Chapter II

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Rural development for inclusive growth and a balanced settlement of the population

Introduction

Achieving sustainable development is a challenge that is not limited by geography, demography or even national status. Joblessness, poverty, hunger, illness and conflict, among many, are manifestations of unmet goals and exist everywhere. But even as populations concentrate in growing cities, development challenges are particularly acute in rural communities and smaller urban settings. It follows that realizing the vision set in the 2030 Agenda for Sustainable Development requires solutions tailored specifically for the challenges of rural communities. This chapter will examine the role of rural development in achieving inclusive economic growth and will explore the barriers to and solutions for unlocking the potential of the rural sector.

The sustainable development of rural communities involves the realization of all the Sustainable Development Goals (SDGs), integrating economic, social and environmental goals. This chapter will focus on the economic aspects of this journey, particularly on SDG 8—which calls for the promotion of sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all—and SDG 2.3, which addresses agricultural productivity and incomes. At the same time, affluent rural areas, if achieved, could help make cities safe and sustainable by reducing rural-urban migration, or building sustainable transport. This chapter is one part of the argument that sustainable and equitable development must give urgency to the economic, social and environmental development of rural areas.

The objectives of this chapter are threefold: first, to highlight the importance of rural communities for achieving the economy-related SDGs; second, to highlight patterns of economic growth and development that do not require the mass migration of people to large cities; and third, to give policymakers inspiration from empirical findings as well as examples of successful in situ development that unlocks jobs and incomes, and kick-starts a broader structural transformation of economies. The chapter takes note of the multitude of publications by the United Nations and other organizations on rural development. It hopes to add value by highlighting key findings and elevating the visibility of the issues to policymakers who may not otherwise be aware of this line of work.

Following this introduction, chapter II is organized as follows: The first section describes the historical evidence and logic that explains how nationwide and rural economic structures move in conjunction with national incomes and improved living standards. It follows that national and rural development requires highly productive agriculture and better rural value chains, but also more value from rural non-farm agricultural activities. In this light, the transformation of economies towards producing higher-valued goods and services, when done in a socially responsible and sustainable way, should be viewed as a positive force that accelerates sustainable development. This section also examines different types of urbanizing processes that have impacted rural areas in developing countries. It highlights the idea and practice of place-based improvements in the standard of living of rural communities—often called *in situ* urbanization—in

promoting new employment opportunities and raising the standard of living in rural populations. This process helps reduce rural-urban inequality and avoid the urban overcrowding and squalor caused by rural-urban migration.

Section two describes two necessary conditions for the economic transformation and development of rural areas: improvement in agricultural productivity and the absorption of these gains by local non-farm activities. It explains how such rural development leads to favourable patterns of long-term growth in rural areas, ultimately leading to convergence of rural and urban income levels. This section argues that agricultural productivity growth does not necessarily translate into an expansion of the rural non-farm economy and explores reasons why neither has advanced adequately in many countries. The current speed of rural development is insufficient to meet the goals set by the 2030 Agenda, and a decisive change in the direction of national development planning is much needed.

Section three examines the role of digital technologies in accelerating the process of rural development and transformation. It describes how technologies rooted in digital systems and connectivity are being applied to agriculture with the potential to vastly increase both productivity and incomes for all farmers. The section provides examples of technologies that are helping food production become more profitable. Digital technologies provide farmers with advice and services that help to produce their crops and also provide regulators with tools to better monitor the quality of the food supply. E-commerce platforms help farmers bring their goods to market, connecting rural producers and the increasingly urban consumers. Fintech innovations ease access to finance and insurance. The result has been more employment opportunities and higher incomes from both agriculture and non-farm employment, as well as more prosperous rural communities.

The last section summarizes the main findings and lists the logical priorities for policymakers that emerge from the discussion. It finds that, among national priorities, the process of economic transformation must be supported and accelerated, but also directed towards sustainable objectives. Priorities must include how to lead rural sectors towards a more productive and prosperous future. Rural transformation, including in situ urbanization, must start with increasing farm productivity (as a precedent for further growth), but must also expand the linkages between the farm and non-farm sectors and encourage entrepreneurship. Further gains in agriculture would subsequently follow, creating a virtuous cycle. Promoting education to develop local talent and skills is important, as is the retention and attraction of talent to public and private activities. Policies must review why many well-meaning economic initiatives often fail to reach the poor and should be designed to ensure that benefits accrue to communities and those most in need. Finally, the use of technology should be greatly accelerated and encouraged for its catalyst role in rural transformation and development. This requires building the underlying infrastructure and supportive financial and regulatory environment with attention to the needs of rural communities.

Structural and rural transformation are fundamental aspects of economic activity and development

Economic growth and development are closely associated with, and in part defined by, the structural transformation of economies. This transformation is thought of primarily as changes in the sectoral composition of the gross domestic product (GDP); as a country becomes less dependent on agriculture, it diversifies its economy, and more people find employment in other sectors (FAO, 2017c).[1] The long-run reallocation of economic resources from agriculture to the manufacturing and services sectors can be clearly seen in historical data

1 The literature on structural transformation is too extensive to be listed. For a summary of the more recent literature, see Lin and Xing (2020). A recent summary of stylized facts is available in Herrendorf, Rogerson, and Valentinyi (2014). Islam and Iversen (2018) discuss how structural change relates to development concepts, including the Sustainable Development Goals.

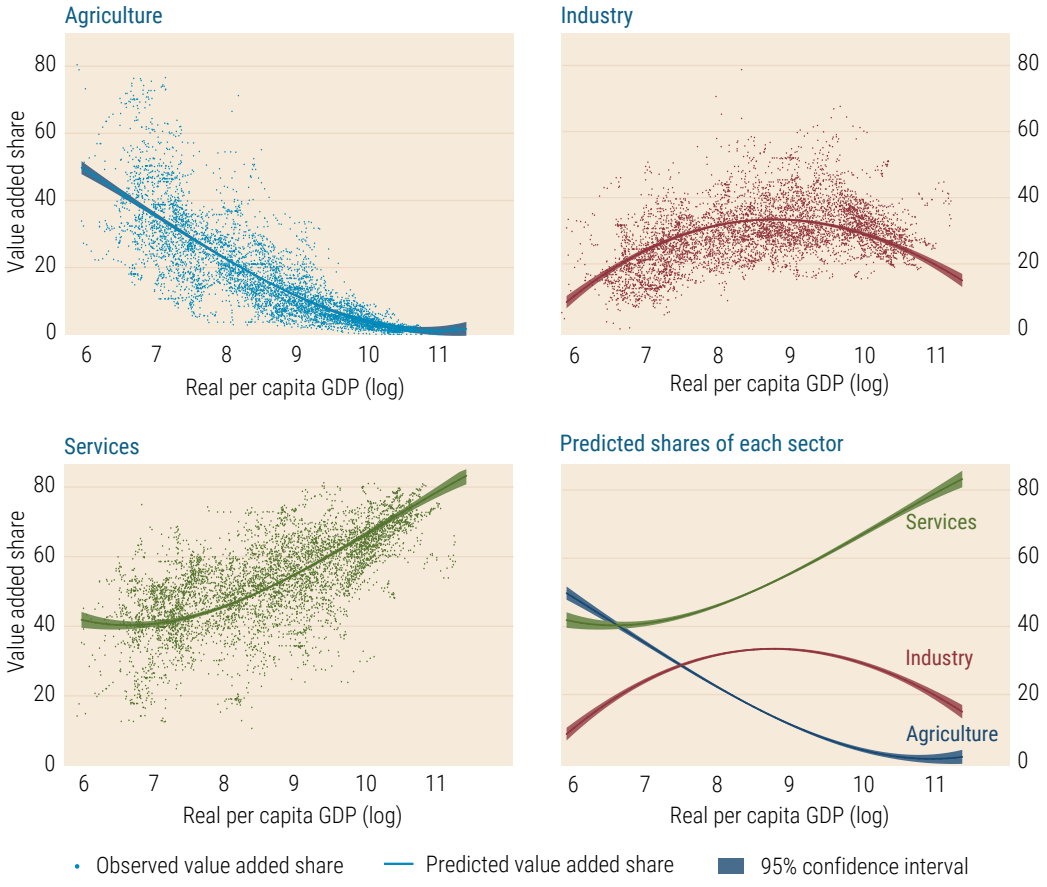
and is one of the major stylized factors of long-term growth. As countries become richer, the importance of agriculture declines, replaced by manufacturing at first. The services sector gains in importance and eventually becomes the dominant sector (figure II.1).

Growth and development, on the one hand, and structural transformation, on the other hand, are mutually enhancing. Productivity growth in agriculture releases labour and other resources to the other sectors while maintaining the required food supply for urban population growth. Simultaneously, the growth and diversification of the urban economy boosts demand for food and raw materials (IFAD, 2016). This process continues throughout a country's history of development and constitutes the core of modern economic growth (Herrendorf, Rogerson, and Valentinyi, 2014).

The chronicle of economic development is filled with examples that showed the importance of agricultural productivity improvement for economic diversification into other sectors. The first industrial revolution began in the United Kingdom of Great Britain and Northern Ireland in the late eighteenth century, made possible by the British Agricultural Revolution that started in the century before (Rostow, 1959; Deane, 1979). Development in the British agricultural sector helped to feed the growing population that worked in the industrial sector. Agricultural growth led to rising purchasing power, which increased demand for industrial products and provided financial capital for industrialization. The experience of East Asian economies in the second half of the twentieth century provides a more recent illustration of this dynamic at work:

Figure II.1

Structural transformation: sectoral shares of value added according to real per capita GDP, 1970–2018



Source: UN DESA, based on data from United Nations Statistics Division and Feenstra, Inklaar and Timmer (2015).

Note: The dataset includes annual data for 125 countries. The fitted line shows the predicted share in value added for a given level of GDP per capita, following the methodology of Herrendorf, Rogerson, and Valentinyi (2014).

economies such as Japan, Republic of Korea, Taiwan Province of China and, later, China all experienced significant improvement in agricultural productivity that preceded, and later overlapped, with the industrialization process that dramatically increased their income levels and allowed noteworthy income convergence with developed economies.[2]

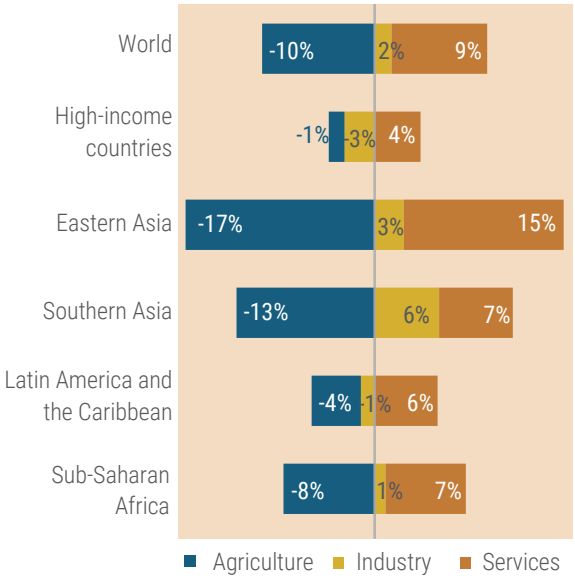
There are, however, notable departures from this general pattern as some countries shift from agriculture directly into services in a process of stalled industrialization and even "premature de-industrialization". Data on employment shares from 2005 and 2019 show that the global decline in the share of agricultural employment was mostly offset by employment share growth in the service sector (figure II.2). In high-income countries, industry employment shares declined at a faster rate than in agriculture. Southern Asia was the only region where the growth in employment in the industrial sector was similar to gains in the service sector. This pattern is thought of as a function of country-specific factors that influence the course of structural change, such as participation in global value chains, national resource endowments, geographical location, institutional capacity, and political leadership (Islam and Iversen, 2018).

Urbanization and the rural-urban divide

As economies have shifted away from agricultural to economic structures based on industrialization and services, so has their population moved from rural communities into cities. Factories and houses are built in the previously undeveloped sites; new networks of roads and railways are constructed to allow the movement of goods and people more efficiently within and between areas, and; people migrate from one place to another to find new jobs and build new lives. The so-called urban area or city is expanded, or newly born, as the result of the greater concentration of people and non-farm activities.

Figure II.2

Percentage point change in the share of total employment by sector between 2005 and 2019



Source: UN DESA, based on data from ILOSTAT.

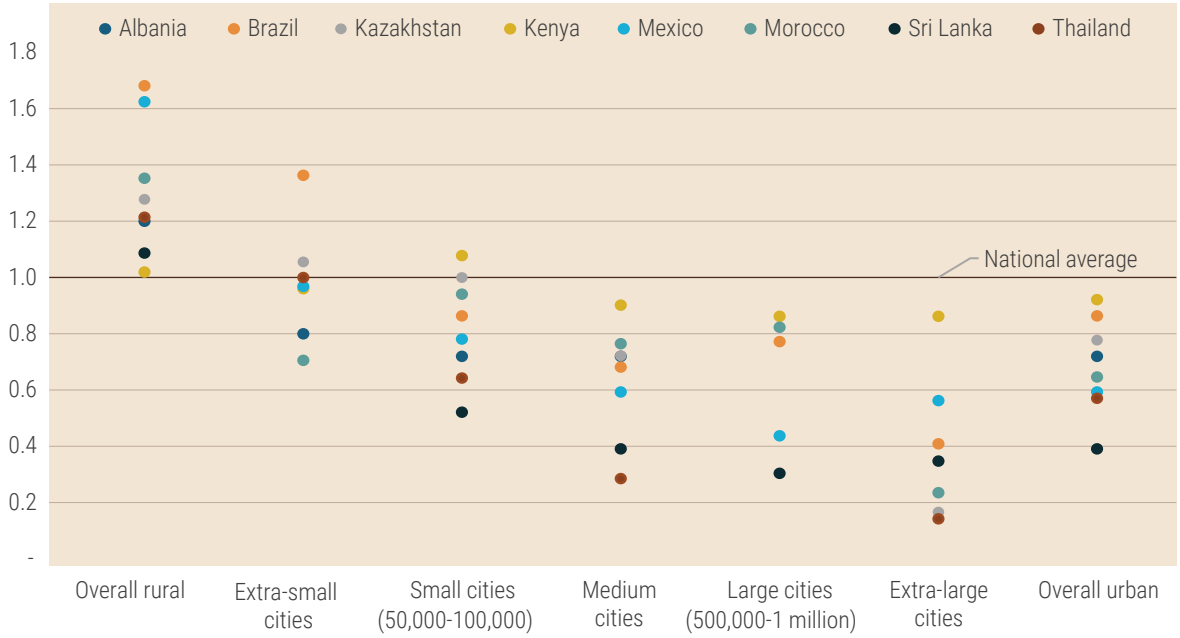
In 2015, a majority of the world population was living in areas classified as urban, up from 39 per cent in 1980 (United Nations, 2019b). This share is expected to grow to 68 per cent by 2050. The population in rural areas will decline in absolute numbers, from 3.4 billion in 2015 to an expected 3.1 billion in 2050.[3] An urban area emerges with the creation of industrial belts, geographic agglomeration of a certain industry, a transportation hub, or a financial centre. At the same time, unmanaged urbanization creates air pollution, unsafe water and noise, traffic congestion and the emergence of urban slums. The emergence or expansion of urban areas necessitates urban or regional planning—a political and technical process that examines the develop-

2 See Helble, Long, and Le (2019) for an empirical exercise that shows how the move out of agriculture into higher-productivity industrial and services sectors in economies in the Asia and Pacific region contributed to rapid productivity growth, leading to a significant increase in income levels. The paper also made an interesting and important observation: many Asian economies actually saw a major reallocation from agriculture to services, skipping the manufacturing phase. They found that such reallocation helped to increase labour productivity. The paper argued that its results contradict the narrative regarding how premature industrialization cannot generate sustained growth.

