

FOODSECURE Recommendation 5

Improve the resilience of food insecure households (via innovation, education and other means of empowerment) to escape the lock-in effects of growing inequality.

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Key message

A mix of education and innovation types is required to achieve impacts across all dimensions of food and nutrition security. Managerial and institutional innovations, both focussing strongly on the local context and actors, hold a high potential for impact on FNS at the global scale.

Short summary

Message 1: Supporting global agricultural innovation & diffusion requires specific policies tailored to the development stages of specific countries. In particular, bringing the poorest countries closer to the agricultural productivity frontier requires efforts in general education and conflict prevention. Investing in R&D or IPR systems cannot substitute for such basic requirements.

Message 2: Innovation and technology diffusion can be inclusive, but reaching the poor may require looking beyond traditional constraints. Interventions on farmers' aspirations may enhance the effectiveness of other policies targeting "external" constraints. Aspiration-raising strategies could hence support innovation diffusion and creation, as well as FNS.

Message 3: The agenda for future research on food and nutrition security needs to account for societal transformations such as educational developments and rural-urban migration. These are commonly overlooked or dealt with in separation, yet affect the availability and accessibility of food by changing the structure of endowments available to an economy. In terms of policy relevance, the scenario analysis highlights the need to take the wide view: to consider developments in agriculture and non-agriculture together, along with identifying demographic and education trends. The policies that operate in this arena such as investments in agricultural productivity and education are long-term.

Full summary

1. Introduction

Two important trends in the world are that the poorest countries diverge from the technical frontier and income disparities have been widening across the world.

Poorest countries diverge from technical frontier

Global evidence shows that innovation and technological change are main drivers of agricultural productivity growth, but this contribution varies across regions or countries. Indeed, at the country level Wurlod and Eaton (2015) have found evidence of strong disparities in trajectories to the agricultural production frontier. Contrary to the hypothesis of convergence, they find that for agricultural productivity, at least when assessed by labor productivity (perhaps the most relevant for developing economies), *the poorest countries diverge from the frontier*. Further, several of these countries are projected to experience escalating agri-food prices between 2010 and 2050 (Smeets-Kristkova et al., 2015). This might increase vulnerability especially for net food buyers in those regions, even if various scenarios show that technological change resulting from R&D investments can partly mitigate price increases (Smeets-Kristkova et al., 2016).

Income disparities have been widening across the world.

In OECD countries, the average income of the richest 10% is now about 9.5 times that of the poorest 10%, up from 7 times 25 years ago (OECD 2013a). Income gains accrued disproportionately to top earners between 1976 and 2007, with the highest-earning 1% taking home 47% of total income growth in the United States, 37% in Canada, and 20% in New Zealand, Australia and the United Kingdom (OECD 2014). The labour income share has fallen from 72% to 64% in the 1960-2013 changing the functional distribution of income in favour of capital. Technical progress has become biased against labour, especially against low-skilled workers (LO & OECD 2015). Within the FoodSecure project stakeholders have developed a set of four future worlds defined along two axes: Sustainability and Inequality (van Dijk et al. 2015). Shutes et al. (2017) and Kuiper et al. 2017 show that within all these worlds income disparities continue in the 2010-2050 period and are often strengthened. Even in the Ecotopia (ECO) and 'Food for all but not forever' (FFANF) worlds with international convergence growth is not necessarily pro-poor due to lock-in effects. Poor people can be locked-in an unfavourable position as unskilled labour saving technological change is high and factor markets are segmented. This implies that unskilled agricultural workers cannot easily move outside agriculture as their skills are not suited for other sectors in the economy. In countries where additional household detail is included Kuiper et al. (2017) project a worsening of the income distribution in decades ahead relative to the 2010 level.

