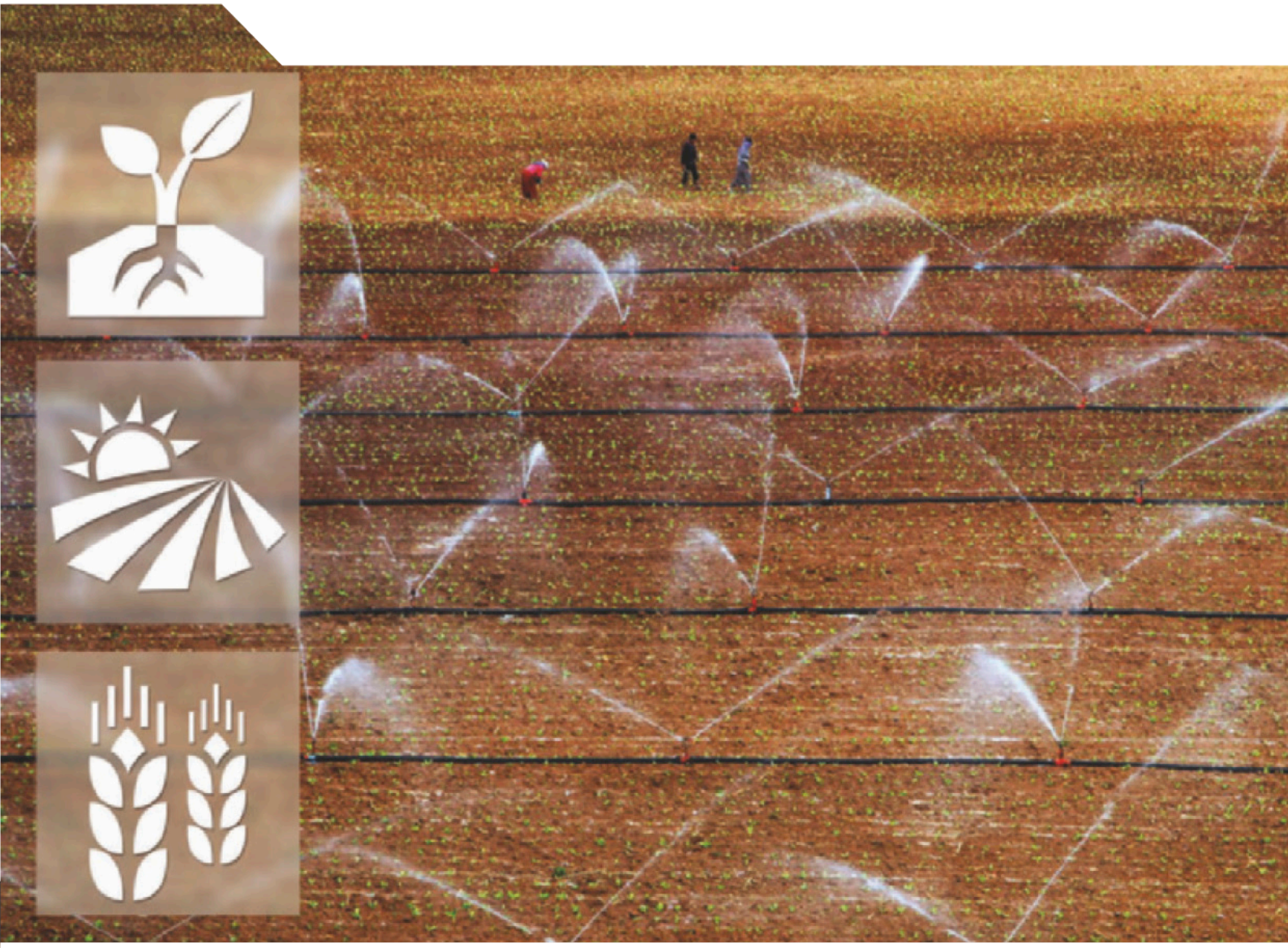
OECD Food and Agricultural Reviews

Innovation, Agricultural Productivity and Sustainability in Turkey



OECD

OECD Food and Agricultural Reviews

Innovation, Agricultural Productivity and Sustainability in Turkey

BETTER POLICIES FOR BETTER LIVES

Please cite this publication as:
OECD (2016), *Innovation, Agricultural Productivity and Sustainability in Turkey*, OECD Food and Agricultural Reviews, OECD Publishing, Paris.
http://dx.doi.org/10.1787/9789264261198-en

ISBN 978-92-64-26118-1 (print)
ISBN 978-92-64-26119-8 (PDF)

Series: OECD Food and Agricultural Reviews
ISSN 2411-426X (print)
ISSN 2411-4278 (online)

Photo credits: Cover © Ministry of Food, Agriculture and Livestock, Republic of Turkey.

Corrigenda to OECD publications may be found on line at: *www.oecd.org/about/publishing/corrigenda.htm*.

Foreword

Innovation, Agricultural Productivity and Sustainability in Turkey is part of the OECD Food and Agricultural Reviews series. This review was prepared in close cooperation with Turkish Government. It examines the policy conditions for businesses in Turkey to undertake innovation for the food and agriculture sector to become more productive and environmentally sustainable. The report begins with an overview of the food and agriculture sector and outlines its development challenges and opportunities (Chapter 2). A wide range of policies which influence incentives for innovation are then examined: economic stability and a favourable and predictable environment for investment (Chapter 3); capacities and public services enabling business development (Chapter 4); agricultural policy (Chapter 5), and the operation of the agricultural innovation system (Chapter 6). Chapter 1 summarises these findings and provides policy recommendations.

Turkish policies are analysed following a framework developed by the OECD as part of its work on agricultural innovation and in response to a request from the G20 in 2012 under the Presidency of Mexico. This framework has been previously applied in similar reviews for Australia, Brazil, Canada, and the Netherlands and additional countries will be studied in subsequent work.

The review was prepared by Julien Hardelin, Olga Melyukhina and Lihan Wei from the OECD Secretariat. Sinan Hatik from the Turkish Ministry of Food, Agriculture and Livestock, and Elselien Breman from the Ministry of Economic Affairs of the Netherlands contributed to the preparation of several chapters. Comments were provided by a number of colleagues from the OECD Secretariat: Carmel Cahill, Dimitris Diakosavvas, Rauf Gönenç, Franck Jesus, Catherine Moreddu and Frank van Tongeren. Michèle Patterson provided editorial and publication support, Clara Thompson-Lipponen editorial assistance, and Martina Abderrahmane administrative assistance.

The review draws on responses to the innovation framework questionnaire, which were provided by the Turkish Ministry of Food, Agriculture and Livestock (MOFAL), the Ministry of Development (MOD), the Ministry of Forestry and Water Affairs (MOFWA), the Ministry of Science, Technology and Innovation (MOSIT), and the Scientific and Technological Research Council of Turkey (TÜBITAK). The inputs to this review also include background reports by consultants: on the trends in agricultural productivity in Turkey by Ozan Eruygur from Gazi University, Mustafa Can Küçüker from Atilim University, and Gönül Muratoğlu and Yusuf Muratoğlu from Gazi University (Turkey); on structural adjustment and rural development policy by Halis Akder from the Middle East Technical University (Turkey); on Turkish agricultural innovation system by Şule Akkoyunlu from the Rimini Centre for Economic Analysis (Italy); and on agricultural water management in Turkey by Basak Bayramoglu from L'Institut national de la recherche agronomique (France). The review also draws on OECD analysis in other economic and social policy fields and uses cross-country comparable indicators developed by the OECD and other international institutions, such as the World Bank and the World Economic Forum.

The review benefitted from comments provided by the Turkish Ministry of Food, Agriculture and Livestock, the Ministry of Development, the Ministry of Science, Industry and Technology, the Ministry of Forestry and Water Affairs, the Turkish Scientific and Technological Research Council, and the Small and Medium Enterprise Development Organisation. Sinan Hatik from the Turkish Ministry of Food, Agriculture and Livestock ensured co-ordination and liaison with the Turkish authorities throughout the course of this project.

This review was declassified by the OECD Working Party on Agricultural Policies and Markets in May 2016.

Table of contents

Tables

Figures

Boxes

Acronyms

ACC	Agricultural Credit Cooperative
AIS	Agricultural Innovation System
ARIP	Agricultural Reform Implementation Project
BEEP	Burden on the Economy due to Environmental Policies
BERD	Business expenditures on R&D
BRSA	Banking Regulation and Supervision Agency of Turkey
CAP	Common Agricultural Policy
CIP	Competitiveness and Innovation Framework Programme
COST	European Cooperation in Science and Technology
CPI	Consumer Price Inflation
CSE	Consumer Support Estimate
CU	Customs union
DAP	Eastern Anatolia Project
DOKAP	Eastern Black Sea Project
DSI	General Directorate of State Hydraulic Works
ERA	European Research Area
FAO	Food and Agriculture Organization of the United Nations
FDI	Foreign Direct Investment
FP	Framework Programmes
FTA	Free Trade Agreement
GAP	South Eastern Anatolia Project
GCI	Global Competitiveness Index
GDAR	General Directorate for Agricultural Research and Policies
GDP	Gross Domestic Product
GEM	Global Entrepreneurship Monitor
GERD	Gross Domestic Expenditure on R&D
GVA	Gross value added
GVC	Global Value Chain
ICT	Information and communication technologies
IFAD	The International Fund for Agricultural Development
IFC	International Finance Corporation

ILO	International Labour Organization
IMF	International Monetary Fund
İŞKUR	Turkish Employment Agency
IP	Intellectual Property
IPARD	Instrument for Pre-Accession Assistance Rural Development (Programme)
IPR	Intellectual Property Rights
KOP	Konya Plains Project
KOSGEB	Small and Medium Enterprise Development Organisation
KUGEM	Small Enterprise Development Centre
MENA	Middle East and North Africa
MFN	Most Favoured Nation (tariff)
MOD	Ministry of Development
MOEU	Ministry of Environment and Urbanisation
MOFAL	Ministry of Food, Agriculture and Livestock
MOFWA	Ministry of Forestry and Water Affairs
MOSIT	Ministry of Science, Industry and Technology
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
O&M	Operation and Maintenance
PCT	Patent Co-operation Treaty
PISA	Programme for International Student Assessment
PSE	Producer Support Estimate
PwC	PricewaterhouseCoopers
R&D	Research and development
RBMP	River Basin Management Plans
RCA	Revealed Comparative Advantage
RD&I	Research, Development and Innovation
SME	Small and medium-sized enterprise
SOE	State owned enterprise
STI	Science, Technology and Innovation
TARSEY	Integrated Management Information System
TARSİM	Agricultural Insurance Pool
TBS	Agricultural Information System
TEKMER	Technology Development Centre
TFP	Total Factor Productivity

TiVA	Trade in Value Added (database)
TRA	Turkish Research Area
TRY	Turkish lira
TSE	Total Support Estimate
TTGV	Turkish Technology Development Foundation
TÜBITAK	Scientific and Technological Research Council of Turkey
TÜRKSTAT	Turkish Statistical Institute
UBTYS	National Science, Technology and Innovation Strategy
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UPOV	International Convention for the Protection of New Varieties of Plants
USD	US dollar
VAT	Value Added Tax
VET	Vocational Education and Training
WDI	World Development Indicators (data base)
WEF	World Economic Forum
WTO	World Trade Organization
WUA	Water User Associations
WUO	Water User Organisation

EXECUTIVE SUMMARY

The Turkish agro-food sector has the potential to significantly contribute to the country's overall economic development, but its ability to do so will depend largely on productivity growth. To achieve this, a fundamental challenge will be to overcome the buffer role traditionally played by agriculture; labour resources must be re-allocated to more efficient uses within and outside this sector. In essence, agricultural productivity growth in Turkey will depend on the extent to which the country's overall economic and human development enables rural people to generate income outside low-technology agriculture.