3 See the introduction to this publication for a discussion on the difficulty in distinguishing what is a rural area and what is a city. These binary categories often reflect arbitrary definitions that are inconsistent across space and time. In parts of India, for instance, areas currently classified as rural have populations of more than 250,000 people in high-density towns and have significant non-farm economies (Van Duijne, 2019).

Figure II.3

Poverty headcount by region and city size relative to national poverty headcount, selected countries and years



Source: United Nations (2020e, table 4.1), based on Ferré, Ferreira and Lanjouw (2012).
Note: A ratio below (or above) 1 indicates that the prevalence of poverty in cities of a given size is below (or above) the national average.

ment and design of land use, environment and socioeconomic infrastructure.

Urbanization is seen to have contributed to these classical urban and rural structures via industrialization and centralization of people and commercial activity. Jobs, infrastructure and public services are more available in cities, and explains the rural-urban divide. The growth of urban areas is, however, often seen as a negative phenomenon in the context of the SDGs: for example, 24 per cent of the urban population lived in slums in 2018; air pollution caused 4.2 million premature deaths in 2016; and over 90 per cent of COVID-19 cases are in urban areas.[4]

Rural areas are viewed as the source of migrants, undeveloped and poorer segments of the national economy, on the other hand. In fact, as discussed in chapter III, the gap between rural and urban poverty remains high even as the world has made significant progress in reducing poverty. Rural areas continue to face social, economic and political marginalization and there is a concern that the population in rural communities is being further left behind. Notably, poverty remains much higher in rural areas. Rural areas have been treated as a challenge rather than a solution to growth and sustainable development.

The absolute and relative deprivations experienced in rural communities are also experienced in cities, according to their size (figure II.3). Smaller cities have higher rates of poverty and their social and economic conditions reflect a more limited availability of education, water, sanitation, and other social services and infrastructure (United Nations, 2020e, chap. 4). This pattern emerges regardless of the definition of "rural" and "urban" used in the analysis. Using data that links socioeconomic outcomes with population density, a study of 20 sub-Saharan countries by Gollin, Kirchberger and Lagakos (2020) finds not only that urban households are better off than rural households, but that the outcomes improve in line with population density, a proxy for the degree of "urbanization". This result

4 Sustainable Development Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable.

extends to public services and infrastructure such as electricity, piped water, sewage systems, paved roads, school quality, police stations and health facilities. It is no surprise, then, that net migration flows from rural areas to towns and cities.

Urbanization also benefits rural communities

But not all the news is bad, and the process of structural transformation and urbanization provides important benefits to rural communities and smaller cities. A sustained investment to enhance productivity in agriculture and the broader rural economy (farm and non-farm activities) has a large impact on both growth and poverty reduction (FAO, 2017c). Rising agricultural productivity is consistent with urban growth as the rural sector provides cities with essential ingredients, including the food for a growing population, the labour needed for expanding the industrial and service sectors and the savings to help finance the more capital-intensive economic activities.

For rural households, the migration of workers to cities creates new permanent and temporary work opportunities to rural households. Asada (2020) examines how the expansion of transportation infrastructure has vastly increased the opportunities for non-farm employment in Sri Lanka (see box II.4). More generally, Suttie and Vargas-Lundius (2016) show that temporary, seasonal and permanent migration have significant benefits on income diversification, resilience and productivity-enhancing investments to households. Migration to urban regions increases the wages in rural jobs and provides remittance incomes to rural communities. There are also indirect impacts on multidimensional poverty as rural households benefit from enhanced food security, better education and health care, and other services (FAO et al., 2018).

For those who stay in rural communities, non-farm activities are an important pathway out of poverty. The pace of non-agricultural sector growth is associated with a faster decrease in rural poverty around the world, although there are important differences across countries (IFAD, 2016). A study of more than 3300 individuals from rural households in the United Republic of Tanzania found that about half of those who escaped poverty benefited from the rural non-farm economy or secondary towns (Christiaensen, Weerdt and Todo, 2013). This effect was significantly larger than the poverty-reducing effect of moving to big cities. The authors suggest that "the development discourse would benefit from shifting beyond the rural-urban dichotomy and focusing more instead on how best to urbanize and develop its rural non-farm economy and secondary towns".

In situ urbanization: the transformation of rural areas for inclusive development

Urbanization is *a process* of reallocation of people and economic activity that occurs within an area or across different areas. In the history of many developed countries, industrialization and centralization have shaped the classical urban substructure and facilitated rapid urban growth. In the process, new local governance structures appeared and, with urban planning, socioeconomic infrastructure was strengthened and the health status and educational achievement of the residents improved. It is a process that makes an area "more urban". Urbanization in a rural area is the transformation of the area to include more urban features, infrastructure and services, and is part of the structural transformation of the national economy.

Transforming rural areas into urban areas can reduce rural poverty and narrow the gap in living standards between rural and urban areas. Japan is an earlier example of the successful transformation of rural areas into urban communities, while experiencing the classical urbanization of large cities (box II.2) The rural transformation makes it possible for the country to achieve a more geographically balanced settlement of people, at least in the second half of the twentieth century.

In the late 1980s, the importance of local non-farm activities began to be recognized in rural-to-urban transformation in the areas adjacent to large cities in Indonesia. They called such adjacent areas desakota, coming from the Indonesian desa (village) and kota (city). Desakota models point to a blurred boundary

BOX II.1

COVID-19 outbreak, reverse migration and rural development

The COVID-19 pandemic has brought opportunities to reconsider our socioeconomic systems and make them more resilient and flexible. People in many parts of the world have realized that the rural area not only is the conventional source of essential goods and services, such as food and energy and the source of fresh air and relaxation, but also provides a safer living and more convenient work environment for urban dwellers. Some countries in both the developing and developed world have reported that urban dwellers chose to return to their villages and small towns of origin—so-called reverse migration—when facing lockdowns or mandated closures of factories and stores as well as loss of income sources. The true magnitude of such migration patterns is not yet known.

The pandemic is accelerating the diffusion of digital tools used in the office and at home and pulls people away from large city centres. Fear of spread of the virus in areas with high population density, coupled with isolation measures to ensure social distancing, is leading to remote working practices, remote learning and e-services. All of this has attracted more people into rural areas. With changing habits and greater willingness to accept digital tools, the public and private sectors now have higher incentives to increase investments in digital infrastructure, and the increased connectivity can further unlock opportunities for work and integration between rural areas and their neighbours. In the of case reverse migration, policymakers should focus on improving rural infrastructure to decongest overcrowded cities that prevail in many parts of the world.

Thus, over the longer term, the pandemic can change the locations where goods and services are produced and consumed, including remote work and mobility between rural and neighbouring areas. Socioeconomic infrastructure can be improved to accommodate the increasing demand for work and life support services. At the same time, global value chains of production and services, which are currently going through dramatic changes, could open up new opportunities in some rural areas, particularly areas with improved infrastructure. The pandemic has the potential to create a new pathway for sustainable development in the rural area and beyond, and a more geographically balanced settlement of population within a nation.

Source: UN DESA.

between rural and urban areas, in which farm and non-farm activities co-exist within the predominantly rural landscape. Place-based urbanization—often called in situ urbanization—is also of growing importance in sub-Saharan Africa and other parts of Asia. This type of place-based transition from a rural area into an urban one has received much less attention (Brown, 2018). It is different from traditional urbanization, in which the rural surplus labour and farming populations are transferred to secondary and tertiary industries in cities.[5] The advancement of in situ rural urbanization lies not only in promoting rural development, reducing the cost of labour migration and advancing the social and economic development, but also in realizing the transformation of economic and social structure and a more geographically balanced settlement of people within a nation by reducing population expansion pressure and improving the sustainability of the urbanization of development (Asada, 2020; Guo and Zou, 2015).

For example, urbanization in China since the 1970s has been led by in situ urbanization in its south-eastern coastal regions, where the central Government and, later, local governments, had played the critical role in facilitating the place-based urbanization. At this early stage of urbanization, the regions successfully developed higher valued-added labour-intensive manufacturing, such as sewing and food, which attracted workers from neighbouring villages (box II.3). Because of the very success of the process

5 It should be noted that in situ urbanization is relative to the geographic area and time span to be examined. It can be considered as classical urbanization if the rural area is absorbed at a later stage by a large metropolitan area. It is an in situ urbanization if the viewpoint is more microscopic within a relatively short time span, focusing on the socioeconomic development of the rural area. In situ urbanization examines structural and socioeconomic transformation from more regional perspectives.

BOX II.2

The rise and fall of rural communities in Japan

Since the end of World War II, Japan has transformed underdeveloped rural areas into modern communities with high per capita income and better infrastructure and health status. Before the mid-twentieth century, rural areas suffered high population growth, structural underemployment, stagnating agricultural productivity, and lack of financial resources, all factors now common to their counterparts in many developing countries. The underdeveloped regions in Japan overcame these obstacles by increasing agricultural productivity, which enabled them to supply sufficient food for the whole population and send young workers to large cities, thereby contributing to the high national economic growth experienced in the 1960s and 1970s.

A series of land reform measures were introduced in 1946 to convert the landless peasants into landowners. Once landowners, farmers had an incentive to invest in the land by applying fertilizers, purchasing agricultural equipment and improving irrigation. The Government and the agricultural cooperatives (established in 1948) played a pivotal role in improving the well-being of rural residents and building transportation and other infrastructures, such as the distribution system for agricultural inputs and outputs.

The reform measures also included the provision of a rice price subsidy to farmers. The producer price was set much higher than prevailed on the international market with the difference paid by the Japanese consumer through high import tariff rates. Agricultural productivity in Japan increased tremendously as a result. While a farmer with 1 hectare of rice paddy spent 251 days a year working on the land in 1951, this was reduced to only 30 days in 2000. The average rural household now consists of part-time farmers who have a full-time job in the non-agricultural sector. In 2000, the average farm household earned about $80,000 per year, or 23 per cent more than a non-farm household (figure II.2.1). As the manufacturing and, later, service sectors expanded, many young people opted to live in the rural areas but work outside their hometowns. Agricultural production thus became a part-time job for many rural households and non-agricultural income dominated in their overall earnings.

The rice price subsidy increased production levels and productivity, and thus narrowed wage gaps between agriculture and other sectors. But high prices eventually led to reduced demand in the 1970s, with a large stock of unsold rice stored in warehouses. In response, the Government introduced a policy to reduce the area of rice fields per household in order to lower the excess supply. This led some farmers to sell their farmlands, which sometimes were converted to public or housing development projects.

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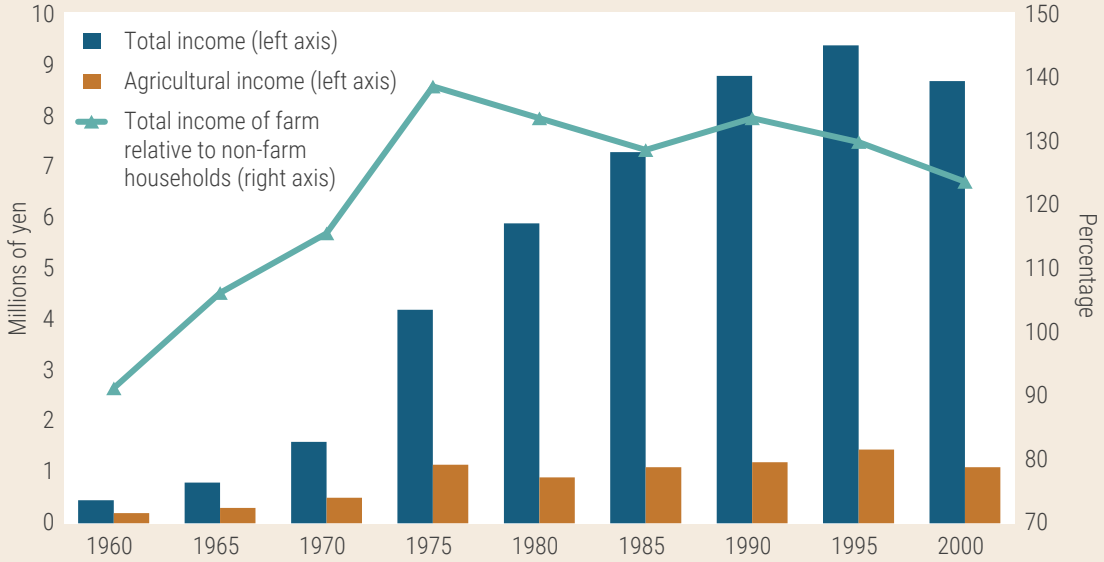
at the early stage, the importance of in situ urbanization has declined recently and now, the traditional urbanization that involves significant flows of migration has become dominant in the country. In Sri Lanka, in situ urbanization of rural areas has not been an explicit policy goal, but rather reflected the long-term development since the colonial period and people's preferences towards a rural-based lifestyle (box II.4). Some researchers further proposed the "settlement transition," involving the urbanization of the rural area without massive rural-urban migration (see Dick and Rimmer, 1998). In the early 2000s, a new form of urbanization was recognized in large rural areas of Bangladesh, India and Pakistan, where the population growth in some places has resulted in densities that equal or exceed the population densities in Los Angeles, New York or Toronto. The high population density is the force that transforms rural regions with urban characteristics but, unlike the case in south-eastern regions in China, migrants have found jobs in the low-skilled, low-wage urban informal sector, not contributing much to higher value added activities.

Not all urbanization experiences have led to the desired outcome and created the typical problems associated with urbanization. One such example is "urbanization without growth" in the sub-Saharan Africa region (Fay and Opal, 1999; Glaeser, Resseger and Tobio, 2009; Jedwab and Vollrath, 2015). In these

BOX II.2 continued

Figure II.2.1

Average total income and income for agricultural activities of farm households in Japan, 1960–2000



Source: Yamashita (2014).

