultural Economics. I am grateful to Sambuddha Goswami for background research.

iii. Including: (i) large investments in irrigation; (ii) quality seeds; (iii) soil health; (iv) cold chain and warehousing to prevent losses; (v) value addition through food processing; (vi) creation of a pan-India national market for farm produce; and (vii) risk mitigation through crop insurance and agricultural diversification into areas like poultry, beekeeping and fisheries.

iv. The Situation Assessment Survey 2013 defines an agricultural household as a household receiving some value of produce more than ₹3000 from agricultural activities and having at least one member self-employed in agriculture either in the principal status or in subsidiary status during last 365 days.

About IWMI-Tata Water Policy Program

The IWMI-Tata Water Policy Program (ITP) was launched in 2000 as a co-equal partnership between the International Water Management Institute (IWMI), Colombo and Sir Ratan Tata Trusts (SRTT), Mumbai. The program presents new perspectives and practical solutions derived from the wealth of research done in India on water resource management. Its objective is to help policy makers at the central, state and local levels address their water challenges – in areas such as Sustainable groundwater management, water scarcity, and rural poverty – by translating research findings into practical policy recommendations.

Through this program, IWMI collaborates with a range of partners across India to identify, analyse and document relevant water management approaches and current practices. These practices are assessed and synthesized for maximum policy impact and published as IWMI-Tata Policy Papers, Water Policy Research Highlights and IWMI-Tata Comments. The research underlying these publications was funded with support from IWMI, Tata Trusts, CGIAR Research Program on Water, Land and Ecosystems (WLE) and CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). The views expressed in the publications are of the author/s alone and not of ITP's funding partners. All IWMI-Tata publications are open access and freely downloadable from the Program's blog: http://iwmi-tata.blogspot.com

IWMI Headquarters
127 Sunil Mawatha, Pelawatte, Battaramulla, Colombo, Sri Lanka
Mailing Address
P. O. Box 2075, Colombo, Sri Lanka
Tel: +94 11 2880000, 2784080 **Fax:** +94 11 2786854
Email: iwmi@cgiar.org
Website: www.iwmi.org

IWMI-Tata Water Policy Program
"Jal Tarang"
Near Smruti Apartments, Behind IRMA Gate
Mangalpura, Anand 388001, Gujarat, India
Tel: +91 2692 263816, 263817
Email: iwmi-tata@cgiar.org
Blog: http://iwmi-tata.blogspot.in

IWMI International Water Management Institute

IWMI is a CGIAR Research Center and leads the: CGIAR

RESEARCH PROGRAM ON Water, Land and Ecosystems