Turkey has made significant progress in economic and social development since the early 2000s, but economic growth has slowed. The economy remains vulnerable to the risks of high inflation and high current account deficit, and its growth drivers need to be rebalanced in favour of greater reliance on external rather than domestic demand, and on domestic savings rather than external borrowing. This requires further progress on structural reforms in areas such as product and market regulation, labour market, education, and the social security system. There is considerable potential for productivity gains across the economy by improving firm-level productivity and re-allocating resources to higher-productivity firms.

Turkey implemented various policy initiatives to stimulate investment and promote private sector activity. However, state control in certain economic sectors and the complexity of regulations pose some challenges, and the costs of doing business are higher than in world's best performing economies. While the tariff regime is liberal overall, the lack of trade facilitation reduces gains in competitiveness resulting from trade. Labour market regulations are rigid and increase labour costs, perpetuate informality in labour relations, and impede structural adjustment. In 2016, the government launched a new Action Plan which aims to improve the business and regulatory environment and includes a number of labour and product market reforms.

Businesses face moderate tax burdens, and investors enjoy significant tax concessions. Financial markets have seen rapid growth; finance is facilitated through interest concessions and financial grants for businesses investing in less-developed regions, and for small and medium-sized enterprises, while the provision of reduced-cost credit for the agricultural sector is a long-standing policy. However, tax and credit policy incentives may be eroded by the rigidity and complexity of business regulations that increase the costs of doing business.

Segments of the business sector represented by smaller businesses operate on an informal basis, and are unlikely to be exposed to policy incentives built into formal regimes. A reform of the regulatory system to make it more flexible would help to integrate more businesses into a rule-based framework and to provide policy incentives with broader effects. For the agricultural sector, the challenge is more complex and long-term, as it involves moving towards a fully-commercial farming system.

There is a substantial lag in the availability and quality of infrastructure. In recognition of this, the development of infrastructure has been made a national priority: large investments have already been undertaken and ambitious plans formulated. Current infrastructure projects address many of the major needs of rural areas. Where agricultural productivity is concerned, there is a need for stringent monitoring and assessment of impacts of infrastructure development on the availability and quality of agricultural land and on cross-sectoral shifts in skilled labour.

Progress has been made in the area of education, helped by overall income growth and considerable poverty reduction, as well as educational reforms. Nevertheless, the average level of education remains modest. The education gap is particularly large in rural populations, which continue to lack essential skills, thus curbing the capacity of the sector to increase efficiency and innovate. Various initiatives for better education have been undertaken, and multiple objectives have been set. Maintaining the momentum in educational improvements by emphasising the inclusiveness of rural, low social economic status citizens, as well as of women in general, is critical to ensure agricultural development.

Turkey's agricultural policy is focused on increasing agricultural production for domestic and external markets. To achieve this, the government mostly relies on price protection at the border, price premiums, and variable input subsidies. As such, the structure of agricultural producer support is distortive of market conditions and is unlikely to increase producer incentives to employ production factors more efficiently. As a result, agricultural productivity growth is constrained in the long term. Policy transfers oriented towards long-term productivity improvements – such as agricultural knowledge systems, plant and animal health systems, and food safety – constitute a very small share of total support provided to the sector. The transformation of the farm structure through large-scale land consolidation has recently become a major policy undertaking. Reduced fragmentation of farmland is expected to improve land use, with potential benefits for agricultural productivity and natural resource management, including water resources. The objective of environmental sustainability has been progressively integrated into agricultural policy, and specific support to producers has been introduced to stimulate the adoption of environmentally-friendly practices. Rural development is becoming a more prominent policy focus. Nevertheless, environmental sustainability and rural diversification measures currently attract a relatively small share of government spending for agricultural development.

Significant efforts have been made since the early 2000s to build up national Science, Technology and Innovation (STI) capacities and to introduce new governance principles and support measures in the STI area. Tax concessions and assistance through public-private partnerships have been provided in order to stimulate business R&D. Agriculture and food are national STI priorities, and therefore benefit from special public funding schemes for priority areas. R&D outputs in the agro-food area have rapidly increased, and there has been active integration of national research into international R&D collaboration frameworks. However, there is room for improvement in STI performance, particularly where "quality" and "impacts" of STI are concerned.

Policy recommendations encompass the following key areas:

- **Improve the conditions for overall economic development in order to enable sustained agricultural productivity growth,** by advancing structural reforms in areas such as product and market regulation, the labour market, education, and the social security system; pursuing efforts across policy areas to ease the rigidity of the regulatory framework, reduce the costs of doing business, and eliminate business informality; improving trade facilitation; and continuing the development and consolidation of environmental regulation, while strengthening both its implementation and environmental monitoring.

- **Enhance capacities and services that are essential for agricultural development**, in order to remove major capacity constraints to sustainable productivity growth. This can be achieved by pursuing improvements in infrastructure, with a stronger focus on impact assessment and the monitoring of publicly-funded projects; consolidating and up-scaling specific initiatives for off-farm employment in rural areas into a nationwide rural diversification framework; achieving higher education participation targets while also ensuring good quality of education; enhancing measures and underlying resources to enable the greater inclusion of rural populations in education; and promoting government-industry co-operation in agricultural education, particularly vocational education and training.

- **Reorient agricultural policy towards better productivity and sustainability outcomes,** by shifting away from support based on subsidising output and input prices; moving towards a more balanced distribution of public resources in the provision of general services for the sector; further downsizing – and eventually eliminating – transfers to state-owned enterprises and agricultural co-operatives; accomplishing farmland consolidation plans; and developing irrigation systems while ensuring efficient water-sharing mechanisms, water pricing, and the financial viability of systems.

- **Enhance the efficiencies and impacts of the agricultural innovation system** by increasing the policy focus on the quality and relevance of Research and Development (R&D); reinforcing these criteria in the performance evaluations of scientists, projects, and institutions; maintaining human capacity-building for STI as a principal orientation of the STI strategy, supported by the necessary resources; enabling increased R&D investment and activity by agricultural and food businesses; improving awareness of the opportunities for business development through R&D and innovation; raising the awareness of intellectual property rights amongst potential innovators; increasing the resources and human capacity of the rural extension system at local level; and encouraging the supply of extension services by private consultants.

- **Strengthen policy analysis in order to better inform potential policy changes**, and build the necessary databases and policy-relevant information. The issues that require broader analytical evidence include: agricultural productivity trends and its determinants, in particular the impacts on productivity of changes in farm size structure; the potential effects of the decoupling of agricultural support from the production of specific commodities; opportunities and pathways for rural economy diversification and off-farm employment; the impact of infrastructure and rural development projects on agricultural productivity and off-farm employment; and the effectiveness and efficiency of policy instruments to support R&D.

Chapter 1

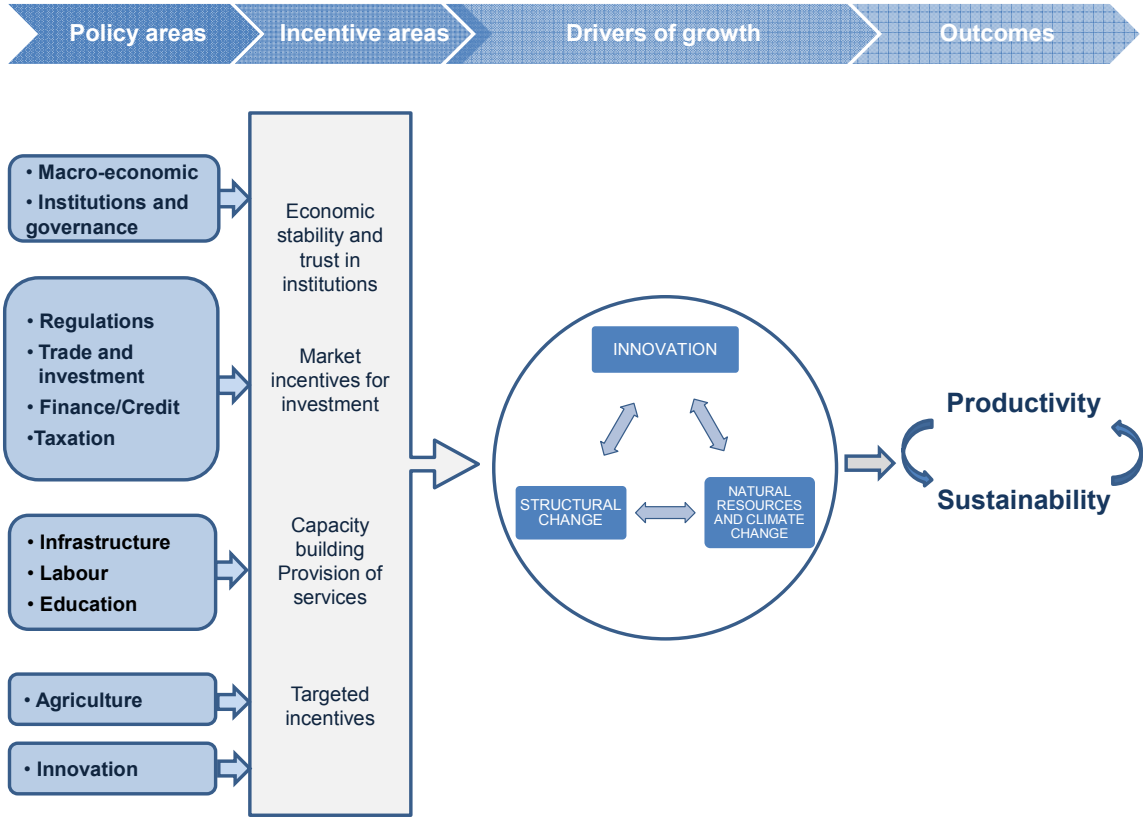
OVERALL ASSESSMENT AND RECOMMENDATIONS

This chapter summarises the findings of the review and presents policy recommendations to foster productivity and sustainability in the food and agriculture sector. Turkish policies are examined using a framework developed by the OECD to analyse the extent to which a country's policies support innovation, structural change, and sustainable use of natural resources in the food and agriculture sector.