Today, many rural areas located on the outskirts of large cities have become parts of a metropolitan region, producing non-rice agricultural products (such as flowers, fruits and vegetables); serving as a residential location; and hosting manufacturing and service activities. Other rural areas, however, are facing different socioeconomic challenges, such as the abandonment of cultivated farmland; declining commercial activities; rapid population ageing; and increasing fiscal deficits. This means that Japan now needs to devise a new rural development strategy to revitalize the role of rural areas in the national economic transformation process.

Source: UN DESA.

cases, population shifts to cities accelerated without sufficient expansion of employment opportunities. Karonga is the fifth largest city in Malawi and located in the northern region of the country. The city has grown from a former trading post in the colonial period under the United Kingdom to a subregional service centre. Its population increased to 61,609 in 2018 from about 11,000 in 1966, growing at 3.3 per cent per year on average. Despite its growth in population, Karonga does not have a local government, which could have planned and managed the growth of the city. The city experienced numerous large and small disasters, including earthquakes and strong winds, as well as environmental hazards, such as poor sanitation and seasonal floods (Manda and Wanda, 2017). The absence of a local government in the city has been an obstacle to the emergence of modern institutions and formal urban development, which could help reduce the risks associated with the environment and disasters.

Table II.1 schematically summarizes the urbanization experiences in these regions and countries. The urbanization experiences in some sub-Saharan African countries and the settlement transition in South Asia have transformed the previous rural areas into areas with higher population density, but socioeconomic transformation has not caught up with population growth, leaving the increased demand for decent jobs and public services often unmet (third column). A com-

BOX II.3

Government-led in situ urbanization of rural China

The in situ urbanization in China has contributed to the emergence and development of some 20,000 small towns since the late 1970s and provided more than 100 million people with employment in the non-agricultural sectors. It was a deliberate policy choice by the Government. The in situ urbanization has been particularly prominent in the south-eastern coastal region of China. The process has involved the creation of new city centres together with the reclassification of areas from rural to urban, along with physical changes of rural settlements and infrastructure through the development of township and village enterprises (TVEs) (Zhu, 2017). Table II.3.1 shows that the reclassification of rural areas to urban constituted about 67 per cent of the total population growth between 1982 and 1990, while the natural increase in cities and towns and rural-urban migration accounted for less than 5 and 28 per cent, respectively. The dominant role of in situ urbanization in population growth continued during the 1990s. Only in the 2000s did the rural-urban migration become the dominant factor in explaining the rapid increase of people living in urban areas.

In 1978, TVEs employed about 28.3 million people, but the number increased to 130.5 million by 1997. By the end of the twentieth century, the total value of TVE output accounted for about 30 per cent of China's gross domestic product and the TVE contribution to exports accounted for about one third. The emergence and expansion of TVEs has been the major driver of in situ urbanization by bringing structural and infrastructural changes to the rural areas—for example, by the creation of industrial parks and development zones, and by contributing to higher population density through better infrastructure and public facilities.

The true impact of in situ urbanization in China is likely to be underestimated, largely because public statistics only reflect those areas that have been officially reclassified as urban. There are three factors that have particularly contributed to the emergence and development of in situ urbanization in China (Zhu et al., 2013):

Table II.3.1

Population growth in cities and towns, 1982–2010

Components of population growth	Period between 1982 and 1990 censuses		Period between 1990 and 2000 censuses		Period between 2000 and 2010 censuses	
	Urban population growth (thousands)	Percentage of the total growth	Urban population growth (thousands)	Percentage of the total growth	Urban population growth (thousands)	Percentage of the total growth
Natural increase in cities and towns	19,320.6	4.9	28,497.0	17.0	28,283.6	13.3
Rural-urban migration	108,442.8	27.7	51,732.2	30.8	122,326.4	57.4
Reclassification of areas previously definied as rural	263,799.0	67.4	87,624.2	52.2	62,509.1	29.3
Total	391,562.4	100.0	167,853.4	100.0	213,119.1	100.0

Source: Zhu (2017), table 1.

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mon characteristic of the recent experiences in urbanization and in situ urbanization in developing countries is the absence of significant movements of people from rural to urban areas (fourth column). In Desakota, the initial stage of urbanization is characterized by rural-rural migration but, at the later stage in which some previously rural areas are reclassified as urban, the migration is considered to be rural to urban. They have involved migratory movements between rural areas, caused either "naturally" or by policy. Finally, all the urbanization experiences examined here ended up with an increase in population density, except Sri Lanka (fifth column). In Sri Lanka, many rural dwellers commute to cities for work by using extensive yet inexpen-

BOX II.3 continued

1. ***Population density and infrastructure***. In the late 1970s, the population density in the coastal region reached 400 persons per km^{2}, the common criterion for the definition as an urban territory. Relatively inexpensive means of transport, such as motorcycles, buses and trucks were available, with rapidly improving and expanding road networks (Rodrigue, 2020). In-ground and wireless communication systems were also fast becoming available in many parts of the region. All these developments have reduced the necessity for rural dwellers to be close to the cities in order to gain the economies of agglomeration;
2. ***Internal and external socioeconomic conditions***. The lack of investment is the major obstacle to urbanization in rural areas. Prior to the economic reforms of the 1970s, people in the coastal region invested in housing and created family-based workshops jointly owned by several households, often financed by remittances received from overseas. In cooperation with the commercial networks of overseas Chinese (people of Chinese birth or descent who live outside the territories of China), people engaged in labour-intensive production, such as sewing, construction materials, and food processing, which required limited upfront capital and an unskilled workforce. These family workshops were the forerunners of TVEs, the incubators for the in situ urbanization in the coastal region. In October 1986, the Government enacted a new measure that welcomed foreign investment, which ignited a large inflow of capital into the region from overseas Chinese. Foreign capital improved not only access to the international markets, but also production methods and facilities;
3. ***Policies and institutions***. China's household registration system, known as ***hukou***, which restricted rural-urban migration, as well as the national urban development strategy, which limited the growth of large and medium-sized cities, indirectly promoted the in situ urbanization of the rural areas. The land tenure and social security systems in China also created disincentives for rural residents to move to urban centres and thus indirectly encouraged in situ urbanization. For example, once a resident leaves a village permanently, the rights to use farmland and entitlements (dividend payments) from village collective enterprises may be lost. In addition, greater decentralized decision-making for economic development in the 1980s empowered local governments to create TVEs and "urban centres" in the rural areas.

Towards the end of the 1990s, a consensus emerged that large cities needed to accelerate their urbanization by better coordinating with surrounding smaller cities and towns. The removal of hurdles to rural-urban migration restricted by the hukou system also encouraged local governments to expand regional urban centres, particularly provincial capitals.

Shifting the importance to the creation of large cities is an inevitable consequence of the success of in situ urbanization, as the previous rural areas have become officially recognized as cities and the shares of their population and economic activities have increased. But the recent developments do not imply a lesser relevance of in situ urbanization in the coastal provinces of China. In situ rural-urban transformation is ongoing, and the relatively dispersed spatial pattern of city locations will continue to affect the future models of urbanization at the provincial level.

Source: UN DESA.

sive publicly owned bus transportation. The free universal health care and education up to the tertiary level, together with increased per capita income, have made it possible for the country to minimize the rural-urban gaps and rural-to-urban migration.

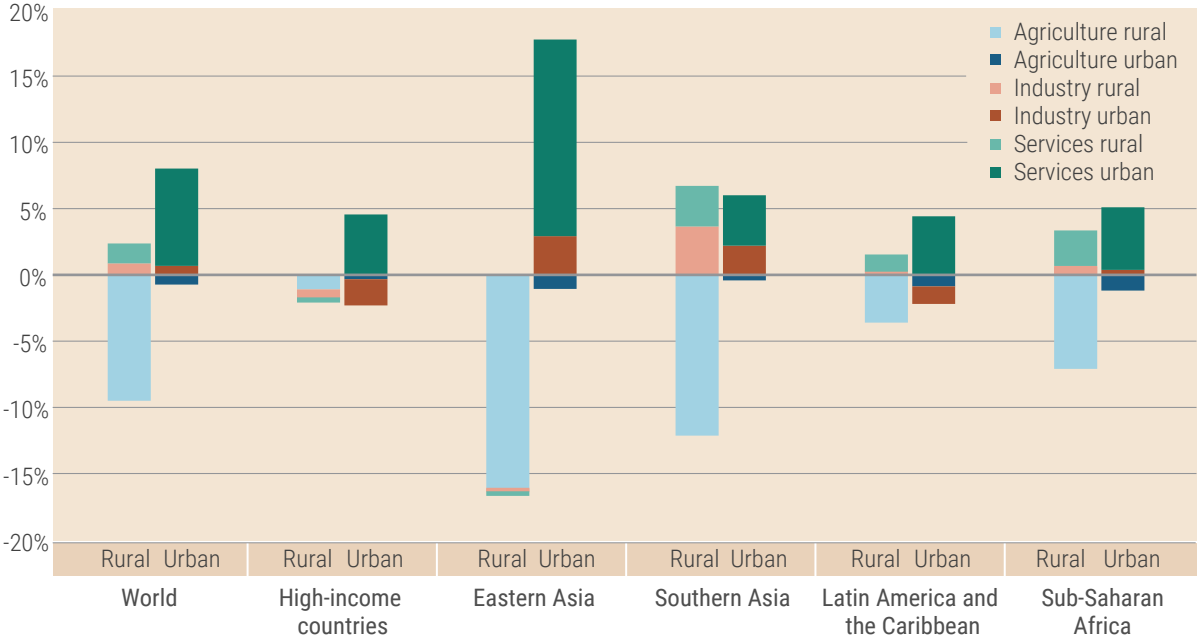
In a few regions, employment data at the national level show what may be interpreted as in situ (rural) growth of non-agricultural jobs. In Southern Asia and to a lesser extent in sub-Saharan Africa, where the agricultural sector dominates rural economies, the rural sector has experienced an increase in the employment share of industry and services in total employment (figure II.4). This increase absorbed some of the job losses in agriculture, preventing what would have been a corresponding migration of rural population to urban areas to seek employment opportunities.

Table II.1
Types of urbanization

Pattern	Example of country/region	Structural transformation	Rural-to-urban migration	Increase in rural population density
Classical urbanization	Europe, Japan	●	●	●
Urbanization without growth	Some sub-Saharan countries	□	●	●
Policy-driven in situ urbanization	South-eastern coastal region in China	●	□	●
Settlement transition	Bangladesh, India and Pakistan	◆	□	●
Desakota	Indonesia	●	◆	●
Rural-first in situ urbanization	Sri Lanka	●	□	□

Source: UN DESA.
Note: ● applicable, □ not applicable, ◆ not always applicable.

Figure II.4
Percentage point change in the share of total employment by sector and region between 2005 and 2019



Source: UN DESA, based on data from ILOSTAT.

BOX II.4

Rural-first in situ urbanization in Sri Lanka

Sri Lanka joined the group of upper-middle-income countries in 2019 without experiencing significant rural-urban migration. According to the World Bank (2015a), the country has achieved spatial equity between rural and urban areas in the provision of basic public services and living standards. The urban population share in Sri Lanka increased from 15.3 per cent in 1950 to 18.7 per cent in 2020, while in South Asia as a whole (including Sri Lanka), the same percentages were 16 and 37 per cent respectively (United Nations, 2019b).[a] Regional differences in Sri Lanka are minimal except in the Western Province, the location of the capital city, which exhibits some urban characteristics such as higher per-capita income, greater share of non-agricultural activities, and lower number of schools and hospitals per capita (see table II.4.1).

Table II.4.1
Socioeconomic indicators by province, Sri Lanka

Province	Number of schools per 100,000 population	Number of schools per 10 km^2	Number of hospitals per 100,000 population	Number of hospitals per 100 km^2	Per capita GDP (1,000Rs)	Share of non-agricultural sectors (per cent of total output)
Western	23.2	3.7	1.1	1.7	810	97.9
Central	59.0	2.7	3.9	1.8	487	89.7
Southern	44.8	2.0	2.5	1.1	482	86.6
Northern	92.7	1.1	6.4	0.8	467	87.5
Eastern	71.6	1.1	4.4	0.7	439	87.8
North-Western	52.5	1.6	2.6	0.8	534	89.9
North-Central	64.3	0.8	4.0	0.5	543	89.4
Uva	70.9	1.1	5.1	0.8	543	87.1
Sabaragamuwa	58.5	2.3	3.2	1.2	465	92.4
Country	**50.0**	**1.6**	**3.0**	**0.9**	**585**	**92.5**

Sources: UN DESA, based on Central Bank of Sri Lanka (2018) and Asada (2020).

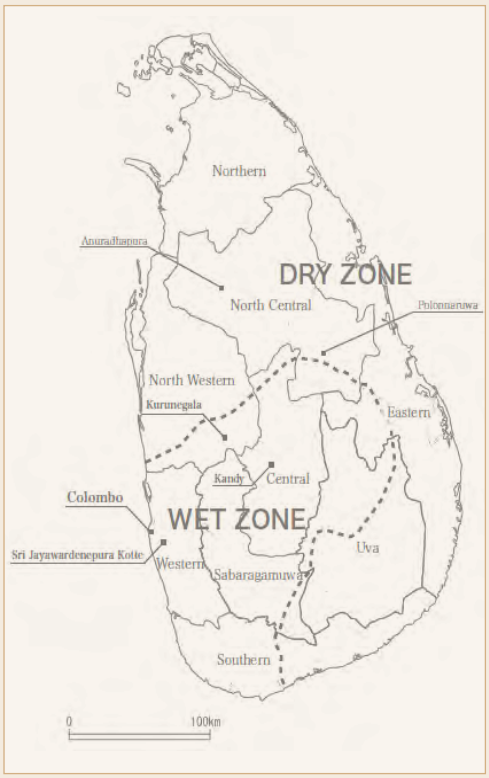
Rural areas in Sri Lanka enjoy many social benefits and a relatively high quality of life, in addition to rising per capita income. Although different political parties have ruled the country since the post-colonial period, they have consistently emphasized the development of rural societies, what Asada (2020) calls the "rural first principle"—guaranteeing universal free education and health care and offering affordable public transportation.[b] Schools and hospitals are located equally among provinces and districts although there are some disparities in terms of quality of service and facilities. Access to educational and medical facilities is enabled by reliable, subsidized public transport networks. In the 1970s, the country also instituted a poverty-alleviation programme and a low-interest-rate loan scheme for small businesses, which continue to this day.

Sri Lanka currently enjoys the highest level of health status and educational attainment and the lowest poverty rate among South Asian countries—all of which has reduced the need for rural residents to migrate to the cities. Public transport in Sri Lanka has also played a key role in achieving a geographically balanced growth. The rural bus network is expansive, and fares are kept low, which has facilitated rural-urban mobility as well as the overall welfare of people living in local areas.

continued >>

BOX II.4 continued

Map of Sri Lanka



The currently changing economic conditions, however, are making it challenging for the country to maintain some of the social programmes based on the rural-first principle. The economy of Sri Lanka has stagnated in recent years and is heavily dependent on remittances from overseas, amounting to about 10 per cent of gross domestic product. The Metro Colombo Urban Development Project, which started in 2012, with support from the World Bank, may contribute to further urbanization of the capital city in the long run and shift the rural-urban balance more to the latter.