2. Why do countries with lower agricultural productivity struggle to catch up with the frontier?

At the macro level the lack of agricultural productivity convergence can be explained broadly by the rapid rate of innovation at the frontier and slow diffusion to countries significantly within the frontier. This means widening productivity gaps. Wurlod and



Eaton (2015) find evidence of four major drivers of agricultural labour productivity: Educational attainment, Openness of the Economy, Public R&D Spending, Role of IPR & private sector in diffusion. Yet interestingly, these drivers do not behave in the same way across all (classes of) countries. Agricultural labour productivity in middle income countries reacts positively to enabling factors such as openness to trade, the existence of IPR systems and the performance of the economy (non-agricultural GDP), but does not react to R&D expenditures. On the other hand, those factors play no role in the least developed countries. There, the share of population above 25 years with a secondary education and the presence of conflicts are the main drivers of labour productivity. These are much more basic capacity indicators of technology adoption. The impact of IPRs and R&D investments is inconclusive (negative for single impacts, but a positive impact of their interaction). Yet while absorptive capacities and models of innovation diffusion are relevant, processes of innovation generation in developing countries should co-exist with technological diffusion. In fact, total factor productivity and labour productivity measures arguably capture the effects of both. Further, diffusion is not only a “North-South” phenomenon: it also happens among and within developing countries (e.g. adoption of improved seed varieties, often developed in the national system).

3. Can we make innovation more inclusive within agriculture?

At farm level, why are the poorest not innovating or adopting innovations? The literature has shown that access to inputs, markets or information constrains innovation/adoption – but is that all? Beyond these external constraints, individuals still behave differently. Why? A new strand of literature shows that internal constraints, such as beliefs or the sense over control of ones’ life, matter for development through their impact on people’s aspirations. Mekonnen and Gerber (2016b) show that people in the poorest income and lowest wealth and education groups in rural Ethiopia have comparatively low aspirations. Further, their analysis suggests that low aspirations or an extreme gap (i.e. either too wide or too narrow) between aspirations and the current state are associated with low innovation and low adoption (intensity). Aspirations also significantly affect food security at the household level (Mekonnen and Gerber, 2016a).

Technological and institutional innovations can enhance the resilience of farm households

The (economic) resilience of farm households can be enhanced through innovations in agricultural technology, although institutional changes may be required to deliver their impacts at scale. Bozzola, Smale and Di Falco (2016) show that maize intensification in Kenya, defined as the maize area share planted with hybrid seeds per farm positively impacts crop income, without increasing the variance of income or the exposure to downside risk (crop failure). Yet this intensity of technological diffusion is negatively affected by the occurrence and severity of droughts, thus

suggesting additional measures to improve impacts (e.g. addressing market failures such as credit constraints, access to markets, information failures etc.). Similarly in Uganda, Bozzola, Ting and Swanson (2016) find that inadequate experimentation hampers farmers' adoption of improved seeds, despite reforms in seed legislations.

Education and urbanization are important for pro-poor growth

The increasing inequality findings in the FOODSECURE scenarios of Kuiper et al. (2017) do not do justice to the expected developments and vision of the stakeholders of contrasting developments for the poor (Dijk et al. 2015). Two additional drivers are therefore added to better capture the inequality dimension: education and urbanization because they are important underlying factors of income and food accessibility. Adding these drivers to the mix has a massive impact on the income distribution, where the poor are now better off in the more equal worlds and worse off in the unequal worlds relative to the 2010 distribution.

Apart from having a major impact on the distribution of income across households, thus affecting accessibility of food, demographic changes alter the key variables for the agri-food system. Education and urbanization change the supply of agricultural labour thus altering a key driver from the input side. At the same time rising incomes due to skilled labour and an increase in number of people with an urban diet change the type of food demand, generally increasing the demand for meat and processed foods. Projecting future agri-food prices thus needs to look beyond the agri-food system.