A framework to analyse policies for innovation, productivity and sustainability in the food and agricultural sectors

Improvements in agricultural productivity growth are necessary to meet the growing demand for food, feed, fuel and fibre, and these must be achieved sustainably by means of the more efficient use of natural and human resources. A common finding is that a wide range of economy-wide policies affect the performance of the food and agriculture sector, and need to be considered alongside agriculture-specific policies. The framework used to review policies in Turkey considers policy incentives and disincentives to innovation, structural change, the access to and use of natural resources, and the adaptation to and mitigation of climate change, all of which are key drivers of productivity growth and the sustainable use of resources (Figure 1.1).

Figure 1.1. Policy drivers of innovation, productivity and sustainability in the food and agriculture sector



Source: OECD (2015), "Analysing Policies to improve agricultural productivity growth, sustainably: Revised framework". www.oecd.org/agriculture/policies/innovation.

This review begins with an overview of the characteristics and performance of the food and agriculture sector and the challenges that it faces (Chapter 2). A wide range of policies is then considered according to the main channels or incentive areas through which productivity growth and environmental sustainability are impacted. These include:

- Private investment, which in turn requires a transparent and predictable environment that balances the interests of investors and society (Chapter 3).
- Capacity building, including the provision of essential public services (Chapter 4).
- Agricultural policy, domestic and trade-related (Chapter 5).
- The agricultural innovation system (Chapter 6).

Challenges to increase agricultural productivity and competitiveness

The agro-food sector is an important part of the Turkish economy, with high potential to contribute to the country's overall economic development. Turkey is reasonably well endowed with land and water, and enjoys a climate favourable for diversified agricultural production. Its agro-food sector has a sizeable domestic market, and its favourable geographic location provides access to large external markets. The country's diverse agricultural production creates opportunities to tap into different, and new, product niches in which it has a comparative advantage in primary production and modern know-how in processing.

The ability to capture these opportunities will largely depend on productivity growth in the agro-food sector. The available evidence on agricultural productivity performance in Turkey is partial and fragmented. There have been improvements in crop and animal productivity. The gap between labour productivity in agriculture and the non-agriculture economy has narrowed, but this catch-up seems to have lost momentum since the mid-2000s.

The primary levers of productivity and competitiveness in Turkish agriculture come from outside the sector. Agriculture pays a "buffer role" in the economy, by providing employment, food and income to vulnerable groups in society. But this is a fundamental challenge for agricultural productivity. Excess agricultural labour needs to be re-allocated to more efficient uses within and outside the sector. This is not only a long-term, but also a socially sensitive process, as it involves moving towards more land- and capital-intensive agriculture, with the accompanying pressure to accommodate excess labour elsewhere. In essence, agricultural productivity growth in Turkey will depend on overall economic growth and a comprehensive human development effort to enable rural populations to generate income other than in low-productivity agriculture.

General economic conditions also affect agriculture because this sector uses a significant proportion of imported inputs. The agricultural sector is thus strongly exposed to cost risks from movements in exchange rates and world prices for intermediate goods. Cost pressures also come from the development of the non-agricultural sectors – industry, infrastructure and energy – which compete with agriculture for land and skilled labour. The success of the agricultural sector in attracting these resources will depend on the extent to which it is able to generate competitive returns.

The establishment of modern food chains is a distinct challenge, given the significant presence of semi-formal and low-technology activities at all stages of the food chain. Well-developed food chains are a prerequisite for future agricultural growth, as they increase the cost- and quality competitiveness of domestic products, and enable these to be channelled to larger and more diverse markets.

As elsewhere, agricultural productivity growth in Turkey must take environmental and climate change concerns into account. The expansion of irrigated agriculture and its implications for sustainable water and land use is one such concern. Another is the use of fertiliser and pesticides, potentially leading to nutrient pollution. Soil erosion resulting from agricultural activity, such as overgrazing, is also a concern. The projected increase in urban and industrial water needs and the expected adverse effects of climate change – droughts in particular – on yields, are issues gaining prominence. An environmentally-friendly agriculture could enhance the export competitiveness of the sector by generating a positive environmental reputation, opening possibilities for the development of green labels in high value-added market segments and, more broadly, supporting the development of higher value-added agriculture.

Overall economic growth is fundamental to sustained gains in agricultural productivity

The economy has performed well in the past, but requires a new momentum

Turkey has made significant progress in economic development in the past fifteen years. Economic growth was associated with reduced disparities across regions, the dynamic development of the business sector, and significantly improved social conditions, with a large part of the population taken out of poverty. However, economic growth slowed in the 2010s, and has been further constrained by domestic

and external political instabilities in the past two years. This is an unfavourable trend, given that the country has yet to reach the average economic and social development levels of the OECD area.

The economy remains vulnerable to certain macroeconomic risks

High inflation persists and requires monetary tightening. This, however, implies allowing the exchange rate to strengthen, and to erode export competitiveness. This is also a concern, given Turkey's strong dependency on energy imports and its persistently large current account deficit. Gross external financing relies predominantly on short-term capital inflows, rather than on foreign direct investment (FDI), resulting in high exposure to shifts in market sentiment and exchange rate fluctuations. Nevertheless, public finances are robust overall, and have been the central anchor of the country's macroeconomic credibility (OECD, 2014a).

A rebalancing of growth drivers is required, helped by further structural reforms

While the short-term economic outlook points to moderate and more balanced growth (OECD, 2016b), this is unlikely to create sufficient jobs to absorb the expanding workforce and attain unemployment reduction targets. To date, economic growth has been driven predominantly by domestic consumption and, to a lesser degree, by domestic savings, generating a high external deficit. The production and employment structure is largely oriented towards the domestic market, with a low share of tradable output and below-potential integration into global value chains. To achieve higher and sustained long-term growth, an important rebalancing must occur in favour of greater reliance on external rather than domestic demand, and on domestic rather than foreign savings. This requires more progress on structural reforms in areas such as product and market regulation, the labour market, education, and the social security system (OECD, 2014a; OECD, 2016a). To this end, in 2016, the government launched a new Action Plan which aims to improve the business and regulatory environment and includes a number of labour and product markets reforms (OECD, 2016a).

Structural reforms would also enable firm-level productivity improvements across the economy

The business structure is highly segmented, with numerous micro, small and medium-sized enterprises (SMEs) co-existing with a relatively small number of large, listed corporations and cutting-edge technology businesses. There is considerable potential for productivity gains across the economy through the improvement of firm-level productivity and the re-allocation of resources to higher-productivity firms (OECD, 2014a; OECD, 2016a).

Businesses face fairly rigid regulations, and there is room to improve conditions for doing business

The regulatory environment can either facilitate or impede the evolution of the business structure towards a more productive one. Turkey's overall regulatory framework is the most rigid of the OECD economies, as measured by the OECD Product Market Regulation indicators (OECD, 2014b). Regulations are particularly restrictive in terms of state control, reflecting state ownership of the largest firms and other forms of state control in such sectors as electricity, gas, telecommunications, transport infrastructure, water management, and water pricing. There are significant barriers to entrepreneurship, such as complex regulatory procedures and high burdens on start-ups. Regulations translate into direct and indirect costs for business. The World Bank ranks Turkey 55th out of 189 countries on the ease of doing business. In particular, entrepreneurs face more complicated rules to resolve insolvencies, obtain construction permits, start a business, and obtain credit (World Bank, 2016). The rigidity and complexity of business regulations may also offset policy stimuli embedded in the formal regimes, such as credit and tax concessions.

The EU acquis is a driving factor for changes in the national regulatory framework

Turkey-EU accession negotiations were launched in October 2005 and foresee the alignment of national regulations with the EU framework. The country's commitments and the implementation

benchmarks of the regulations concern all principal areas of economic activity, such as the free movement of goods, labour and capital, company and labour laws, competition, intellectual property, financial services, taxation, environmental and consumer protection regulations. The latest report by the European Commission (November 2015) noted different degrees of Turkey's preparedness for EU membership across these regulatory areas (EC, 2015).

There has been progress in the development of environmental regulations, but implementation, monitoring, and assessment are also important

Agricultural productivity growth must be achieved with the sustainable use of natural resources and the reduced environmental footprint of agriculture. The protection and improvement of water and soil is a priority for Turkey. Regulations on natural resources are being developed and consolidated under the impetus of the EU *acquis* process, but there is significant room for progress, particularly with regard to the implementation of regulations, the establishment of efficient monitoring systems, and policy assessment. Recent changes in regulations related to land transfers, along with farmland consolidation works, are expected to help reduce farmland fragmentation and improve its use, with potential benefits for agricultural productivity and natural resource management. Coherence between regulations governing land transfers, land consolidation, and land protection is important to create synergies between agricultural productivity and sustainability objectives.