The Sri Lankan experience offers several lessons for other developing countries facing urbanization challenges. For example, maintaining universal welfare programmes is key to achieving balanced rural-urban development. The provision of universal free education and health care is a bedrock principle of the Sri Lanka development experience. The country's expansive road networks and affordable public transport have also been critical in ensuring the access of all to schools and health facilities, regardless of where they live. The country's impressive progress in achieving spatial equity between rural and urban areas has thus reduced the incentives for rural residents to migrate to the cities.

Source: UN DESA.

a The urbanization in Sri Lanka in 1881 is estimated to be around 10 per cent (Central Bank of Sri Lanka, 2018). Weeraratne (2016) notes that the Government of Sri Lanka reclassified 89 previous urban areas into rural settlements.

b Asada (2020) argues that the rural first principle is rooted in the prosperity of the country during the pre-colonial period based on rich agricultural practices and the Buddhist culture that emphasizes a sustainable relation between humans and nature and between production and consumption.

Rural transformation and what holds it back

For economic transformation to take off in rural areas, at least two crucial steps have to happen. The first is the improvement in agricultural productivity. The second is the spillover of agricultural productivity growth to the expansion of local non-farm activities in rural areas, rather than the release of all factors of production—labour, capital and knowledge—to the cities, leaving the rural areas deprived of these factors. It would result in more diversified, more productive production patterns and livelihoods in rural areas, generating more resources for better coverage and access to services and infrastructure. This could in turn create conditions for rapid growth of rural areas to become mid-sized cities and small rural cities and ultimately leading to convergence of income levels across region. Besides supporting growth, diversification into a wider range of economic activities also improves long-term economic resilience of rural residents, which is critical to sustaining the elimination of poverty and hunger.

The policy focus in rural development has typically been on improving agricultural productivity, and there has been relatively less focus on how to ensure it would translate into reallocation of resources into

other sectors locally in rural areas. Moreover, for many developing economies, neither step is happening at the pace or to the extent that is fully compatible with sustained growth and generation of decent work in rural areas. It is estimated that global agricultural productivity growth has been below the rate that is needed to sustain the projected increase in need of food, feed, fibre and biofuel for the coming decades (Steensland and Thompson, 2020). A review of historical experiences—including the aforementioned successful ones in the United Kingdom and East Asia—clearly shows agricultural productivity improvement typically results in expansion of industrial and service sectors in cities rather than rural areas, for reasons that will be explained later in this chapter. A decisive change in the direction of national development planning—one that places more emphasis on rural areas and their linkages with urban areas, while ensuring equitable distribution of developmental gains within and between different areas—would need to happen to accelerate and actualize rural transformation.

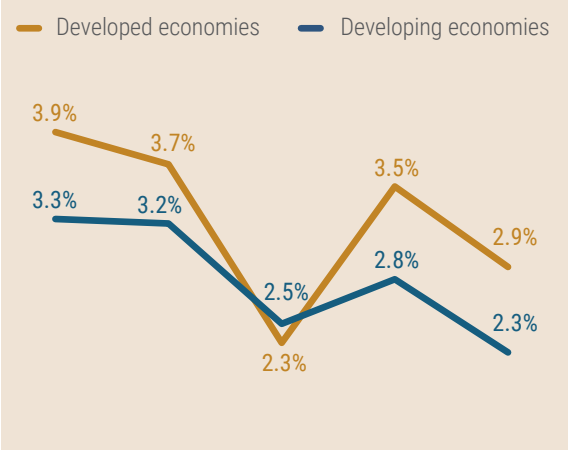
Factors behind inadequate agricultural productivity growth

A major characteristic of the global agriculture landscape is the great variance of agricultural productivity levels and growth across countries.[6] Developing economies generally have significantly lower levels of agricultural productivity and have seen lower agricultural productivity growth in the past decades (figure II.5). In the majority of the 15 years during 2003–2017, the median agricultural growth rate among developing economies fell below—and in some years far below—that of developed economies.[7] As a result, there has been little catching up of low-agricultural-productivity countries with those at the productivity frontier (figure II.6).

Figure II.5

Agricultural labour productivity growth by country group, 2003–2017

Percentage



Source: UN DESA calculation, based on Dieppe (2020).

Note: Median value among countries is used for each country group. Value shown for each period is the simple average of the median values of the years in the period.

Regionally, the Middle East and North Africa have seen the highest median agricultural productivity growth during 2003–2017, followed by high-income economies in Europe and Central Asia and North America, as well as East Asian economies. On the other end are Latin America and the Caribbean and sub-Saharan Africa, which have seen considerably lower agricultural productivity growth.

Globally, in the 15 years from 2003 to 2017, more than 147 million agricultural workers—close to one fifth of global agricultural workforce—were working in developing countries that did not see sufficient agricultural labour productivity growth that would allow any meaningful catch-up with the agricultural labour productivity levels in the developed countries.[8] Furthermore, it is projected that countries that are home to at least 501 million agricultural workers will not be able to double their agricultural labour productivity during the SDG period (2015–2030) (figure II.7). Without acceler-

6 Throughout this section, the terms "agricultural productivity" and "agricultural labour productivity" are being used interchangeably. It is calculated as the total agricultural value added divided by the number of people employed in agriculture.

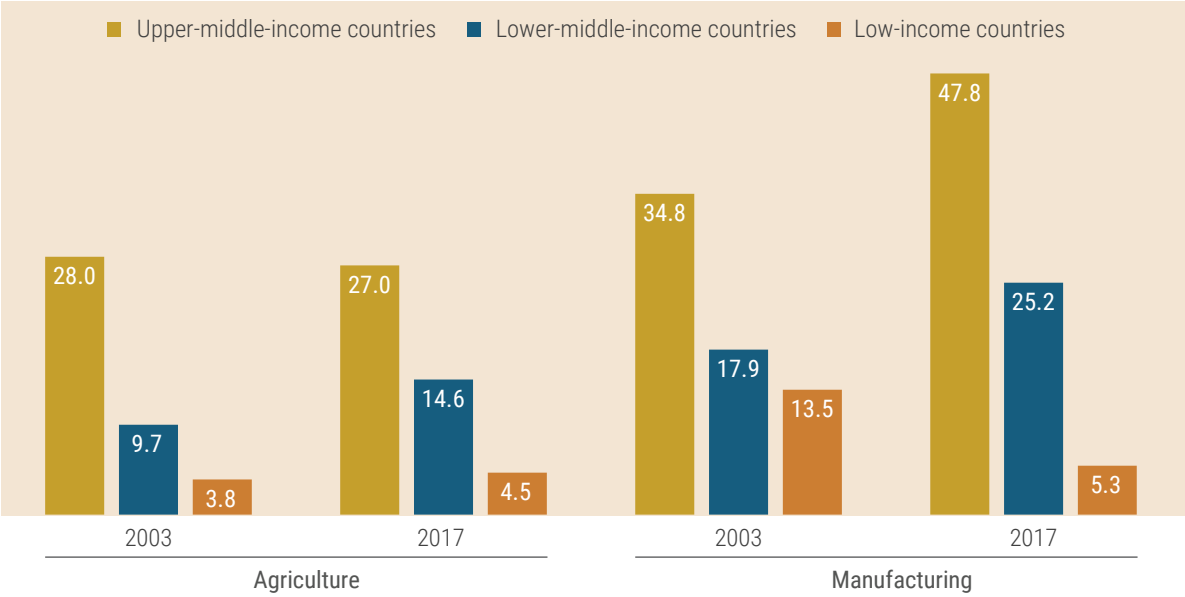
7 In the period following the global financial crisis period, low-income countries suffered the most among the developing countries from a productivity slowdown in their agriculture sector, which has coincided with a broad-based decline in agricultural commodity prices since 2011 (Dieppe, 2020).

8 UN DESA calculation, based on data from Dieppe (2020). These are developing countries where each of their average agricultural labour productivity growth rate during 2003–2017 was below that of the average growth rate in developed countries.

Figure II.6

Labour productivity in purchasing power parity, relative to high-income countries, 2003 and 2017

High-income countries' median=100



Source: UN DESA calculation, based on Dieppe (2020).

Note: Median value is shown for each income group.

ation in agricultural labour productivity growth, SDG 2.3 (doubling the agricultural productivity and incomes of small-scale food producers) could be out of reach for these countries, particularly given that small farms are typically outperformed by larger ones in terms of labour productivity (Gollin, 2018).[9]

One way to understand the slow agricultural productivity growth—defined here as changes in output per agricultural worker—is to decompose it into its two key elements: deepening of physical capital and accumulation of knowledge and technology.

9 It should be noted that there is also an alternative view that small farms could be more productive than their larger counterparts. For example, Binswanger-Mkhize, McCalla and Patel (2009) argue small family farms are more productive because of greater incentives felt by family labour to work hard. Also, small farms could be more productive in highly variable weather conditions, as they demand close management and supervision that is more viable in small farms. The paper also notes, however, that plantation crops (such as sugar, oil palm, tea, bananas) and horticultural crops grown for export (that need to be processed quickly and satisfy exacting quality standards) can experience economies of scale—meaning large farms would be more productive. Also, the rise of precision agricultural technologies in recent years means that close management and supervision is increasingly feasible for large farms, even with low levels of labour relative to land size.

Inadequate and uneven investment in agriculture

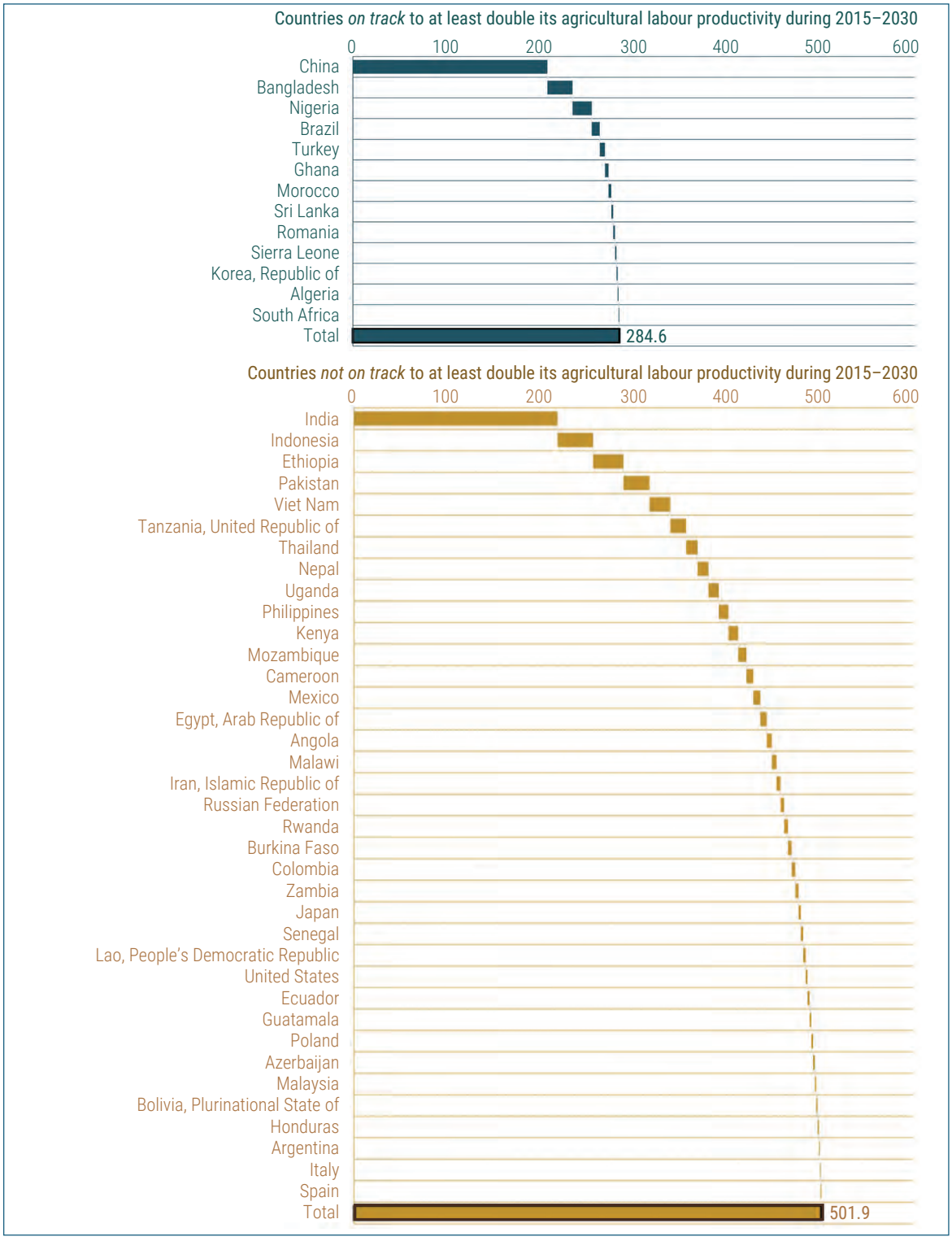
There has been chronic underinvestment in the agricultural sector across countries, which can be seen to go hand in hand with lower agricultural labour productivity growth (figure II.8). The median level of agricultural capital stock per agricultural workers in low-income countries remained a meagre 3 per cent of that in high-income countries in 2017 (figure II.9). Middle-income countries did not fare well either, with lower-middle-income countries and upper-middle-income countries reporting median values of about 25 per cent and 50 per cent of that in high-income countries, respectively. In Africa, where the median agricultural capital stock per agricultural worker is the lowest among all regions, the dismal agricultural investment is reflected in the almost non-existent improvement in the scale of irrigation and the use of fertilizer inputs and agricultural machinery per hectare of land, which drags productivity growth (Binswanger-Mkhize, McCalla and Patel, 2009).

Despite having significantly lower capital stock per worker in the agricultural sector (figure II.9), low-

Figure II.7

Doubling of agricultural labour productivity during the SDG period (2015–2030)

Millions of agricultural workers

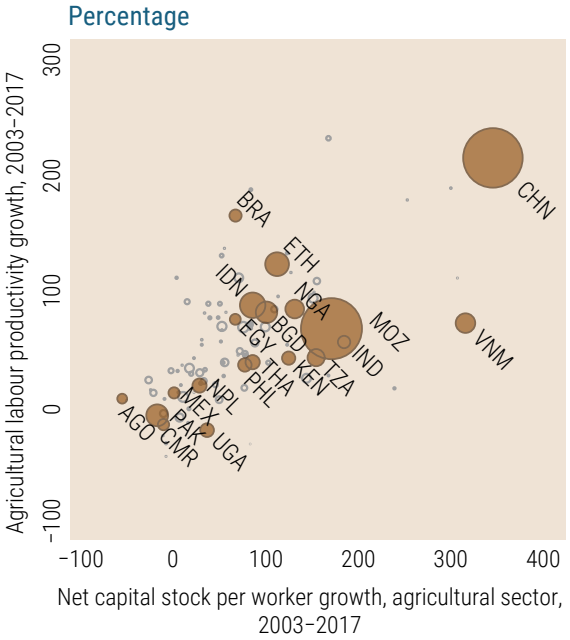


Source: UN DESA estimation.