References

Bakker, E. de, Bogaardt, M.J., van der Werff, M. and Beekman, V. 2015. The four legged chair - Benign or detrimental institutional environments for GM crops. FOODSECURE working paper 54. The Hague: LEI Wageningen UR

<http://www.foodsecure.eu/navigator?title=The four legged chair - Benign or detrimental institutional environments for GM crops>

Bozzola, M., Smale, M. and Di Falco, S. 2016. Climate, Shocks, Weather and Maize Intensification Decisions in Rural Kenya. FOODSECURE Working paper no. 39.

<http://www.foodsecure.eu/navigator?title=Climate, Shocks, Weather and Maize Intensification Decisions in Rural Kenya>

Bozzola, M., Ting, H. and Swanson, T. 2016. Uganda legal pluralism case study: transfer of improved varieties in informal markets and diffusion of embedded innovation. FOODSECURE working paper 55. The Hague: LEI Wageningen UR.

<http://www.foodsecure.eu/navigator?title=Uganda legal pluralism case study: transfer of improved varieties>

ILO & OECD (2015) The Labour Share in G20 Economies, International Labour Organization

Klümper W, Qaim M (2014) A Meta-Analysis of the Impacts of Genetically Modified Crops. PLoS ONE 9(11): e111629. <http://doi.org/10.1371/journal.pone.0111629>.

Kuiper, Marijke, Lindsay Shutes and Diti Oudendag (2017). With food and nutrition security hinging on inequality, labour allocation beyond agriculture proves a neglected key driver in long term FNS projections. Paper developed as part of deliverable 7.4 of the FoodSecure project on 'Long-term supply, food and non-food demand drivers, contrasting scenarios and their impact on FNS'.

<http://www.foodsecure.eu/navigator?title=With food and nutrition security hinging on inequality, labour allocation beyond agriculture proves a neglected key driver>

Mekonnen, D.A. and Gerber, N., 2016a. Aspirations and income, food security and subjective well-being in rural Ethiopia. FOODSECURE Working paper no. 51. The Hague: LEI Wageningen UR. <http://www.foodsecure.eu/navigator?title=Aspirations and income, food security and subjective well-being in rural Ethiopia>

Mekonnen, D.A. and Gerber, N., 2016b. The effect of aspirations on agricultural innovations in rural Ethiopia. FOODSECURE Working paper no. 52. The Hague: LEI Wageningen UR. <http://www.foodsecure.eu/navigator?title=The effect of aspirations on agricultural innovations in rural Ethiopia>

OECD (2013a) Crisis Squeezes Income and puts Pressure on Inequality and Poverty. OECD Publishing, Paris.

OECD (2014) Jobs, Wages and Inequality. OECD Publishing, Paris. Organisation for Economic Co-operation and Development. Report prepared

Shutes Lindsay , Hugo Valin, Elke Stehfest, Michiel van Dijk, Marijke Kuiper, Hans van Meijl, Andrzej Tabeau, Monika Verma , Diti Oudendag, Willem-Jan van Zeist and Petr Havlik (2017). *Food and Nutrition Security and Sustainability in Long-Term Projections: An Assessment of the FoodSecure Scenarios*. Paper developed as part of deliverable 7.4 of the FoodSecure project on 'Long-term supply, food and non-food demand drivers, contrasting scenarios and their impact on FNS'.

<http://www.foodsecure.eu/navigator?title=foodand%20nutrition%20security%20and%20sustainability%20in%20long-term%20projections>

Smeets Kristkova, Z., M. Van Dijk, and H. Van Meijl. "Projections of Long-Term Food Security with R&D Driven Technical change—A CGE Analysis." *NJAS - Wageningen Journal of Life Sciences* 77 (June 2016): 39–51.

<http://doi.org/10.1016/j.njas.2016.03.001>.

Wurlod, J.D. and Eaton, D. 2015. Chasing After the Frontier in Agricultural Productivity. FOODSECURE Working paper no. 36. The Hague: LEI Wageningen UR. <http://www.foodsecure.eu/navigator?title=Chasing After the Frontier in Agricultural Productivity>