The tariff regime is liberal overall, but better trade facilitation could increase gains from trade

In addition to increasing market size and acting as competition drivers for innovation, trade and FDI operate as immediate channels of technology, know-how and managerial expertise. Although the Turkish regime is liberal overall in terms of tariff protection, conditions are less favourable towards trade facilitation. This includes the use of internationally-harmonised standards, certification procedures and mutual recognition agreements (OECD, 2014b). More specifically, Turkey lags in border agency co-operation, the simplification of formalities, disciplining fees and charges, the availability of information, and consultations with traders (OECD, 2015a). These issues make Turkey's overall stance in trade regulation more restrictive than in most OECD countries. This diminishes gains from trade, including those that could arise from participation in global value chains. As shown by OECD's Trade in Value Added (TiVA) indicators, Turkey's per capita exports of value added are low, as is its integration into global value chains, including in the agro-food sector (OECD-WTO, 2015). This suggests that opportunities to increase competitiveness by being part of the global trading system, in particular by integrating production systems with international outreach, remain insufficiently exploited. Turkey's ratification in 2016 of the WTO's Trade Facilitation Agreement provides an impetus to reduce the existing impediments to trade in this area.

Foreign direct investment regulations are generally favourable to investors

Foreign investors are granted the same legal status as Turkish companies. The OECD FDI Regulatory Restrictiveness Index shows that Turkey's FDI regulations are less constraining than on average across the OECD area (OECD, 2015b). Policies to promote FDI, together with improvements in intellectual property protection, the removal of minimum interest rate requirements, investment incentive schemes, and the introduction of more flexible equity acquisition regulation, resulted in strong increases of FDI inflows. No restrictions are applied to foreign investments in the agricultural and food manufacturing sector. However, as in many countries, these sectors attract only a small share of total inward FDI, which is also far below the aggregate share of these sectors in national GDP.

Financial markets generally function well, while finance is facilitated for some business segments

A well-functioning domestic financial system – with sufficient provision of varied services to borrowers of different profiles – facilitates the innovation process. Financial markets in Turkey have expanded rapidly since the early 2000s, but remain small by international standards. Banks dominate the financial markets and, despite certain risks, the proportion of non-performing loans remains relatively

low. Turkish businesses perceive the functioning of financial markets to be favourable in most respects. This viewpoint is similar to those of businesses across the OECD area. Nevertheless, Turkish businesses consider their legal rights to be relatively weak, and would favour substantial improvements in the availability of venture capital (WEF, 2015).

Finance is facilitated for businesses investing in activities that have been prioritised for national development, particularly if they are undertaken in less-developed regions. Such investors can receive subsidised credit. Financial assistance through grants and interest subsidies is also provided to SMEs. The agricultural sector has traditionally been treated as a government-protected sector in terms of finance, and for decades benefited from subsidised credit. Nevertheless, only large and commercially-oriented agri-businesses are connected with formal credit institutions. Smaller commercial farms rely mostly on input suppliers, traders, and informal lenders for finance, while numerous other agricultural households have no recourse to any borrowing. The formal agricultural credit system thus covers only part of the sector, leaving aside small and often low-productivity semi-subsistence farms which do not generate sufficient income to allow borrowing, and which also lack collateral.

The tax burden on businesses is moderate and substantial tax concessions are provided

Taxation affects returns to investment and thus the decisions of firms and individuals to invest and innovate. Taxation is often used as a targeted tool to stimulate innovation through tax preferences granted to creators and adopters of innovations. Turkish businesses face lower rates of income taxation compared with the majority of OECD countries. Wage and sales taxation rates are close to OECD medians, but are relatively high compared to the minimum rates of these taxes across the OECD area (OECD, 2015c). Various tax incentives are provided as part of the economy-wide investment incentive framework. Tax concessions are also part of the policy set to support SMEs.

However, there are de facto distortions in business taxation

Progress has been made in adapting corporate taxation to international norms, but the system needs to be improved in order to discourage informal operations and reduce distortions in the treatment of larger-scale formal companies and the remainder of the business sector. Simplified taxation rules provide benefits, in particular by helping to formalise smaller businesses. However, both size-dependent differences in statutory taxation and in-practice divergence in financial transparency create different tax burdens for large and small firms. The magnitude of tax differences seems to have reached distortive proportions, discouraging modern business as well as large indivisible investments (OECD, 2014a). This is fully applicable to agriculture-based manufacturers and downstream services where a small number of large companies co-exist with numerous small and often semi-formal businesses.

Greater integration of businesses into the formal economy will enable policy incentives to have broader effects

Small and micro-enterprises are a large segment of the business sector, but some operate informally. These businesses become disconnected from policy incentives or disincentives built into formal tax or credit regimes. Such a disconnect is likely to be more pronounced in the agricultural sector, where numerous semi-subsistence or subsistence households exist. Enabling all economic actors to operate within a common regulatory system is essential for policy incentives to have broad effects. Reforms leading to a more flexible regulatory system would help to integrate more businesses into a rule-based framework. For the agricultural sector, this challenge is probably more complex, as it requires a broad and long-term development effort for the sector to become fully commercial.

Recommendations for the overall policy framework for investment and innovation

- Reduce the overall regulatory burden on entrepreneurship, particularly by simplifying regulatory procedures and administrative burdens on start-ups. Ensuring coherence across regulatory areas and different administrative levels is also key. Pursue the reform of business regulations identified in the 2016 Action Plan, and undertake a comprehensive review of business regulations and procedures to determine critical areas for further reform.
- Continue efforts across policy areas to eliminate business informality, in particular, in order to reduce *de facto* distortions in the tax treatment of different-sized businesses.
- Improve trade facilitation by expanding the application of internationally-harmonised standards, certification procedures and mutual recognition agreements. Simplified border formalities, the disciplining of fees and charges, transparency and availability of information are complementary aims.
- Continue the development and consolidation of environmental laws and regulations, and strengthen their implementation; ensure that appropriate human and institutional resources are deployed to fulfil environmental targets; improve the cost-efficiency of regulations and reinforce their acceptability.

Lags in infrastructure and education are serious bottlenecks to productivity growth

The infrastructure gap is being reduced and future plans are ambitious

Infrastructure provides the connectivity of the economic system, enabling the movement of factors of production, goods and information across agents and markets. As such, infrastructure is important in determining the location of an economic activity and the activities or sectors that can develop within the economy. The availability and quality of infrastructure affect decisions by firms and individuals to invest, including in innovation.

Turkey lags behind its international competitors in the agro-food area in the availability and quality of its infrastructure. The development of infrastructure is a national priority, and large investments have been made towards this objective. The total amount of investment in transport infrastructure, for example, increased in constant terms from EUR 1.6 billion per year in 2000-02 to EUR 6.3 billion per year in 2011-13 (OECD, 2015d). Ambitious plans by 2032 aim to reduce the infrastructure gap further. Integration with EU standards and trans-European transport and electricity networks is a priority, as is developing connections with Asian countries, the People's Republic of China (hereafter "China") in particular. In the information and communications technology area, the Information Society Strategy and Action Plan (2015-18) sets the objectives and actions to transform Turkey into an information society.

A particular objective of infrastructure development in Turkey is to reduce regional economic and social disparities. Infrastructure plans address key needs of rural areas, including farmland consolidation, electricity and irrigation networks, and rural transportation. With substantial funding needs, the policy has been to encourage private investment through tax, credit and social contributions concessions and the encouragement of public-private partnerships.

Stronger governance, monitoring and impact analysis is needed

Although national strategies are in place, experience in implementing infrastructure projects highlights the need for clearer governance and co-ordination. Infrastructure development is also associated with environmental and social impacts due to changes in land ownership, land use, economic activity structure, and regional demography. This creates the need for the adequate monitoring and management of natural resources, appropriate land use planning and urbanisation, and the management of pollution from industry. There is also a need to consider infrastructure and regional development projects in terms of how they affect agricultural productivity through changes in the availability and quality of agricultural land and the re-allocation of skilled labour.

The rigid labour system impedes more modern and efficient businesses from developing

Labour market policy influences employment composition and plays an important role in facilitating structural adjustment. Labour mobility and social security for the workforce helps to provide the conditions for innovation and skills training.

The Turkish labour market is characterised by relatively high self-employment and small enterprises acting as the principal employers. The incidence of informality is significant: the share of informal jobs, which has declined since the early 2000s, remains approximately 33% for the whole economy and 22% in non-agricultural sectors. The OECD indicator of employment protection legislation shows that the system is stricter than in other OECD countries, with rigid requirements for temporary contracts, employment through work agencies, and severance costs (OECD, 2015e). This rigidity increases labour costs, perpetuates informality in labour relations, and impedes structural adjustment.

Labour reforms are needed, as are strengthened social safety nets

Moving all businesses into the formal labour framework would allow more efficient firms to develop and to achieve growth opportunities across the entire economy. However, policies would be required to support smaller informal and semi-formal businesses in their transition to formality, as well as a stronger safety net system to deal with the social impacts of labour adjustments. A far-reaching labour market reform – National Employment Strategy – was prepared in 2014 with the aim of reforming the costly severance payment regime and facilitating modern employment forms which had been prohibited or highly restricted in the formal sector, but actively used by businesses operating in the informal sector. The implementation of these reforms has, however, faltered to date, amid a lack of stakeholder consensus. A consensual social safety net system could help to support the necessary reforms. Collective social protection, including unemployment insurance, up-grading skills of the unemployed, and Earned Income Tax Credit-type transfers to the working poor continue to be limited in scope. The schemes currently in place do not offer a credible alternative to enterprise-level job protection, neither for the minority of formal-sector insiders, nor for the majority of workers aspiring to the same level of protection (OECD, 2014a). To address these issues, the government's 2016 Action Plan has included the objective of improving the flexibility and security ("flexicurity") of labour market based on EU good practices. It also envisages an impact analysis of the on-going active labour market schemes (OECD, 2016a).

Despite recent progress, education and skills require a major boost

Education policy has strong and diverse links to productivity and innovation. A high level of general and scientific education facilitates the acceptance of innovations by society. Effective innovation systems require well-educated researchers, teachers, extension officers and business owners. Producers with a good general, technical and business education will generally be more willing and better skilled in fostering and adopting innovations.

The education levels of the population have increased over the past two decades, helped by overall improvements in incomes and significant poverty alleviation. This progress has also been supported by the educational reforms. Along with increases in educational attainment, student performance has improved. Despite these positive trends, the overall educational status remains modest. The share of adults aged 25-64 who do not have an upper secondary education (64%) is the second highest of the OECD countries, and Turkey has the lowest share of the population with higher education (17%). Less is spent per student on primary and secondary education than in any other OECD country, suggesting this imposes a restraint on further advancements in education (OECD, 2015f).