Note: Each bar denotes the number of agricultural workers in the country as of 2017. The chart only shows countries that are among the world's top 50 in terms of agricultural labour force. The projection of whether a country is on track to at least double its agricultural labour productivity during 2015–2030 assumes that its average annual agricultural labour productivity growth rate in the SDG period will remain equal to its annual growth rate during 2001–2015. Agricultural labour productivity is calculated as the total agricultural value added divided by the number of people employed in agriculture.

Figure II.8

Positive correlation between agricultural investment growth and labour productivity growth, 2003–2017



Source: UN DESA calculation, based on data from FAOSTAT(2020) and Dieppe (2020).

Note: The circle size of each country is proportional to the size of its agricultural employment. The top 20 countries in terms of agricultural employment are labelled. Net agricultural capital stock is calculated by cumulating historical series on physical investment flows and deducting the part of assets that are consumed in every year.

income and lower-middle-income countries have seen very low share of investment going into agriculture (figure II.10). As of 2019, the median share of agriculture in gross fixed capital formation among low-income countries and lower-middle-income countries are 7.5 per cent and 6.9 per cent, respectively. In particular, the median value of the share of agriculture in gross fixed capital formation has declined in the past two decades in low-income countries—the countries most in need of an increase.

Unfavourable return is likely a main factor behind the tepid agricultural investment, which is in turn a result of a combination of factors. These include volatile agricultural prices that have been on a decade-long downward trend; insufficient access to productivity-enhancing agricultural technologies and knowledge; inadequate infrastructure; insecure access to land;[10] and increasingly debilitating effects of climate change and environmental degradation on agricultural outputs. Weak agricultural investment is also a function of inadequate access to financing, which is a prevalent challenge for smallholder farmers—especially female farmers—that predominate many developing countries. Many of these factors will be discussed further in the remainder of the report. For the more developed middle-income countries, the stagnant accumulation of agricultural capital stock could also partly be a result of their failure to orient to livestock and horticulture, which have surpassed cereals to become their major agriculture industries (Mellor, 2017). This in turn reflects the underappreciation of agriculture by urban-oriented governments.

Decade-long trend of decline in agricultural prices coupled with volatility

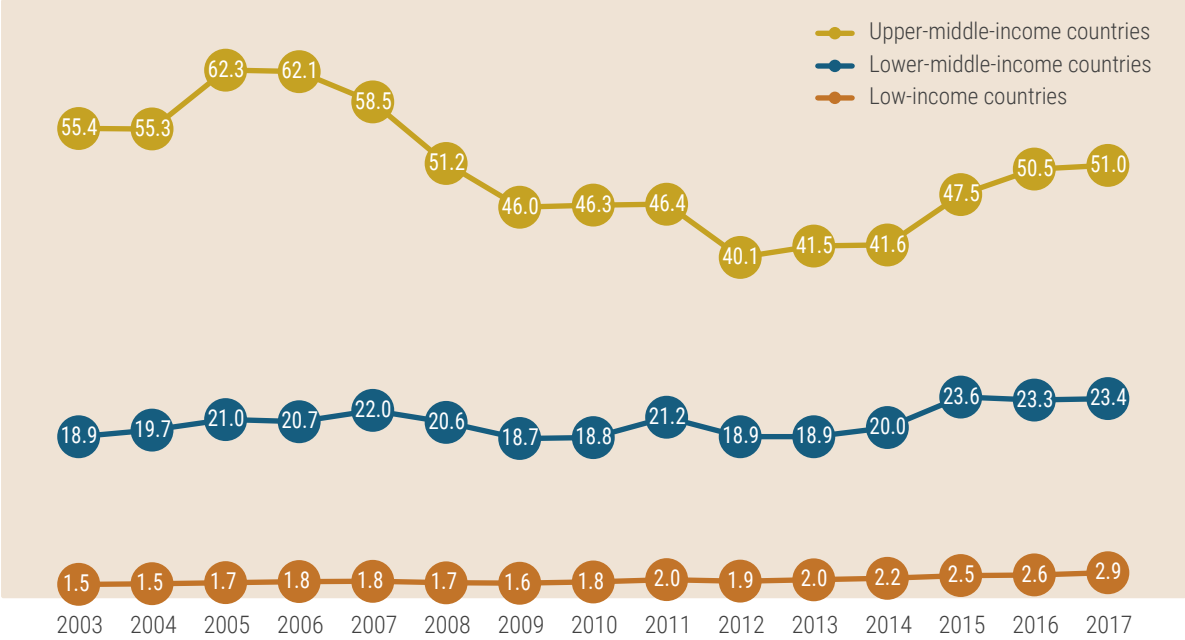
Subdued investment in agricultural assets reflects the steady fall of agricultural prices for much of the past decade. At the global level, a strong correlation between agricultural investment and agricultural commodity prices provides some prima facie evidence of the linkage (figure II.11). More sophisticated empirical evidence shows that an increase in agricultural prices has a long-term, persistent effect on agricultural labour productivity through both capital deepening and increase in total factor productivity, the latter of which includes accumulation of knowledge and technology (Dieppe, 2020). In the case of emerging markets and developing economies, it has been shown that a 10 per cent increase in agricultural prices tends to be followed by an increase of labour productivity among agricultural exporters by 2.0–2.5 per cent after 10 years. Higher agricultural prices could translate into higher agricultural productivity, as the increased revenue for farmers could be invested into newer technologies and equipment. The signals of higher prices also incentivize governments to invest in complementary infrastructure.

10 There is in-depth treatment of the issue of land access and land reform in chapter III.

Figure II.9

Net capital stock per worker in agriculture sector, relative to high-income countries, 2003–2017

High-income countries' median=100



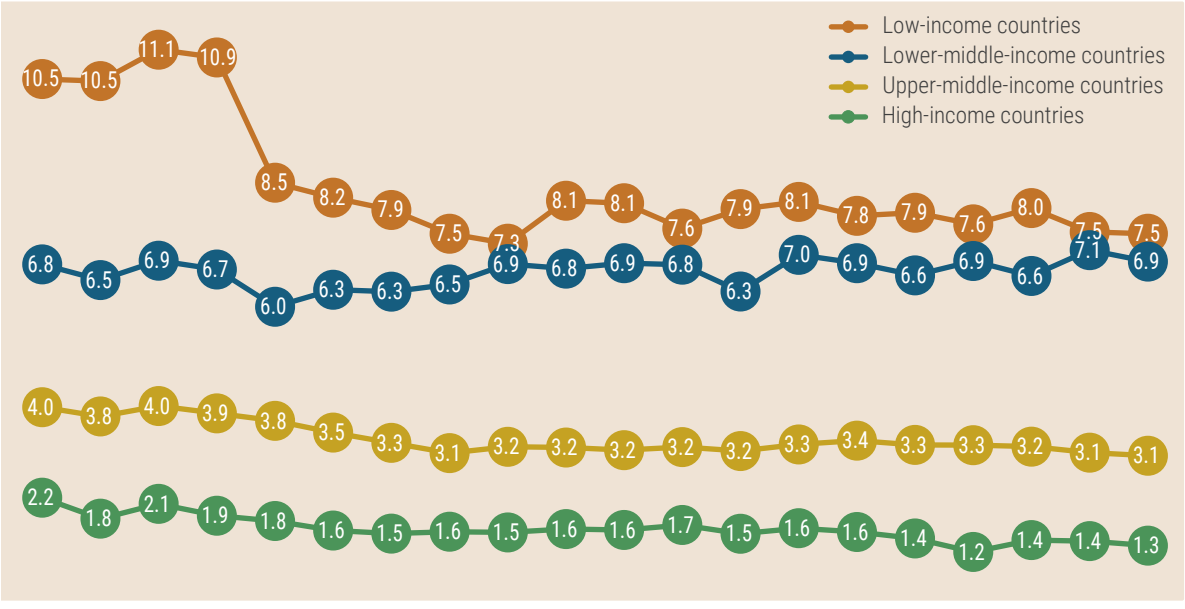
Source: UN DESA calculation, based on data from FAOSTAT (2020) and Dieppe (2020).

Note: Median value among countries is used for each income group. Net capital stock is calculated by cumulating historical series on physical investment flows and deducting the part of assets that are consumed in every year.

Figure II.10

Share of agriculture in gross fixed capital formation, 2000–2019

Percentage

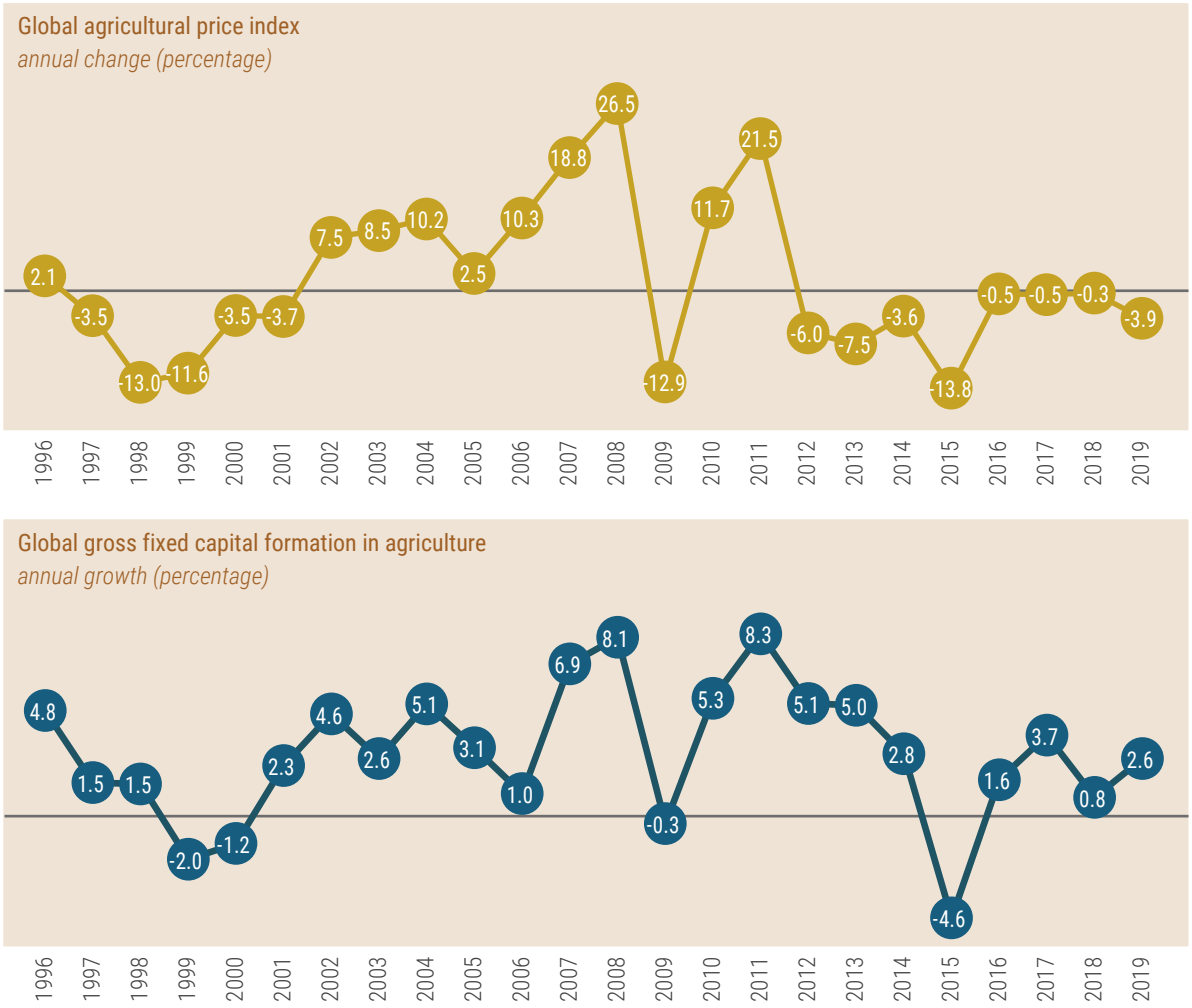


Source: UN DESA calculation, based on data from FAOSTAT (2020).

Note: Median value among countries is used for each income group. Forestry and fishing are included in agriculture.

Figure II.11

Strong correlation between global agricultural prices and investment, 1996–2019



Source: UN DESA elaboration, based on data from FAOSTAT (2020) and World Bank Commodity Prices data.
Note: The Pearson's correlation coefficient of the two variables is 0.76 and is statistically significant at 0.01 per cent level.

In this view, the overall downward trend of agricultural prices in the past decade has spelled trouble for agricultural investment. The World Bank Agricultural Price Index has fallen from its peak in February 2011 by 30 per cent, further denting the prospects for agricultural investment.

Traditionally, volatility of agricultural prices—partly driven by the financialization of commodities and the associated speculation—is a deterrent to investment in the agricultural sector, as it injects uncertainty to the return. However, given that agricultural price volatility has been on a general downward trend in the past decade (and at levels far below that around the global financial crisis and its immediate aftermath), it is likely a secondary factor behind the declining agricultural investment growth in recent years. Going forward, the trend of agricultural price volatility could once again reverse, as disruptions to the agricultural system caused by COVID-19 have created some upside volatility risks. Even if the uptick in agricultural prices since the pandemic is sustained, volatility would likely cloud the decisions of the public and private sectors

on longer-term investments in improving agricultural productivity and better food safety standards (Timmer, 1995 and 2009).

Underfunded agricultural research and insufficient access to technology

Underinvestment in agricultural capital stock has been accompanied by underfunded agricultural research across developing economies, which is a main cause behind the slow accumulation of knowledge about agricultural practices and technologies. Low- and middle-income countries typically spend less than 1 per cent of agricultural GDP—and in many cases less than half of 1 per cent—on research, which is substantially lower than expenditure in high-income countries (Mellor, 2017). For example, in recent years, public and private sectors in the United States of America spent approximately 6 per cent of agricultural GDP on agricultural research; on a per-researcher basis, high-income countries' agricultural research spending is twice that of low- and middle-income countries.