Rural populations in particular need to become better educated

The education gap is particularly large in rural populations that continue to lack essential skills, severely curbing the capacity of this sector to increase efficiency and innovate. Persons with high-school or technical school-level education constitute less than 7% of those employed in agriculture, and

over three-quarters only completed primary or secondary level, while 15% are illiterate (TÜRKSTAT, 2015). This high illiteracy rate is due to particularly low education amongst women, who constitute nearly half of the employed in agriculture – one in four is illiterate and lacks the essential skills to run productive farms, use extension services, and leverage technology. With low demand for education in the agricultural labour force, a small proportion of students pursue higher education in agricultural and veterinary sciences. The number of university graduates in agriculture is likely below the sector's need for skilled labour.

Various initiatives for better education have been undertaken and further objectives defined

Turkey's aspirations to become an information society, to improve economic competitiveness, and to develop sustainably, in addition to the goal of EU membership, have made educational reform an urgent necessity. Many recent educational reforms have been supported by international organisations, in certain cases beginning as pilot projects. These efforts were aimed at increasing the quantity and equity of education, improving vocational education and training, raising the professional levels of teachers, and stimulating private sector participation in education (OECD, 2015g). Current objectives include further advancement in terms of the quantity of education at all levels – early childhood participation in particular – as well as a higher quality of education though the development of performance-based systems, curricula updates, and the introduction of a national qualifications framework. The higher education system is to be given greater autonomy, and the engagement of private investors and professional organisations in the provision of education is to be increased. Maintaining the momentum of these reforms in the long term, supported by adequate financial resources, is an imperative for national development. Future policies should aim to build on previous efforts, with enhanced policies aimed at the inclusion of rural, low social economic status and female populations.

Recommendations for innovation capacity

- Pursue improvements in infrastructure, with a focus on impact assessment and the monitoring of infrastructure projects in terms of environmental sustainability, climate resilience, and changes in the availability and quality of agricultural land.
- Simplify governance and facilitate the co-ordination of infrastructure development initiatives at different administrative levels (national, regional, provincial, and local) and with different scopes (sectoral and multi-sectoral).
- Progress with the planned labour reforms; allow the formal sector greater flexibility in labour arrangements; strengthen unemployment safety nets, job placement, and up-skilling programmes.
- Engage public and private actors at all administrative levels in order to identify and achieve the opportunities for off-farm employment in rural areas; draw on the experience of regional and rural development projects; consider the consolidation and up-scaling of specific initiatives for off-farm employment in rural areas into a nationally-scoped rural diversification framework.
- Ensure that efforts to meet higher targets for *participation* in education take place in parallel with improvements in the *quality* of education; consider a comprehensive policy package to improve the quality of instruction, which would include standards and training for teachers, a performance-based pay system, and incentives for the retention of teachers in disadvantaged regions.
- Enhance measures and the underlying resources for greater inclusion of rural populations in the education system, rural women in particular; align efforts to improve participation rates with social policies, such as the child benefit system, consider making certain social transfers conditional on children's schooling; exploit low-cost distance-learning methods.
- Pursue the promotion of the non-government provision of education, with a special focus on vocational education and training; promote public-private partnerships in the area of education; co-operate with industry and professional organisations in the creation and updating of training packages, job placements, and advocate agro-food careers among those in vocational and higher education.

Agricultural policy needs to be more oriented towards productivity and sustainability outcomes

Boosting domestic and export supplies is the principal orientation of agricultural policy

The principal orientation of agricultural policy in Turkey is to increase agricultural output in order to attain greater supply for the domestic market and exports. Associated with this are the objectives of improving phyto-sanitary, veterinary and food safety systems, and the development of higher value-added agro-food activity. A broad mix of instruments is used to support production growth targets. High tariff protection is provided for imports and export subsidies for exports, combined with purchase prices set by state wholesalers and sales cooperatives, and deficiency ("premium") payments. All of these measures generate substantial and varying levels of price support across agricultural commodities. Premium payments are established on the basis of agro-climatic modelling, whereby for each "agricultural basin", the types of production are defined and "strategic" supply deficits and competitive products are selected with corresponding payment schedules. Producers also receive area payments and subsidies for credit, and insurance. Subsidised insurance is available for crop losses from natural disasters and for livestock in the event of disease, natural disaster, or accident. Since its inception in 2005, the subsidised insurance system has considerably expanded. Investment assistance for agricultural production is offered through various forms and within various frameworks, some with a broader regional development scope.

Consolidation of the farm structure is a major undertaking of current agricultural policy

The re-allocation of resources, from low-productivity uses within agriculture to more productive uses within and outside the sector, is essential to achieve agricultural productivity growth. Farm structure policy works to activate this process directly, and, as such, is particularly important for Turkey, given the prevalence of small low-productivity family enterprises. The farm size structure has changed little since 1970: the last four agricultural censuses between 1970 and 2001 register almost the same average farm size for the country as a whole (around 6 ha), with the mid-point of total land distribution (50%-50% benchmark) falling under the same farm size class (10-20 ha). A farm holding most often cultivates several parcels – 90% of all holdings have more than one parcel, and 60% operate four or more (TÜRKSTAT, 2014; TÜRKSTAT, 2008). The transformation of the farm structure through large-scale land consolidation has recently become a major policy focus. Between 1961 and 2014, almost 5 million ha of agricultural land underwent consolidation, and an additional 9 million ha are to be consolidated by 2023. This makes in total almost 37% of the agricultural land. In addition to land consolidation, land regulations were changed in 2014 in order to prevent further land fragmentation by imposing minimal farm size requirements for farmland transfers.

Environmental sustainability has become an explicit policy objective and specific policy measures are emerging

From the perspective of agricultural productivity, the sustainable use of two principal natural assets – water and land – is central. The water issue is important due to Turkey's aim to expand irrigated agriculture. This requires long-term planning of water resource availability and use, as well as cost-efficient measures to improve water use efficiency, and incentives for balanced management and use across water users. Increased attention should be paid to the impacts of climate change on yields and the availability of water resources. In terms of water quality, the pressure imposed by excess nutrients and pesticides – while limited at present – could grow, posing a threat to health and the environment in the medium- to long-run. Turkey needs to pursue efforts to develop representative networks for the measurement and monitoring of water quality, and to target policies at the most affected regions. Soil erosion is a problem for agricultural productivity because of inappropriate soil management practices and overgrazing in some provinces. The dissemination of best practices through extension services and the adoption of cost-efficient agro-environmental measures should be part of policies to address these environmental concerns.

Although some environmental issues in agriculture – soil erosion, for example – are long-standing, they are progressively becoming an explicit agricultural policy concern. Since the mid-2000s, programmes benefitting from international assistance – the World Bank's Agricultural Reform Implementation Project (ARIP) and the EU Instrument for Pre-Accession Assistance Rural Development (IPARD) – have provided further impetus in this respect. The objective of the environmental sustainability of agriculture derives from broad national environmental objectives, and includes the efficient use and preservation of water and land in agriculture. Policies regarding the adaptation and mitigation of climate change are also developing. Policy transfers in favour of farmers' actions to achieve environmental sustainability have increased, such as the introduction of payments for soil conservation, concessional loans for the adoption of good agricultural practices, and organic farming. However, these transfers currently constitute a marginal share of total support to producers.

Various national and regional development programmes target rural areas and invest in agriculture and supporting infrastructure

Rural development has traditionally been inscribed into the overall development policy which has focused on large infrastructure projects. The current large regional development programmes – the South-eastern Anatolia Project (GAP), the Konya Plain Regional Development Project (KOP), the Eastern Anatolia Regional Development Project (DAP), and the Eastern Black Sea Regional Development Project (DOKAP), among other activities, concern land consolidation, irrigation and transportation in rural areas. Smaller regional development projects with rural aspects are implemented in various provinces, often with international assistance. In addition, support related to rural development is provided in the framework of social programmes for poverty alleviation.

The EU acquis goal has led to the emergence of a specific rural development framework, also concentrated on agricultural investments

A specific rural development strategy and programme has emerged in the context of Turkey's EU acquis. The priorities formulated in the current (second) Rural Development Strategy 2014-20 – together with investments in agricultural productive activities – target environmental sustainability and rural diversification, as well as the social advancement of rural areas in education, health, poverty reduction, and local institutional capacities. This Strategy lays the ground for the EU Instrument for Pre-Accession Assistance Rural Development (IPARD), which provides the EU co-funding. Investment support has been the dominant component of Turkey's IPARD-I (2007-13), and was largely directed to agricultural production and processing in the milk and meat sectors. These two sectors have low international competitiveness and receive substantial policy support. For these investments, IPARD's key focus is on upgrading local enterprises to EU environmental, hygiene, food safety and animal welfare standards. A far smaller share of IPARD's investments has been allocated to the diversification of rural activities and to the provision of technical assistance to potential private co-investors in order to enable them to take up this support. With the exception of very small changes related to the launch of the environmental component, IPARD-II (2014-20) will maintain the previous investment orientations up to 2020 (MOFAL, 2014).

The current producer support structure is unlikely to be effective in stimulating long-term productivity gains

A key characteristic of agricultural policy, from the perspective of productivity and innovation, is the extent to which producer support relies on measures that distort market conditions. To reach its policy objectives, the Turkish government relies mostly on altering prices that farmers face in output and input markets. This is evidenced by the high prevalence of transfers to individual producers in the total support to agriculture (82%) and the fact that 88% of these transfers originate from price protection at the border, price premiums, and variable input subsidies (OECD, 2016c). Price premiums are established on the basis of agro-climatic programming of production, which uses sustainability criteria (notably the sustainable use of water in crop growing). However, the extent to which these subsidies

allow producers sufficient flexibility to react to changing market conditions and to diversify production is not clear. Overall, 88% of producer support is tied to the production of specific commodities.

Such a support structure may have important short-term effects on the production levels of targeted commodities. However, this structure is highly distortive of market conditions in which the sector operates and, as such, is unlikely to increase producer incentives to employ production factors more efficiently. It may also impede the efficiency to drive production structure adjustments, and result in a less productive agricultural sector in the longer term. Furthermore, economic analysis shows that a large part of support originating from input subsidies, price premiums, and import tariffs is captured by input suppliers and lost as deadweight in the economic system. This support therefore has low efficiency in increasing producer incomes, while import protection also increases the cost of food.

Important productivity-enhancing general services have a small spending share and require a better balance

Another key feature of agricultural policy is the extent to which it is oriented towards supporting long-term productivity improvements by funding the systems which are essential for the efficient functioning of the entire agro-food system and which provide broadly spread benefits. Such policy orientation can be revealed by the level of funding allocated to the development of knowledge systems, infrastructure and institutions as a share of overall support to agriculture. Policy transfers for general services to the agricultural sector constitute a relatively small share of total support to agriculture (18%) and are strongly concentrated in infrastructure, with a major effort in land consolidation. Acknowledging the rationale for large investments in land and infrastructural improvements, there continues to be an important need for a more balanced provision of various public goods. Productivity-enhancing areas, such as agricultural knowledge, plant and animal health systems, and food safety, currently constitute a very small share of support to general services. Compared to these areas, transfers to State Economic Enterprises and agricultural co-operatives, in order to cover their deficits, absorb a significantly greater share of public resources.

Rural diversification and environmental objectives attract little resources

Despite the emergence of policy objectives and underlying measures which extend beyond the objective of increased production, the structure of support has remained largely unchanged since the early 2000s. Public resources oriented at long-term productivity, environmental sustainability and rural diversification, yet account for a minor share of government spending.

A re-orientation of policy away from supply and towards income growth is required

The high prevalence of support tied to the production of specific commodities follows from Turkish agricultural policy, which is in essence oriented at achieving certain supply targets established on the basis of commodity supply and utilisation planning. This approach is largely driven by a food security rationale, which is typically seen from the supply side and equated with food self-sufficiency. A broader and longer-term response to food security would be for policies to raise real incomes and combat poverty. Overall, food security would be more effectively tackled through a diversified policy approach: to increase output based on sustainable productivity growth; to develop and diversify the rural economy and reduce poverty more generally, including through private and public investments; to expand exports, where income opportunities exist for competitive producers; and to allow imports, which help to ensure that consumers have access to food supplies at international prices. A well-targeted food aid and enhanced safety nets would more effectively address temporary food insecurity for vulnerable people.

The time is favourable for such a re-orientation

The Turkish Ministry of Food, Agriculture and Livestock intends to formulate its new Strategic Plan for the mid-term, a framework that determines the structure of agricultural support and its underlying

instruments. This could be a new opportunity to advance analytical and administrative groundwork for a re-orientation of the existing producer subsidies towards a system that is more decoupled from production, and oriented towards supporting the productivity and efficiency improvements and thus farmers' incomes, rather than quantitative supply targets.

Recommendations for agricultural policy

- Consider re-orientating agricultural policies away from those with production targets and towards those which pursue improved agricultural efficiency and income growth, together with the sustainable use of natural resources.
- Underpin this policy re-orientation by allowing producers sufficient flexibility to react to market conditions; move away from support which alters output and input prices and from product-specific subsidies. Increase focus on investments in people (education and skills), strategic physical infrastructure, and agricultural innovation system that are responsive to the needs of producers and consumers.
- Move towards the more balanced distribution of public resources, including by down-sizing and targeting the eventual elimination of transfers to state economic enterprises and agricultural co-operatives; this will free up additional resources for agricultural knowledge, plant and animal health and food safety systems.
- Exploit the possibilities presented in the new national agricultural information system to generate more comprehensive and up-to-date evidence on agricultural productivity trends and its determinants.
- Improve the efficiency of water use in a combined effort to develop and modernise irrigation systems, to put in place formal, transparent and simple water-sharing mechanisms, and to ensure the financial viability of irrigation systems.
- Integrate climate change adaptation and mitigation as a cross-cutting aspect of agricultural and agri-environmental policies; develop a greater understanding of the impacts of climate change, at a local level if possible, ensure climate change monitoring which involves local stakeholders; raise climate change awareness amongst all stakeholders.
- Consider an assessment of existing subsidised agricultural insurance, with regard to its longer-term financial and actuarial soundness and in view of climate change risk; monitor subsidised insurance to ensure the provision of competitive services; equip farmers with a variety of risk management instruments, including accessible information, and adapted tax and social security mechanisms.
- Consolidate and enhance rural diversification activities across various agencies and within various programmes (for regional and rural development, labour, and education); consider a co-ordinated national rural diversification framework that focuses on the development of rural industries, including those based on agriculture as an input source; increase the emphasis on rural diversification in regional and rural development investments.

Enhance the outcomes and the impacts of agro-food innovation system

Important efforts have been made to foster the overall STI system and to align policies with the EU framework

All current strategic and planning documents in Turkey consider innovation-driven productivity growth to be the way towards national economic and social progress. The political commitment to foster competitiveness and build an innovative economy was strengthened in the early 2000s by the country's EU accession process. The alignment with the EU principles of STI governance has been the main driver of change for the Turkish STI system. The provisions of the "competitiveness and innovation" section of the Country Action Programme for Turkey's EU Pre-Accession Assistance have largely fed into the National STI Strategy and the underlying implementation documents. The concept of a Turkish Research Area, similar to the European Research Area, has been adopted, emphasising the synergies and co-ordination between national actors towards broadly-shared STI goals. A consultative approach to STI policy formulation and R&D planning has been promoted through stakeholder consultations and arrangements such as the Ministry's advisory board and technology platforms. Gross Domestic Expenditure on R&D rose from 0.51% of GDP in 2000-03 to 0.96% in 2011-14, with a 3% target set for 2023 (OECD, 2016d, TÜBİTAK, 2013). The policy aims to increase the number of researchers, their

performance, and international mobility; promote entrepreneurial and innovative activities in universities and university-industry co-operation; increase private R&D investments; and develop, promote and market technological products STI development in Turkey, however, has been advancing from a low base, and there is considerable room for improvement – when compared with the majority of OECD countries – on all key aspects of STI performance (OECD, 2014c).

The Agricultural Innovation System (AIS) functions as a part of the overall STI system

The National STI Strategy and its objectives to improve STI performance span across all economic sectors, including the agro-food sector. These cross-cutting objectives concern the development of human resources, the increased uptake of innovation, and cohesion. They also concern the better integration of SMEs into the STI system, the strengthening of R&D infrastructure, and international co-operation. The integration of the AIS into the overall STI system is also due to the centralised R&D planning and funding, and the cross-sectoral applicability of the main R&D support programmes.

Agro-food area is one of the national STI priorities

Food and agriculture – together with defence, aerospace, health, energy, and water – are identified as a priority area, requiring need-oriented R&D in order to accelerate its development. The current National Food R&D and Innovation Strategy (2011-16) elaborates on the STI objectives and priorities in the agricultural and food area, from the production of raw materials through industrial processing and value-adding at the local level, to food safety. Specific research topics include seed quality; productivity-enhancing agricultural technologies and technologies to meet the quality requirements of the food industry; environmentally-friendly farming; and advanced technologies for food processing, packaging, storage, transportation and food safety. The priorities formulated in this and other national planning documents establish the framework for agro-food R&D programmes and public funding. At present, R&D in Turkey is largely focused on crop issues, but livestock issues and the sustainable use of natural resources have recently increased in importance. Water, the irrigation in particular, as well as soil, and climate change are among the growing R&D activities.

R&D intensity in the agro-food sector lags behind other economic sectors and is low internationally

Turkish gross expenditures on agriculture R&D have more than tripled between 2005 and 2014 in real terms. The government has invested considerably in R&D infrastructure, including for agro-food research. Scientists and businesses in the agro-food area can receive project-based funding through a range of general schemes available from various public and semi-public institutions. Agro-food projects can also tap into the support targeted specifically to priority STI areas. The data on the overall funding by all these sources are partial, but for certain funding flows, agro-food appears to be an important recipient of support. Despite the growth in investments, the agricultural sector has lagged behind the rest of the economy in R&D spending relative to its size, with this gap becoming wider in most recent years. Among the 21 OECD and non-OECD countries for which comparable data is available, Turkish agriculture is one of the least R&D intensive (OECD, 2016d).

Agribusiness participation in R&D is increasing, aided by policy stimuli, but is still limited

Government and higher education sectors remain the principal performers of agricultural R&D, attracting 86% of total R&D spending in 2011-14 (OECD, 2016d). Business participation in R&D, although increasing, remains limited and may be one factor explaining the overall lag in the R&D intensity of the agro-food system. This is a feature observed across the world, but the low private participation in agro-food R&D in Turkey has specific factors. In many countries, business R&D comes from large national or multinational companies. However, small family farms dominate Turkish agriculture. SMEs dominate the food processing sector, and generally have limited capacity to invest in R&D. More broadly, Turkish agro-food companies do not typically perceive R&D to be part of their business growth strategies. Stimulating businesses to invest in R&D and adopt innovations is one of the government's policy orientations.

Incentives are provided to increase business R&D across all sectors through public grants, some of which are available specifically for the agro-food sector as one of the STI priority sectors. Public-private-partnerships are another instrument enabling private research to use public R&D infrastructure and personnel. Considerable concessions to firms employing R&D personnel above a set minimum number have recently been introduced to stimulate business R&D. These concessions apply to corporate income tax, the personal income tax of researchers and employer's social contributions. This may have the advantage over direct public R&D funding by providing firms with greater flexibility in relation to areas in which to research. At the same time, tax concessions are not as flexible a tool as public funding to direct business towards socially desirable R&D activities. R&D tax concessions linked to company's profits and the minimum number of R&D personnel may create bias against non-eligible R&D performers – such as smaller firms and start-ups, which do not generate sufficient profits or R&D employment.

IPR regulation has been considerably strengthened, while procedures and law enforcement require improvement

IPR legislation had been considerably strengthened in Turkey since the mid-1990s, with significant progress reflected in internationally-comparable IPR protection indicators (Park, 2008; Campi and Nuvolari, 2013). The government's 2016 Action Plan includes a new Patent Law which is intended to provide stronger support to high value added activities (OECD, 2016a). Nevertheless, IPR protection in Turkey has yet to reach the levels in those countries which are most advanced in this area. Issues are also raised concerning the high transactions costs associated with the execution of IP rights and law enforcement. These issues have contributed to the rating, by businesses, of IPR protection in Turkey as relatively low compared to that in the majority of OECD countries (WEF, 2015). IPR protection in the agro-food area faces the challenge of providing sufficient incentives to inventors (and investors), while making innovations more broadly accessible, for small farmers in particular.