Besides the subpar innovation effort, accumulation of agricultural knowledge has also been hindered by inadequate and uneven access to information and technology. In developing countries, extension services—predominantly carried out by the public sector—are typically of low quality, due to poor fiscal and political support and to extension workers' insufficient accountability and knowledge of emerging technologies (World Bank, 2007). Another factor behind the inefficiency of public extension systems is that extension and research are usually situated in different administrative units, and without proper integration between the two (Mellor, 2017). This has led to poor performance on both the extension side and research side.

Disruption to the agricultural global value chain

Global trade facilitates the procurement of inputs to agricultural activities, such as machinery, fertilizers and pesticides (Farrokhi and Pellegrina, 2020). And fall of trade costs in agricultural inputs has shown to have a notable impact on improving agricultural productivity. In some more successful cases, countries' participation in the agricultural global value chain (GVC) and associated changes in the institutional organization of value chains also led to major inflows of domestic and foreign investment (Reardon et al., 2009). In this view, the expansion of the agricultural GVC witnessed in the past two decades has likely played a positive role in improving agricultural productivity. The magnitude of its overall productivity impact relative to other drivers, however, is unclear. Cross-country data from the recent two decades shows no noticeable correlation between agricultural productivity growth and agricultural GVC participation,[11] suggesting the latter is secondary to other factors in explaining the former.[12] This empirical observation is also consistent with the fact highlighted by the World Bank (2020f) that domestic value chains are generally more dominant than global value chains in the agricultural sector, unlike in the manufacturing sector.

Nevertheless, recent disruptions to international trade caused by COVID-19 do generate concerns over their negative impact on agricultural productivity, particularly given their global scope. Restriction on transportation—such as full or partial shutdown of ports that limit freight capacity on commercial flights and maritime shipping—and other COVID-19-induced disruptions to the global supply chain could have adverse effects on agricultural productivity, as they significantly constrain farmers' access to critical agricultural inputs and markets (Stephens et al., 2020). The length and extent of such impact would depend on how quickly international trade can recover, which for now is difficult to project.[13]

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11 The global value chain (GVC) participation measure reflects the share of a country's exports that flow through at least two borders. It is computed as the share of GVC exports in total international exports.

12 There are countries, such as Kenya, the United Republic of Tanzania and Viet Nam, that experienced rising agricultural productivity together with stronger participation in the agricultural GVC. But there are two things to note here: (i) they are among the exceptions; (ii) it is unclear if there is a causal effect, and more research has to be done to ascertain the dynamics.

13 See United Nations (2021) for a discussion on the impacts of COVID-19 on global trade.

Other factors behind subdued agricultural productivity growth

A significant factor behind the subdued agricultural productivity growth is gender inequality in rural areas, perpetuated by gender norms that limit the economic possibilities for women. This has significant implications, given the importance of women's labour participation in agriculture-dependent countries: they are the primary agricultural workers in many of these countries. There is a gender gap in education in many developing countries, resulting in a gendered agricultural productivity divide. For example, in sub-Saharan Africa, the improvement in closing the education gap has slowed down after the Global Financial Crisis, which is subsequently reflected in lower productivity of female agricultural works and entrepreneurs (World Bank, 2019; O'Sullivan et al., 2014). Other dimensions of gender inequality—such as access to productive resources, including land, technology, financial services and social capital—are also hampering agricultural productivity growth. A literature review by the Food and Agricultural Organization (FAO) (2011) found that closing these gender gaps could yield an improvement in women-owned land by an average of 20.0–30.0 per cent, which could translate into an improvement in total agricultural output in developing countries by 2.5–4.0 per cent.

Adding to the list of long-standing factors behind low agricultural productivity is climate change, which has been increasingly disrupting agricultural activities.[14] Around the world, the agricultural sector is becoming more constrained by temperature rise and extreme weather events that could completely ruin a whole year of farmers' efforts, devastating the sector's productivity (IPCC, 2014; Steinbach, 2019). Other human-induced changes, such as deforestation, agricultural intensification, soil compaction, surface sealing, soil acidification, pollution, and many others also adversely affect agricultural sustainability and productivity, including through undermining the crucial role of soil biodiversity in ecosystem functioning and ecosystem service delivery (FAO et al., 2020).

Adapting measures for advancing agricultural productivity to the institutional environment

Agriculture is highly context specific. As illustrated by table 1.3 in chapter 1 of this publication, there are numerous agriculture models that differentiate from each other in terms of technology, scale, ownership pattern and other institutional factors. For governments to effectively push to step up agricultural investment, research and adoption of agricultural technology, and to ensure accurate agricultural price signals that incentivize investment and production, they must account for the different market structures and institutions.

Small-scale farmers operating in a traditional institutional setting tend to have inadequate access to affordable financing that allows them to invest, as conventional bank loans are either outright inaccessible or accessible at very high interest rates with stringent collateral requirements (Hilmi and Nærstad, 2017). Therefore, countries with traditional institutions where small-scale farmers predominate the agricultural landscape cannot rely on these farmers alone to step up investment. Examples in Ethiopia, Mozambique and Nicaragua show that unifying small-scale farmers into community cooperatives allows them to better mobilize necessary financial resources to support investment. If being run efficiently and transparently, these cooperatives allow members to gain quick access not only to capital, but also to knowledge and technical solutions to the challenges they face in production. Also, governments must reverse the declining trend of public investment in agriculture, especially in developing countries where private investment is lacking.[15]

Besides increasing research funding, an efficient approach to strengthening agricultural research must also ensure an optimal balance of different actors in agricultural innovation. Compared to countries at the more advanced industrialization stages, those at the

14 On the other hand, unsustainable agricultural and land management practices contribute to climate change, land degradation and loss of biodiversity. See chapter IV for detailed discussions.

15 It was reported that, during 2001–2015, Governments allocated a low (typically below 2 per cent) and declining share of their central government expenditure to agriculture. See FAO Food and Agriculture Statistics.

earlier stages of industrialization would likely have to rely more on the public sector to play a dominant role in R&D, given that the latter have lower levels of market maturity and more limited research capabilities in their private firms. The latter countries are also likely to be more dependent on adopting foreign technologies for making advances in agricultural development, given the high cost and risks associated with innovation. This highlights the importance of having a flexible global intellectual property regime that facilitates rather than hinders cross-border diffusion of essential agricultural technologies, while allowing innovators to be sufficiently compensated for their R&D investment. Reliance on foreign technologies, however, must not mean neglecting domestic innovation efforts, which is necessary for boosting countries' absorptive capacity, and without which adoption of foreign technologies would be unsuccessful (United Nations, 2018b).

The issue of competition and market structure in the agricultural sector requires a close look by policymakers as it plays a significant role in price formation. Uncompetitive intermediary markets create the possibility that traders who engage in large-scale aggregation, storage and transportation could pay below-competitive prices to farmers. Empirical evidence from Kenya on high concentrations of intermediary market power and its adverse welfare and efficiency effects provides some affirmation of the speculated exertion of market power by agricultural traders in Africa (Bergquist and Dinerstein, 2020). The adverse effects are likely to be amplified in countries where smallholder farmers predominate, as they have little bargaining power vis-à-vis the traders, further disincentivizing investment in the production processes. Improving competition at the intermediary markets is therefore important. Better competition policies that mitigate collusion and other anticompetitive behaviours are needed, even though they might be less effective in countries where competition authorities have constrained enforcement capacity. Technologies that enable more direct matching between farmers and consumers also hold promise (this is discussed in the section on technology).

From agricultural productivity growth to the expansion of rural, non-farm economy

For agricultural productivity to play a significant role in reducing poverty, it must lead to not only higher incomes for agricultural-sector workers, but also a vibrant non-farm economy. While the mention of agricultural work in developing countries might conjure up images of countless subsistence farmers labouring in the field, agricultural production in a significant number of low- and middle-income countries is in fact dominated by small-scale, commercial, and typically non-poor farmers (Mellor, 2017). For example, in Ethiopia, such farmers own 77 per cent of the country's farmed land. In fact, in many countries, poverty is more prevalent among rural non-farm households that are either landless or have insufficient land to escape poverty from farming. It then follows that improvement in agricultural productivity alone does not necessarily lead to broad-based and immediate poverty reduction, since the lion's share of benefits would likely be captured by these small-scale, commercial farmers who live above the poverty line.

There are indications that the poverty-reducing benefits of higher agricultural productivity could be significantly enhanced through helping the expansion of non-farm activities in rural areas. As farmers' productivity grows and their incomes increase, demand for food processing, marketing and logistics, and food services also grows (Christiaensen, Rutledge and Taylor, 2020). The productivity gains also benefit producers in the rural non-farm economy—which are often households that diversify their earnings—because they can source their products locally and benefit from not paying the high costs of transporting goods from other locations. These extra earnings release household labour from agricultural activities, rather than inciting an increase in agricultural productivity or intensification. In other words, gains from non-farm income start a virtuous cycle in the non-farm economy (Davis, Di Giuseppe and Zezza, 2017).

Non-farm economic activities have been gaining importance in poverty reduction. In as recent as 2016,

35–50 per cent of rural income in developing countries came from productive activities in the rural, non-farm economy (World Bank, 2016). For many of the very poor and landless populations in rural areas, sustainable income gains at the household level are generally associated with extra income earned from engaging in non-farm activities. Jobs created by this growing non-farm rural activity are more accessible for rural workers, particularly women who are less likely to migrate. Keeping a vibrant non-farm economy in rural areas is therefore crucial for lifting, and keeping, many rural residents out of poverty.

Evidence has shown that the rural non-farm economy can contribute to poverty reduction in a range of different country and sectoral settings (Lanjouw and Lanjouw, 2001). Even participation in less-productive rural non-farm sectors that are at the lower end of value chains can help reduce poverty, as it smooths and boosts income over the year for rural residents that see less work during the slack season of agriculture. By providing an additional layer of buffer against poverty, the diversification of employment into the non-farm sector could also support agricultural income by expanding the possibility of investment in high-risk, high-return agricultural technologies.

Expansion of non-farm sectors in rural areas is also necessary for countries that have a so-called youth bulge—that is, a large share of the population comprised of children and young adults. Youth bulge necessitates the need for generating a large number of jobs. Urban jobs have attracted many of these young workers, but the rural non-farm economy could also provide considerable employment potential for a young labour force. There is a prevailing view that because youth are better educated and less attracted to agricultural work, they are well-positioned to establish rural non-farm businesses (Mueller, Rosenbach and Thurlow, 2019). Empirical evidence based on country studies in Africa have provided some support to that view, but the conclusion is far from final. A more definitive conclusion from these studies is that even when youth are more likely to engage in non-farm work, they tend to work in informal, low-productivity jobs or run less successful non-farm businesses. This result stresses that non-farm sector expansion must be measured not only by quantity but also by quality in order for it to be an effective contributing factor to the generation of decent work.

It should be noted that additional jobs generated by non-farm sectors also provide opportunities for a growing number of older persons who are often either left behind in rural areas—particularly in sub-Saharan Africa, but also in Eastern Europe and other regions—or who return from cities upon retirement from urban jobs.

It must also be noted that the translation of higher agricultural productivity into an expansion of the local non-agricultural sector is not automatic. The successful development of agrifood systems is part of Asia's structural transformation story. In Africa, on the other hand, most of the expansion of non-farm entrepreneurship has been in activities that do not require significant start-up costs or that give higher expected returns. The potential of these activities to generate sufficient additional investment to ignite rural development and faster structural transformation is therefore limited. Encouraging smallholder farmers to drastically increase their non-farm incomes to levels similar to other regions remains an important policy challenge.

Barriers to the development of rural, non-farm economy

Productivity improvements in the agricultural sector in a rural area often resulted in expansion of non-agricultural sectors in the cities, but did not necessarily lead to expansion of non-farm sectors in the same area.[16] Even in the case where there is an eventual integration of farm labour into the non-farm economy, in both rural and urban areas, evidence has shown that the process takes a long time (Timmer, 2017).

A key and well-documented reason that industrial activities have concentrated in cities rather than in rural areas is economies of agglomeration. Agglomeration provides (i) better opportunities to match work-

16 See Hornbeck and Keskin (2015) for a careful empirical analysis on the Ogallala counties in the United States of America that shows sizeable and persistent agricultural gains did not lead to long-run relative expansion of non-agricultural sectors in the same counties.

ers and employers; (ii) more global and dynamic peer learning and flow of ideas; (iii) more efficient sharing of infrastructures, business services, and intermediate suppliers; and (iv) ease in specializing. These are factors that rural areas, because of their low population density, cannot fully replicate. Rural firms also tend to be less connected with, and less equipped to operate in, the global manufacturing and service value chains, for various reasons: they may be far from major ports, and smaller firm sizes put them at a disadvantage when it comes to dealing with different national regulatory regimes. These firms also appear less attractive to the younger labour force, as a negative perception of working in the manufacturing industry in rural areas prevails (Hemstreet, 2017). More recently, some frontier technologies have created the possibility of at least partially replicating some of the benefits that agglomeration provides without the same extent of geographic clustering of factors of production (LaFleur et al., 2020). Moreover, better transportation infrastructure with affordable and relatively well-functioning public transport has significantly reduced daily commuting times between a city and its surrounding villages, lessening the need for people to concentrate in cities.

A less-explored factor that could hinder the spillover of agricultural-sector expansion to non-agricultural sectors is the unintended adverse effect of the former on the development of the latter, through at least two cost channels (Hornbeck and Keskin, 2015). First, increased agricultural land values could lead to increased land cost for non-agricultural sectors. Second, certain agricultural practices—such as increased use of agricultural chemicals and fertilizers—may disrupt living conditions for the local population (see chapter IV for more discussion on this issue) and increase labour costs, as wages have to go up to compensate for such disamenities.

In the end, without the appropriate type of human capital, complementary hard and soft infrastructures, including financing, long-term planning and coordinated actions from different government agencies and the private sector, there is little prospect for non-farm activities, such as manufacturing and high value-adding services, to thrive in rural areas. Evaluation by the World Bank (2016) has found that countries' efforts to create enabling conditions for rural enterprise activity are critical to poor households' participation in and benefit from the rural non-farm economy. The evaluation highlights (i) enhancing rural transport infrastructure; (ii) linking education and skills development to agribusiness and associated value chain activities; and (iii) strengthening financial inclusion as strategic initiatives that have proven to support the rural non-farm economy in different country contexts. These initiatives would be important not only for facilitating the reallocation of resources to the rural non-farm sectors, but also, and equally important, to promote rapid productivity growth within these sectors. Otherwise, as Diao, McMillian and Rodrik (2019) pointed out, structural change without significant and sustained productivity growth in the modern sectors would be "necessarily self-limiting".

Inclusive rural financing central to rural transformation

Inclusive rural financing would be crucial for both improving agricultural productivity and developing a rural, non-farm economy. Rural finance expands options for households and firms to adopt more advanced technologies, to invest in education and capacity-building, and to scale up their productive activities, thereby improving productivity in both rural farm and non-farm sectors (IFAD, 2016). Financial intermediation also allows better cash flow and risk management that are important for effective operation in agricultural and non-agricultural businesses.