Efforts are made to strengthen knowledge flows to farmers and industry

Different agricultural innovation system actors are engaged in supporting knowledge flows. The public system of agricultural extension in Turkey has a long history and continues to play the dominant role in transferring knowledge to producers. However, its resources (finance, staff, and infrastructure) are insufficient for the number of people involved in agriculture. There is need to increase the capacity of the public extension system and also to encourage non-government provision. In 2006, farm organisations, private companies and independent agricultural advisors were authorised to provide extension and consultancy services. The government ensures the training and certification of private extension providers and offers them financial support. In regions where strong agricultural co-operatives exist, these are active in agricultural research and are the main disseminators of innovations to farmers. University Technology Transfer Offices is a recent institution to facilitate the commercialisation of university R&D products through linking university research with business. Some of these functioning within the universities with large agricultural faculties are active in agro-food projects. However, these new institutions face constraints. The early-stage nature of university technologies diminishes the willingness and capacity of firms to take them up; in addition, companies may not be very aware of available domestic technologies, and instead tend to seek technologies abroad.

There have been rapid increases in R&D output, however further progress needs to be made with regard to its quality and impacts

Turkey's agro-food R&D outputs – patents, publications and international citations – have rapidly increased in the past two decades. Although representing partial evidence, these outputs suggest that the country remains a relatively modest agro-food R&D performer in international comparison (OECD, 2014d; SCImago, 2014). Having been active in the integration of international collaboration frameworks in the agro-food area, particularly at EU level, Turkey has yet to advance substantially in exploiting the potential of these frameworks.

Overall, Turkey has made substantial efforts since the early 2000s to build up its STI capacities and introduce new governance principles into the STI area, as well as new support instruments. The current National STI Strategy concludes in 2016. This is an important juncture for the evaluation of the current policies and support mechanisms to refocus policy orientations, if necessary. There remains considerable room for improvement on STI performance, in particular with regard to such dimensions as "quality" and "impacts" of STI.

Recommendations to strengthen direct incentives for innovation

- Increase the focus of the new STI strategy on the quality and relevance of R&D and innovation; enhance these criteria in the performance evaluations of scientists, projects, and institutions; pursue efforts to improve the coordination of R&D projects across various institutions and research groups.
- Maintain human capacity-building for STI as a principal orientation of STI strategy and secure the necessary resources for its implementation. Ensure that the R&D incentive structure does not lead to the misallocation of human resources across sectors that perform R&D – public, university, and private sectors.
- Make the STI policy more informed: establish regular STI policy evaluations; develop the underlying methodologies and procedures; build up supporting databases and ensure that they contain transparent and comprehensive information to analyse public resource flows and their effects, including by priority sectors, such as agriculture and the food industry.
- Broaden the evidence for the formulation of STI policy through innovation surveys which provide information on the characteristics of innovators, investigate their willingness and capacity to innovate and the main barriers to adoption of innovation; extend innovation surveys to cover the agricultural sector as well as industry.
- Continue to strengthen the consultative principle of STI policy: engage stakeholders at all stages of the policy cycle, including the identification of issues of importance and their prioritisation, the formulation of policy objectives, and policy monitoring and evaluation; ensure that agendas for consultations are sufficiently flexible to capture the policy alternatives as broadly as possible.
- Consider a clearer delineation and streamlining of responsibilities between government bodies in order to simplify the governance of STI, as an alternative to creating additional structures of inter-agency co-ordination.
- Enable increased R&D investment and R&D conduct by agricultural and food businesses; investigate the impediments to participation by these businesses in R&D compared to other economic sectors; consider actions to raise awareness amongst agricultural and food businesses of the opportunities for business development through R&D and innovation.
- Undertake an impact evaluation of tax incentives for business R&D in terms of their thematic focus, their association with national general and sectoral R&D priorities, and the alignment of incentives across R&D providers of different sizes.
- Raise IPR awareness amongst potential innovators, in particular from public R&D institutions; simplify procedures and regulations that protect IPRs, and strengthen law enforcement; exploit the flexibilities in country's international IP bindings in order to increase the availability of IP-protected products for adoption in the agricultural and food sector, including by small farmers and businesses.
- Strengthen feedback flows from local to higher levels of the public extension system in order to design extension programmes; consider increasing resources and staff to re-inforce the extension system at local level; continue encouraging the provision of extension services by private consultants.
- Exploit further opportunities for bilateral and multilateral co-operation in R&D and technology transfer, including within the European Research Area.

References

Campi M. and A. Nuvolari (2013), *IP Protection in Plant Varieties: A New Worldwide Index* (1961-2011), http://hdl.handle.net/10419/89567.

EC (2015), "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Turkey Progress Report 2015", European Commission, Brussels, 10 November 2015, SWD(2015) final, http://ec.europa.eu/enlargement/pdf/key_documents/2015/20151110_report_turkey.pdf.

MOD (2014), *The Tenth Development Plan 2014-2018*, Republic of Turkey, Ministry of Development, Ankara. www.mod.gov.tr/Pages/DevelopmentPlans.aspx.

MOFAL (2014), *Instrument for Pre-Accession Assistance Rural Development (2014 -2020)*, Republic of Turkey, Ministry of Food, Agriculture and Livestock, Ankara. http://ipard.tarim.gov.tr/admin/app_upload/Turkey_IPARD_Programme.pdf.

OECD. (2016), *OECD Economic Surveys: Turkey 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-tur-2016-en.

OECD (2016b), *OECD Economic Outlook 2016 Database*, https://stats.oecd.org/index.aspx?DataSetCode=EO.

OECD (2016c), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics* (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

OECD (2016d), *OECD Research and Development Statistics, Gross domestic expenditure on R-D by sector of performance and field of science*, http://stats.oecd.org/Index.aspx?DataSetCode=GERD_SCIENCE.

OECD (2015a), *OECD Trade Facilitation Indicators* (database), www.oecd.org/trade/facilitation/indicators.htm.

OECD (2015b), *OECD FDI Trade Restrictiveness Index* (database), www.oecd.org/investment/fdiindex.htm.

OECD (2015c), *OECD Tax* (database), www.oecd.org/tax/tax-policy/tax-database.htm.

OECD (2015d), Infrastructure Investment Indicators, OECD Publishing, Paris, https://data.oecd.org/transport/infrastructure-investment.htm.

OECD (2015e), *OECD Indicators of Employment Protection Legislation* (database), www.oecd.org/els/emp/oecdindicatorsofemploymentprotection.htm.

OECD (2015f), *Education at a Glance* (database), http://stats.oecd.org/?lang=en#.

OECD (2015g), "Turkey", in OECD, Education Policy Outlook 2015: ***Making Reforms Happen***, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264225442-32-en.

OECD (2014a), *OECD Economic Surveys: Turkey 2014*, OECD Publishing, Paris. http://dx.doi.org/10.1787/eco_surveys-tur-2014-en.

OECD (2014b), *OECD Indicators of Product Market Regulation* (database), www.oecd.org/eco/growth/indicatorsofproductmarketregulationhomepage.htm.

OECD (2014c), *OECD Science, Technology and Industry Outlook 2014*, OECD Publishing, Paris. http://dx.doi.org/10.1787/sti_outlook-2014-en.

OECD (2014d), *OECD Patent databases*, www.oecd.org/sti/inno/oecdpatentdatabases.htm.

OECD-WTO (2015) *Trade in Value Added (TiVA)* (database), https://stats.oecd.org/index.aspx?queryid=66237.

Park, W.G. (2008), "International Patent Protection: 1960-2005", *Research Policy*, No. 37, pp. 761-766.

SCImago. (2014), SJR — SCImago Journal & Country Rank. Retrieved 19 March 2014, www.scimagojr.com.

TÜBİTAK (2013), *Science, Technology, and Innovation in Turkey 2012*, The Scientific and Technological Research Council of Turkey (TÜBİTAK), Ankara.

TÜRKSTAT (2015*), Labour Force Surveys*, www.turkstat.gov.tr.

TÜRKSTAT (2014) *Statistical Indicators, 1923-2013*, Publication no: 4361, 2014, Ankara, pp. 169-171, www.turkstat.gov.tr/Kitap.do?metod=KitapDetay&KT_ID=0&KITAP_ID=160.

TÜRKSTAT (2008), Tarımsal İşletme Yapı Araştırması 2006 [Agricultural Business Structure Survey 2006], *Haber Bülteni [News Bulletin]*, No 196, 17 Aralık 2008. (Farm Structure Survey 2006).

WEF (2015), *The Global Competitiveness Report 2015-2016: Full Data Edition*, World Economic Forum, Geneva 2015, http://reports.weforum.org/global-competitiveness-report-2015-2016/.

World Bank (2016), *Doing Business 2016: Measuring Regulatory Quality and Efficiency,* World Bank and the International Finance Corporation, World Bank Publications, Washington, DC. www.doingbusiness.org/reports/global-reports/doing-business-2016.

Chapter 2

OVERVIEW OF THE FOOD AND AGRICULTURE SITUATION IN TURKEY

This chapter outlines the overall economic, social and environmental context in which the food and agriculture sector in Turkey operates, and the natural resource base upon which it relies. It begins with a discussion of the challenges and opportunities for agriculture and the food complex. It then provides the general natural and economic characteristics; shows the importance of the agricultural sector in the economy; outlines the main structural characteristics of agriculture and the food sector; and analyses the main trends in agricultural productivity and sustainability.

2.1. Challenges and opportunities for the agriculture and food system

The agro-food sector is an important part of the Turkish economy with a high potential to contribute to the country's overall economic development. Turkey is reasonably well endowed with land and water, and its climate allows for a diversified agriculture. With its big population, there is a large domestic market, while population growth and urbanisation imply further increases in the scale and scope of domestic food demand. Turkey's favourable geographical location also provides access to large external markets in Europe, the Middle East, and North Africa.

The diversity of agricultural production creates opportunities to tap into different and new product niches, in particular the higher-value horticulture where Turkey has a comparative advantage in primary production and modern processing know-how. Technology advances in processing could also open markets for products where Turkey is not competitive in primary products but is in their processed forms, as evidenced by the recent rise in exports of processed cereals. Organic production represents another opportunity, given the relatively low overall intensity of agriculture with respect to land and that some organic technologies may be well suited to a small-scale organisation and abundant labour. By opening food markets that have a higher value, organic farming may make some segments of the country's small-scale farming more profitable.