Around the world, the rural population continues to enjoy far less access to finance than their urban counterparts (Demirgüç-Kunt et al., 2018). As of 2017, in only 15 per cent of countries is the share of rural adults with their own financial account (either at a financial institution or through a mobile money provider) on par with the overall national level. Even in cases where access to finance is available, rural residents typically face higher interest rates, challenges in receiving credit ratings, and a lack of profitable projects—all of which disincentivize them from borrowing.

Although rural residents generally face more limited access to finance than their urban counterparts, governments in both developed and developing countries should be on alert to the rising risk posed by rural debt while they seek to boost rural finance as part of their efforts to achieve rural transformation. Significant income volatility—partly driven by volatile agricultural commodity prices and changes in weather patterns—and inadequate access to insurance and other risk management instruments made rural households susceptible to indebtedness, which in turn presents an obstacle to the investment in human and physical capital that enables rural transformation.

An examination of the rural finance situation in a selected set of countries around the world reveals signs of elevated or high rural debt in different development settings. India, a lower-middle-income country, for example, has a long history of rural debt problems. Between 1993 and 2013, the percentage of farm households in debt increased by more than 12 percentage points (Kandikuppa, 2018). The average farm household in 2013 had more than 630 per cent higher debt-to-asset ratio than one in 1992. In China, an upper-middle-income country, it was reported in 2019 that rural commercial banks—whose asset quality is already the worst among lenders in the country—could be facing an even higher level of bad loans amid a slowing economy (Yang and Garrido, 2019). Whereas the average ratio of bad debt of all commercial banks in China was on a downward trend, the average non-performing loan ratio of rural commercial banks that serve mostly farmers and small local businesses was creeping up. In addition, countries including Argentina, Australia, Brazil, Republic of Korea, South Africa, Thailand, and the United States are also confronted by increases in rural debt that demand close attention of the policymakers, highlighting the global nature of the challenge. Going forward, reliable and comparable rural debt data on a large range of countries is needed to more systematically assess the severity of rural debt risk around the world.

Using technology to generate rural growth and employment, and connect rural and urban economies

The fate of agriculture has historically been linked to the path of technology. New innovations in farming methods, irrigation, fertilizers, seeds, machinery and countless others have each unlocked new levels of productivity. New types of technologies, rooted in digital systems and connectivity, are now being applied to agriculture, promising to further boost productivity and incomes for small and large farmers alike. The fast pace of digitization and interconnectivity, the proliferation of mobile phones, and advances in data collection and analysis, among others, are allowing digital technologies to be adopted for use in rural and agriculture activities with great speed. Drones, software analytics, mobile payment solutions, crowdfunding platforms, and countless other examples may be at an early stage of adoption in many countries, but they are rapidly expanding in scope and impact (table II.2).

Together, these technologies are opening new paths for countries to transform their rural economies by helping farmers sell their products to an increasingly urban consumer; by making production, processing, and distribution more efficient; and by strengthening connections between the farm and non-farm sectors. This transformation means more employment opportunities, higher incomes from agriculture and from non-farm employment, lower rural household poverty, and more prosperous rural communities (Barrett, Christian and Shiferaw, 2017). This section highlights five ways in which digital technologies are helping the rural sector:

I. Boosting agricultural productivity;
II. Helping sell products, reduce waste and improve food safety;
III. Easing access to finance and insurance;
IV. Helping many to find non-farm employment opportunities; and
V. Helping local governments.

Table II.2
Examples of technologies and their impact on rural activities

Technology	Key features	Advantages	Challenges	Evidence of impact
Ag tech • Drones • Robots • Sensors • 3D printing	• Encompasses a range of technologies that are relatively new and small-scale • Focus on water management, crop yields, weather prediction, and new machinery • Venture capital firms interested in investing in these innovations • More sophisticated in advanced countries compared to the less developed economies	• Helps improve farmer knowledge and labor productivity • Minimize inputs • Helps farmer productivity and ensures more food sustainably • Alert problems to crop diseases • More benefits to larger farmers (due to high cost)	• Difficulty in scaling up multiple micro-experiments • Hard to ensure relevant technology is adopted • Very poor farmers may not have access • Geography differences prevent "one size fits all"	• Can support both farm and non-farm development • RCT studies show early impact • Precision agriculture can increase yields by 15 to 20 per cent • However, jury still out on longer term impact on productivity
Ag tech • data analytics • artificial intelligence	• Support both small- and large- scale farmers • New and interesting technologies and applications	• Lowers transaction costs • Moves products faster through the supply chain • Helps farmer decision-making	• Difficult to adapt to needs of developing country farmers • High cost	• Can support agriculture and non-farm development • RCT analysis shows early wins in South Asia and sub-Saharan Africa
Fintech • mobile banking • remittances services	• Dynamic and usable model • In emerging markets, fintech can help create a stronger interface between governments, businesses and consumers to increase financial inclusion • With mobile phone and sophisticated algorithms, can foster financial intermediation	• Provides tailored financial services to poorer farmers at low cost • Allows access to credit and financial information • Reduces informational asymmetries • Can reach small farmers, although not poorest farmers	• Regulatory challenges and central bank policy response • Merging tech with finance difficult • Ensuring consumer protection • Training consumers in using app effectively	• Can facilitate access to funds through virtual digital payments • Can lower transaction costs for government services • A large body of empirical evidence shows dramatic increases in farmer credit and incomes
Fintech • Crowd funding platforms	• One of latest development in technology and finance space	• Innovative funding model	• Scalability challenges	• Helps nascent firms but too early to assess impact
E-commerce • Platforms linking producers to consumers • commodities • trading	• Allow greater consumer flexibility • Business to business; business to consumer; consumer to consumer; consumer to business	• Matches buyers and sellers • Allows small and large farmers to connect with urban consumers • Reduces transactions costs • Helps internet intermediaries facilitate transactions between third parties	• Generates sufficient and targeted traffic • Maintains food quality and safety standards • Complexity due to platform intermediaries spanning a wide range of digital business activities	• Can support farm and non-farm development • E-commerce has helped farmers bypass intermediaries, increase incomes and reduce wastage • Quantitative and qualitative evidence is abundant from many micro studies

Source: UN DESA, based on Zafar (2020).

Digital tools to boost farmer productivity

New technologies are transforming and modernizing every part of the agrifood value chain, boosting farmer productivity and incomes while making the whole ecosystem more efficient and more sustainable. Digitization is helping farmers get information and assistance to optimize the management of resources (Đurić, 2020). Platforms now exist to make agricultural knowledge and extension practices accessible to farmers around the world. They also help deliver market information, locally relevant weather and pest information, and video-based farming advice on demand. New digital platforms are also providing farmers with access to modern farming equipment without the need for significant investment or the creation of a sharing cooperative. An example is Hellotractor, which enables African farmers who own tractors to rent them to others that do not have the equipment (Cheng et al., 2020).

The impact of these technologies has been impressive. Practices recommended through digital extension are adopted at rates similar to those adopted through the course of traditional in-person extension practices and at a significantly lower cost. In sub-Saharan Africa and India, providing agricultural information through mobile technologies can improve the chances of farmers adopting recommended agricultural inputs by 22 per cent (Fabregas, Kremer and Schilbach, 2019).

For more commercial settings and more capital-intensive producers, digital data started to become important in the late 1990s, when farm equipment manufacturers in the United States began adding GPS sensors to their machinery. Since then, providers of agricultural equipment as well as seed and fertilizer inputs have used a multitude of sensors to measure nearly every aspect of farming. Input providers are using this data to offer data-rich customized services to farmers, improving yields and profits. These services are now being offered around the world.

In less developed economies, the use of many so-called agtech solutions remains on a relatively small scale, since the economic feasibility of technology adoption depends in part on the scale of the operation (Zafar, 2020). However, given the foundation set over the past decade, the next decade may witness greater adoption of innovative practices and technology, enabled by the digitization of the agricultural industrial complex and potentially accelerated by the impact of COVID-19 (William Blair, 2020). Nonetheless, without measures to address the gap in accessing and using agtech, distribution of the values created in the agriculture supply chain would be uneven. It could also have adverse implications for the market structure of the agricultural sector, where one already sees significant concentration of market power in the processing and distribution segments of the supply chain.

HIGHLIGHT

Precision agro-advisory services powered by artificial intelligence

A collaborative effort between Microsoft and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) has developed a sowing app based on artificial intelligence that enables smallholder subsistence farmers to receive precision agro-advisory services, prompted by weather conditions and other parameters. In 2017, the service was used by 3,000 farmers during the rainy season for several crops, including groundnut, maize, rice and cotton. The increase in yields ranged from 10 to 30 per cent across crops.

Source: FAO (2020a).

Help match rural food producers with urban consumers, reduce waste and enhance quality control

E-commerce is helping many countries revitalize their rural businesses by facilitating smaller firms' integration into local, national and global supply chains. E-commerce connects producers in urban, peri-urban and rural areas with consumers, and helps reduce inventory. For instance, Pinduoduo, one of the largest e-commerce platforms in China, helps farmers sell

products online. As of the end of 2019, more than 10,000 rural industries have been involved in the supply chain, together with farmers. Another example is the Virtual Farmers' Market in Zambia, an app-based e-commerce platform for farmers and buyers to advertise and trade crops (WFP, 2020). The size of the market is small in dollar terms, but since 2017 it has reached more than 1,000 Zambian family farmers.

To overcome any reluctance by farmers to use e-commerce platforms, India's largest brick-and-mortar retailer, Reliance Retail, is using its over 6,000-plus smaller retail stores in more than 5,000 cities and towns as the last mile connection point for its e-commerce platform. This expands access into the rural non-farm sector and to consumers without internet access or who have never shopped online. It is also expected to create a large increase in rural non-farm employment.

Emerging digital technologies can also help to make value chains more traceable and coordinated, helping to further reduce waste and inefficiencies. Better commercialization helps to reduce the loss of food from post-harvest loss and poor distribution systems, estimated to be about one third of all food grown in the world each year. The problem is of such magnitude that resolving the equitable distribution of food would go most of the way to meeting the SDG targets for ending hunger and achieving food security (see chapter IV, box IV.3).

Digital technologies and e-certification systems have been used to detect food contamination and other quality issues, allowing early and effective responses. The IBM Food Trust is a notable example of the application of digital technologies in this area. In a pilot programme, the blockchain-enabled food traceability network has shortened the time for a retailer to trace an item from seven days to 2.2 seconds (Walmart, 2018).

The speed of adoption of these technologies is being accelerated by the stresses created by the COVID-19 pandemic. In Africa, for instance, COVID-19 has driven a perceptible shift in logistics, agriculture, and mobile-based financing (Zafar, 2020; Basta, 2020). Since the COVID-19 lockdown, Nigerian logistics company Kobo doubled its business of matching shippers and truck operators for long-haul trips. In Kenya, small companies such as Copia created a system to source goods and a network of rural distribution points that allows it to offer delivery services to rural households for as low as $1. Companies also offer delivery services to roadside stallholders and directly to consumers, taking advantage of mobile orders. The phone financing operator M-KOPA has increased revenue by 50 per cent, following greater demand from vendors for mobile transactions.

HIGHLIGHT

Digital platform for monitoring agricultural value chain

E- Farmers' Hub is a digital platform created by the Basel-based Syngenta Foundation to help farmers and entrepreneurs in developing countries keep track of agricultural inputs and outputs. Farmers use a mobile app to upload transactional data onto the platform, replacing paper-based documentation of transactions. It allows access to data in real time, location tracking and assessment of overall performance of the agricultural value chain. As of 2018, the project covered 45 Farmers' Hubs and benefited around 30,000 farming households, linking them to buyers, including medium to large traders, processors and export companies. These Hubs are owned by rural entrepreneurs, agribusiness suppliers or farmers' cooperatives, with fees for the services generating a regular income flow. At the same time, buyers benefit from product aggregation and reliable supply.

Source: Syngenta Foundation for Sustainable Agriculture (2020).

Ease access to funds through fintech innovations

Digital financial services (DFS) and fintech offer lower marginal costs and greater transparency, helping to overcome supply-side barriers such as high operating costs and limited competition. DFS is also better positioned to overcome demand-side barriers, including low incomes for the poor, lack of ID, and geographical

barriers (Zafar, 2020). The catalyst for rapid expansion of financial services has been the increase in mobile phone usage and mobile banking in many countries, including many in sub-Saharan Africa. Targeted digital financial literacy training has also had significant impact. In India, Grameen Foundation is providing digital financial literacy training for rural women, enabling them to act as agents for both public and private sector financial service providers. Over 200 skilled agents have empowered almost 270,000 low-income individuals—mostly women—with access to digital financial services, and have already facilitated transactions worth more than 21 million Indian rupees. This has also reduced the gender gap in access to credit considerably (ibid.).

In Africa, the pace of innovation in fintech has been accelerated by rapid and widespread adoption of digital transactions. A similar revolution happened in the continent when mobile technologies were introduced that allowed countries without legacy fixed connectivity networks to leapfrog over more developed countries. As a result, at least 50 per cent of the population in Botswana, Kenya, Uganda, the United Republic of Tanzania and Zimbabwe are using mobile banking (*The Economist*, 2015).

Financing by venture capital is also supporting other fintech as well as agtech initiatives. From 2018 to 2020, the total venture capital inflow into Indian fintech start-ups has more than doubled to 117 per cent, whereas the fintech adoption rate for India has surged to 87 per cent in 2019 from 52 per cent in 2018 (Moneycontrol, 2020). More than 1,000 fintech start-ups globally have entered the agtech sector and the numbers are growing. Since 2010, Ant Financial has a business lending subsidiary which has provided financing to 180,000 rural small and medium-sized enterprises through an Internet-based loan programme that gives poor rural merchants access to Alibaba's platforms and to capital.

HIGHLIGHT

Examples of digital financial services to rural communities

- Farm Drive, a start-up in Kenya, connects smallholder farmers to loans and financial management tools through their mobile phones and apps.
- In Kenya, Agri-wallet is a disruptive fintech that provides supply chain finance to ensure that all actors in the value chain—farmers, buyers and suppliers—can access the resources they need to grow and scale. The Kenyan company M-Shwari uses customers' phone and mobile money records to assess creditworthiness.
- In India, Grameen Foundation is supporting local rural women by training them on digital financial literacy and enabling them to act as agents for both public and private sector financial service providers. Over 200 skilled agents have empowered almost 270,000 low-income individuals—mostly women—with access to digital financial services and have already facilitated transactions worth more than 21 million Indian rupees. This has also reduced the gender gap in access to credit considerably.
- Credible India is an innovative firm that focuses on agricultural entrepreneurs by identifying financing gaps and designing AI-driven crop monitoring and local market demand forecasting tools.
- In the Philippines, a digital ecosystem is emerging with the rise of many fintech companies. Recently, PearlPay has signed a pilot programme agreement with BHF Rural Bank, Inc., based in Dagupan City, marking the first time a Philippine rural bank will utilize cloud-based technologies such as core banking solutions, agent banking solutions and white-label eWallet solutions.

Source: Zafar (2020).

Expand non-farm opportunities and employment

Digital technology has not just empowered individual farmers, but it also has immense potential to make the whole business ecosystem more efficient and sustainable. This is important for the non-farm sector, which includes agricultural value chain activities, such as agro-processing, transport, distribution, marketing and retail, but also tourism, manufacturing, construction and mining, plus self-employment activities (World

Bank, 2016). Technology also helps to expand services and create jobs in remote locations. In Kenya, for instance, an ambulance-hailing service called Flare reduces the response time of emergency services in remote locations where centralized ambulance dispatch services do not exist (Cheng et al., 2020).

Some frontier technologies can mitigate some of the disadvantages of operating in rural areas. For example, advances in information and communications technology (ICT) have made it easier to match workers and employers despite geographic distance. The digital sphere also makes it easier to share ideas and collaborate. Another example is 3D printing, which has the potential of bringing manufacturing activities to the rural areas. It is less capital-intensive and requires less upfront fixed investment, which means economies of scale would be a less salient factor in reducing per-unit manufacturing costs. Furthermore, there are signs that the use of 3D printing technologies is beginning to move beyond the creation of prototypes—their main use for decades.[17] Whether or not its commercial potential can be realized, especially in developing countries, would be conditional on further lowering of costs and development of relevant local expertise.

HIGHLIGHT

3D printing for manufacturing agricultural tools

Proximity Designs, a Yangon-based social enterprise, uses 3D printing to design and manufacture high-quality farming tools that are otherwise unavailable to low-income farmers. Enabled by 3D printing, the social enterprise is able to work closely with farmers to accelerate the process of prototyping. The switch away from metal machining—the traditional prototyping approach—makes creating farming tools that are fit for the purpose of rural households in Myanmar both faster and less costly. Also, 3D-printed parts help to concretize the discussions over the design of the tools, as 2D drawings cannot always fully reflect farmers' needs. This allows farmers to provide detailed and immediate feedback. Since it was founded in 2004, Proximity Designs has served over 102,000 rural households in Myanmar and generated over $276 million in revenue.

Source: Makerbot (2016).

Investing in local e-government for improved governance

ICTs can play an essential role in achieving an improved form of governance, especially when employed at the local level, as shown in the Local Online Services Index (LOSI) of the United Nations E-Government Survey 2020 (United Nations, 2020d).[18] With the appropriate use of ICTs in government services, the aspects of openness, transparency and accountability intensify, thereby helping to achieve sustainable development in general and SDG 16—just, peaceful and inclusive societies—in particular (ibid., p.105, para. 4). This then ultimately leads to the development of responsive policies, rewarding decision-making, lessening corruption and bribery, and strengthening growth in the economy, which ultimately results in local governments thriving from a high level of legitimacy and trust from their residents.

One of the main assets local governments hold over their regional and national counterparts is their proximity to their residents and thus their ability to more adequately address issues of a smaller and more personal nature. Locals feel "a sense of belonging and ownership" (ibid., p. 88, para. 2) towards their local governments. Consequently, concerns of trust and transparency by local residents are alleviated by their participation in local policy decisions. Furthermore, a local government's familiarity with its residents, its territory and its main activities also contributes to building and maintaining trust.

17 In the case of the United States, which leads the world in 3D-printing spending, more than two thirds of manufacturers were already using 3D printing in some way in 2016 (PwC and The Manufacturing Institute, 2016).

18 Local Online Services Index measures e-government development at the local level through the assessment of city web portals. It measures 80 indicators relating to four criteria: technology, content provision, services provision, and participation and engagement.

Use of ICTs in local governments provides more detailed and accurate information, both internally and publicly; makes interacting with residents more efficient and less burdensome; and makes operations more eco-friendly. The use of artificial intelligence (AI) chatbots, for instance, allows for better service delivery and workforce management (ibid., p. xxviii). Big data and analytics help local governments devise policies that are better suited for the locality and use of public resources most effectively. Other emerging technologies, notably the Internet of Things and Augmented and Virtual Reality help governments address issues such as climate change, air pollution, traffic congestion, ageing population, unemployment, public insecurity, solid waste, migration and others (ibid., p. xxix).

Despite the mounting interest of local governments in using technologies, the 2020 LOSI found that the majority of cities assessed still offer a limited menu of online services. Moreover, the survey does not show evidence of impending plans to expand e-services nor improving participation amongst their populations at this time. The reasons include some combination of a lack of financial resources and of a vision for inclusive local e-government, as emphasized in the 2020 edition of the United Nations E-Government Survey.

Conclusion: how to harness the potential from rural transformation

Historical data shows that richer countries derive a greater share of their income from non-agricultural activities in rural areas. This fact explains why achieving higher incomes per capita requires countries to invest in high-value agriculture, in agricultural value chains, and in higher value added industry and service sectors. However, the path that each country must take as it transforms and develops is not obvious. The general observed relationship between income and economic structures is complex and the causal links are multidirectional. Sustainability and social challenges add to this complexity and call for tailor-made interventions. It is no accident, then that there are nearly as many experiences of rural and national development as there are countries.

The discussion above shows that escaping poverty is possible not only through migration to large urban centres where higher-paying jobs are available, but, more importantly, through engaging with the rural non-farm economy. In situ urbanization of the rural areas is a location-based structural transformation that helps not only to eradicate poverty, but also to alleviate urban development issues by reducing incentives for rural dwellers to migrate to the urban area. A decisive change in the direction of national development planning and in situ urbanization in rural areas would need to happen to accelerate and actualize rural and nationwide transformation. Two key processes central to the achievement of rural transformation are the improvement of agricultural productivity and the spillover of agricultural productivity growth to the expansion of local rural-based non-farm economy. For many countries, neither process gathers sufficient pace for generating sustained growth and decent work in rural areas.

Improving agricultural productivity means that food production must become more commercially viable and profitable for small, medium- and large-sized producers. Farms must be able to leverage better production, processing, and distribution methods that are integrated across the farm and non-farm sectors. Whether family, cooperative, or commercially oriented, all farms also benefit from advances in transport and information networks that help producers form stronger connections with increasingly urban consumers.

Looking back to the recent past (2003–2017), more than 147 million agricultural workers were in developing countries where the agricultural labour productivity did not experience any meaningful catching-up with that in the developed countries. And looking forward, countries that are home to at least 501 million agricultural workers are unlikely to reach SDG 2.3—to double the agricultural productivity and incomes of small-scale food producers by 2030—unless they see an acceleration in agricultural labour productivity growth from the levels seen since the turn of the century.

Chronic underinvestment in the agricultural sector and underfunded agricultural research across developing economies are key factors behind the subpar agricultural productivity growth. Tepid investment in agriculture reflects low expected return, which is in turn driven by a host of factors that are putting downward pressure on agricultural productivity. These include volatile agricultural prices that have been on a decade-long decline; insufficient and uneven access to agricultural knowledge and technology; inadequate infrastructure; insecure land access; the gender gap in access to productive resources; climate change; and environmental degradation. Coupled with these factors are the de-prioritization of the agricultural sector by urban-minded governments and the ongoing COVID-19-induced disruptions to the agricultural global value chain. Given that agriculture is highly context specific, measures to advance agricultural productivity must adapt to the institutional environment of each community, accounting for differences in market structure, industrialization level and other institutional factors.

It should be noted that improvement in agricultural productivity does not always lead to broad-based and immediate poverty reduction—due in part to the fact that, in some cases, the lion's share of the benefits are captured by small-scale, commercial farmers who live above the poverty line. In countries where poverty is more prevalent among landless rural households that mainly engage in non-farm activities, keeping a vibrant non-farm economy in rural areas is crucial for lifting, and keeping, many rural residents out of poverty. A viable rural non-farm economy also presents significant potential for generating jobs for the growing young labour force found in many developing countries.

Expansion of the rural non-farm economy is not an inevitable consequence of higher agricultural productivity. Rural firms suffer a number of disadvantages, including weaker economies of agglomeration and economies of scale, less connection with global manufacturing and service value chains, and lack of appeal to the younger labour force—all of which hinder the development of rural non-farm sectors. Moreover, by pushing up land cost and wages, expansion of the agricultural sector could have unintended adverse effect on other sectors.

Continuous improvement in human capital, infrastructure and governance is essential in enabling both the reallocation of resources to rural non-farm sectors and productivity growth in these sectors. Also, some frontier technologies hold promise for mitigating some of the disadvantages that rural firms face, which could pave the way for a more vibrant rural non-farm economy. Inclusive rural financing is crucial and pressing given the persistent rural-urban gap in access to finance, but governments must also keep a watchful eye on the rising risk posed by rural debt that can be observed across countries at different development levels.

Technologies can also help overcome some of the disadvantages that workers and businesses face in rural communities. Agglomeration in cities means the network effects work against rural communities and smaller cities; but with the spread of digital technologies, it may finally be possible to end the rural-urban divide. Greater connectivity can facilitate in situ urbanization by making remote work more accessible. New business ventures and start-ups based on digital and e-commerce technologies make it possible for goods and services to be sourced and provided directly in rural communities; these developments are also helping many to find non-farm employment opportunities. This is a big step forward in removing the economic underpinnings of the rural-urban divide.

New technologies may be at an early stage in many developing countries, but they are rapidly expanding in scope and influence. Many firms now offer farmers mobile payment solutions, crowdfunding platforms, and extension services that use remote sensors and drones, among others. E-commerce and telecommunications infrastructure is helping to connect rural producers with urban consumers, but also vice versa. These and many other initiatives are rich with possibility for government facilitation and participation.

Policy priorities

As shown above, the lives and livelihoods of populations must be improved, especially in rural areas, if we

are to achieve the SDGs by 2030. The analysis in this chapter offers some insights into the policies that are most useful in achieving the connected objectives of rural development and transformation that are necessary for national and global sustainable development. All policy actions should be immediate and sustained but some should target rapid outcomes (quick wins) while others can target longer-term objectives.

Immediate tasks to achieve quick wins

Policy priorities can begin by looking for immediate actions that improve the income and welfare of rural inhabitants from existing activities. This means looking for quick wins that increase agricultural productivity as well as promote economic activity related to the agrifood chain and non-food rural industry. This would rapidly increase incomes for farmers, workers and businesses in rural communities.

Governments can quickly implement policies that will help make incomes more predictable, thereby facilitating investments. Stable domestic agricultural prices can serve as reliable signals for informing production and investment decisions of farmers. The choice of price interventions and their impact will depend on the source of price volatility—whether it stems from local, national or international factors, for example—and must be informed by timely market information, including high-probability forecasts.

The use of price subsidies has to be carefully calibrated in terms of the duration and recipients, ensuring fiscal sustainability, accurate targeting of farmers in need, and minimal distortion to long-term production and investment decisions. Governments should also commit to mitigating the price distortion caused by anticompetitive behaviours of powerful firms in different segments of the agrifood supply chain to ensure market prices accurately reflect the fundamentals of supply and demand. There also needs to be better management of government grain reserves to maintain stable supply and food prices. Well-defined and binding commitments to international coordination of domestic policies, especially trade policies, help to reduce uncertainty in global agricultural prices (Pinstrup-Andersen, 2015).

Technology is a catalyst and accelerator for rural transformation given the right underlying infrastructure and supportive financial and regulatory environment. Immediate action can be taken to increase digital connectivity, including facilitating access to cellular-based services or investigating the viability of emerging satellite-based connectivity services that can reach even the most remote locations. Remote and rural areas even have a particular advantage in new forms of connectivity as they are not encumbered by legacy infrastructure. Governments can also take quick action to create an enabling environment to encourage entrepreneurship in rural areas that leverages digital platforms to provide goods and services.

Immediate tasks for longer-term outcomes

A long-term concern of policy is how to lead rural sectors towards a more productive and prosperous future that does not leave them behind in the wake of urban growth. Sustained actions and longer-term perspectives are needed to ensure that national development plans reflect the concept of transformative change in a way that is compatible with the ambitions and priorities set in the 2030 Agenda for Sustainable Development.

It is not enough to simply set the objectives. It is crucial that national strategies connect longer-term objectives with strategies to achieve rural transformation, including in situ urbanization, providing social and health services, and strengthening governance. Those plans should also aim to build a better workforce and expand a country's capital and knowledge base for this transition.

Immediate actions can also target longer-run objectives such as a rethinking of spatial development. In situ urbanization of rural areas offers an alternative way of narrowing socioeconomic gaps between rural and urban areas, without invoking significant rural-urban migration. Governments can also work to strengthen and expand the socioeconomic infrastructure in rural areas by building more and better schools and hospitals, by building roads and telecommunications infrastructure, and by expanding water, sanitation and electricity networks, among other investments.

Over the long run, such investments are central to generating additional private investments in businesses and to support a more productive and thriving rural population.

Policies must also support the growth of upstream and downstream providers in agrifood and other value chains as a way to lower input costs and facilitate the processing and marketing of products. For quicker results, governments can support a robust financial network to fund investments. In addition, efforts should be directed at addressing information asymmetry that rural producers typically suffer when it comes to regional and global markets, helping them understand the market opportunities, and required capabilities and actions to succeed in the value chains. It should be noted that the value-chain approach may improve productivity and boost revenues, but it has mixed success at reaching the poor. Policies can have a rapid effect if they are combined with community-based, poverty-oriented actions to deliver services for the poor, such as quality education and health (World Bank, 2016).

It bears repeating that governments should take immediate and sustained investment efforts in providing basic technologies such as electricity and sanitation. Billions of people are still relegated to using technologies of the pre-industrial era. They therefore lack access to the modern education and health systems necessary to accumulating a minimum level of human capital for adopting many digital technologies. Developing the right financing and public-private-partnership structures can accelerate investment in basic services to those most in need.

In any situation where employment relationships exist, proper labour market protection must not be neglected. Like their urban counterparts, rural workers must be given a voice and the right to form trade unions and conclude collective agreements. Governments must also invest in the human capabilities needed to enact change by investing in education that develops skills in the local population and by attracting talented workers from elsewhere. It is also important to create incentives to retain the skilled workforce in local governments and communities, ensuring career opportunities and quality-of-life gains, thereby avoiding the "hollowing out" of local government leaders and staff.

Finally, the overall vision must incorporate a new paradigm for rural development that gives greater importance to the needs of local communities and civil society—comparable to that given to the private sector, local governments, and sector institutions in key sectors such as health, education and agriculture. This shift in focus should be established to ensure all stakeholders are empowered to contribute to rural development (Binswanger-Mkhize, McCalla and Patel, 2009). If certain groups are disempowered, it creates openings for other groups to capture a disproportionate share of development gains, thereby preventing the achievement of inclusive and sustainable rural development.