The ability to capture these opportunities will largely depend on productivity growth in the agro-food sector, including where Turkey lags in international competitiveness. Productivity in agriculture in Turkey, as measured by the agricultural output per worker, is substantially below productivity in the non-agricultural sectors of its economy, and this gap is high in comparison with some of its trade competitors. Although the labour productivity gap in Turkish agriculture has been narrowing over the first half of the 2000s, progress seems to have recently stagnated.

The fundamental challenge to agricultural growth in Turkey is to allow labour resources to be re-allocated to more efficient uses within and outside this sector. This is a long-term and multidimensional process, which depends on the overall economic growth, including more equal development across country regions. It also requires significant private and public investment in rural diversification. These investments need to be coupled with a comprehensive human development effort to enable rural people to acquire the necessary knowledge and skills to do jobs outside of agriculture.

The overall economic conditions determine agricultural growth in Turkey from another perspective. The sector relies strongly on external sources for agricultural inputs, both to produce them internally and to obtain them as finished goods. The sector is thus exposed to cost risks from the fluctuations in exchange rate and prices for intermediates in international markets. Domestic cost pressures also come from the development of industrial, infrastructure and energy sectors which compete with agriculture for land and skilled labour. The ability of agriculture to attract resources will depend on the extent to which it will be able to generate competitive returns.

The establishment of modern food chains is another distinct challenge. The integration of agriculture with downstream activities requires a significant boost. The costs of collection, marketing and processing are relatively high. The share of primary products that flow into industrial handling and processing is relatively low, and there are high post-farm losses. In many food segments, vertical contracting is not wide-spread. There is a significant presence of semi-formal and low-technology activity across all stages of the food chain which hinders the implementation of appropriate standards, technical and food safety regulations. Well-developed food chains are a prerequisite for future agricultural growth as they increase the cost and quality competitiveness of domestic products, and enable to channel these to larger and more diverse markets.

As elsewhere, agricultural productivity growth in Turkey needs to be reconciled with environmental and climate change concerns. There is considerable room to improve the efficiency of input use (fertiliser and pesticides) and irrigation water, as well as to fight against soil erosion. The projected increase in urban and industrial water needs, and the expected adverse effects of climate change on yields, especially due to droughts, reinforce the need for action in this area.

2.2. General natural and economic context

Turkey is a large transcontinental Eurasian country which is relatively well endowed with agricultural resources (Table 2.1). It ranks among the top 50 countries by per capita availability of arable land and has reasonable freshwater resources per capita, ranking 28th in the world and fourth among OECD countries (OECD, 2013). Turkey is a Mediterranean country, but its diverse landscape, in particular the mountains along the coasts, lead to significant regional variations in climate. Relatively mild conditions in the coastal areas change into a more continental climate on the Anatolian plateau, which has hot summers, cold winters and limited rainfall.

Table 2.1. Contextual indicators for Turkey

	GDP	GDP per capita	Population	Total land area	Agricultural land	Arable land per capita[1]	Freshwater resources[1]	Freshwater resources per capita[1]
	Billion PPP USD	PPP USD	Million	'000 km2	'000 ha	ha	billion m3	m3
	(2014)	(2014)	(2014)	(2013)	(2013)	(2012)	(2013)	(2013)
Turkey	**1 503**	**19 610**	**77**	**770**	**38 423**	**0.28**	**227**	**3 029**
Turkey's world ranking	(17)	(65)	(18)	(36)	(30)	(42)	(28)	(81)
OECD	49 688	39 213	1 264	34 341	1211 805	..	..	..
EU-28	18 758	36 819	508	4 238	186 356	..	..	..
United States	17 348	54 353	319	9 147	405 437	0.49	2 818	8 914
Canada	1 600	45 029	36	9 094	65 251	1.32	2 850	81 071
China	18 015	12 166	1 394	9 425	515 358	0.08	2 813	2 072
Mexico	2 160	18 046	120	1 944	106 705	0.19	409	3 343
Brazil	2 974	15 065	199	8 358	278 808	0.37	5 661	28 254
South Africa	705	13 032	53	1 213	96 841	0.23	45	843

.. not available

1. World Bank's World Development Indicators (2015), http://data.worldbank.org.

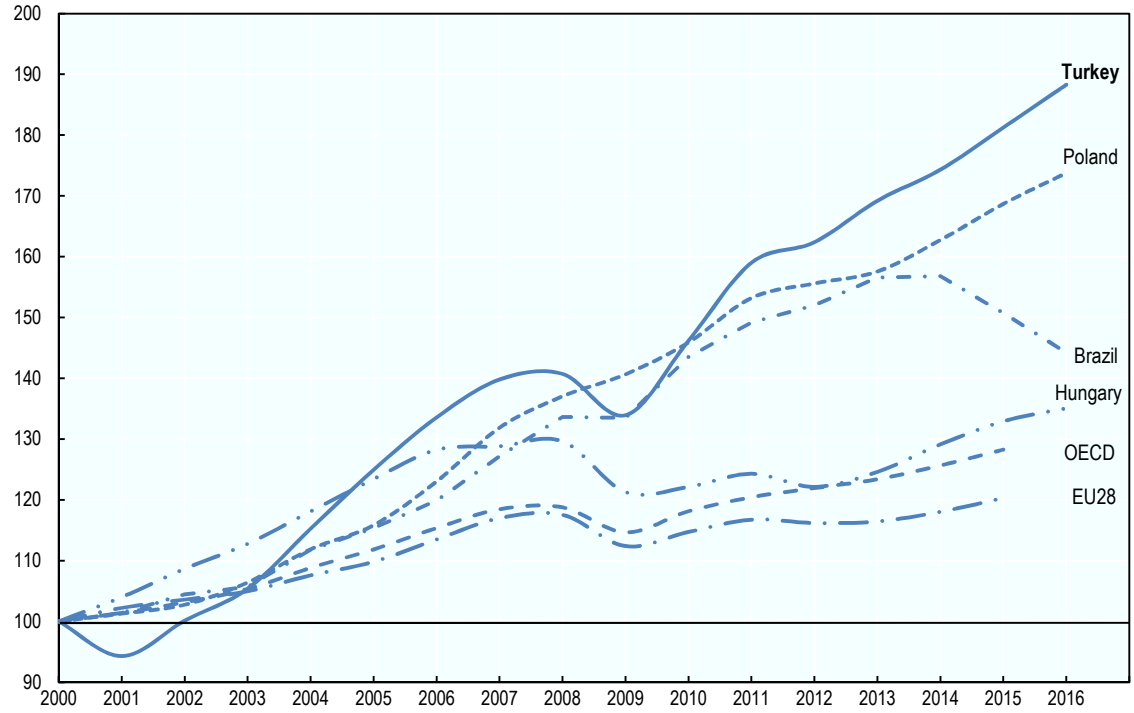
Source: OECD (2015b), *Agricultural Policy Monitoring and Evaluation 2015,* http://dx.doi.org/10.1787/agr_pol-2015-en.

Turkey has a growing population, ranking 18th worldwide, with more than half below the age of 30. The World Bank classifies Turkey as the 17th largest world economy and as an upper-middle income country in terms of per capita GDP (Table 2.1). The International Monetary Fund defines it as an emerging economy, while the political science and economic literature characterises Turkey as a newly industrialised country, placing it between the developing and first-world classifications.

The Turkish economy is dominated by the service sector which generates almost two-thirds of its national GDP (OECD, 2016c). It is dependent on external energy sources: in 2013 the energy deficit accounted for about three-quarters of the country's current account deficit (OECD, 2014b). Following the macroeconomic and institutional reforms in the early 2000s which were conditioned by the IMF and the World Bank, the Turkish economy accelerated and grew faster than the OECD area as whole and the European Union (Figure 2.1). This growth has been supported by a broadening range of the economic activity, including across the regions. The poverty rate fell from 30% in 2002 to 1.6% in 2014 (WDI, 2015), and education and public services have become more accessible to the poorer people.

Figure 2.1. Turkey's real GDP growth: International comparison

At purchasing power parity, 2000=100



Note: Data for OECD and EU28 from System of National Accounts.

Source: OECD (2016c), OECD System of National Accounts, OECD.Stat http://dotstat.oecd.org/?lang=en and OECD (2016h), *OECD Economic Outlook 2016* database, https://stats.oecd.org/index.aspx?DataSetCode=EO.

StatLink http://dx.doi.org/10.1787/888933389440

The economic dynamics since 2000, however, has been uneven, with the high GDP growth between 2002 and 2006 becoming more volatile thereafter. According to the Conference Board (2015), labour productivity growth slowed down significantly in the second half of the 2000s and the overall Total Factor Productivity decreased. Evaluating Turkey's economic performance since the early 2000s, Acemoglu and Ucer (2015) distinguish a turning point around 2007 when the speed and quality of economic growth began to decline, which they largely attribute to Turkey moving away from the reform path taken in the early 2000s. Economic growth has been further constrained by domestic and external political instabilities over the past two years.

Turkey has yet to reach the OECD average levels of economic and social development. Its labour productivity is less than 50% of the US level (OECD, 2016f), with a greater part of the workforce employed in low-productivity sectors, such as agriculture, suggesting a substantial potential for productivity growth (OECD, 2014b). The country ranks 72nd on the United Nations Human Development Index (UNDP, 2015) and has a disposable per capita income at 54% of the OECD average. Despite the impressive poverty reduction in Turkey, income inequality has recently tended to increase, and it is second highest among OECD countries (OECD, 2016a; OECD, 2016e).

2.3. Role of agriculture in the economy

Agriculture has traditionally been an important part of the Turkish economy. Its GDP and employment shares are still high relative to other OECD countries (Table 2.2), although they have been declining. Absorbing nearly a quarter of total employment nationally, agriculture provides over 40% of jobs in the West Black Sea region, Middle East Anatolia, East Black Sea, and Northeast Anatolia (TÜRKSTAT, 2015c). The food and beverage industry is one of the largest manufacturing sectors, adding another 2.5% to overall employment (Eurostat, 2015). Agriculture is also important from a current account perspective as Turkey's positive net agro-food trade balance contributes to reducing its overall trade deficit.

Agriculture is a large user of natural resources (Table 2.2). The sector exploits almost half of the country's land and uses nearly three-quarters of national freshwater withdrawals. The rise in irrigation has increased water stress and the risk of soil erosion. Agricultural activity is estimated to produce overall surpluses of nitrogen and phosphorous, but in some regions it may be associated with nutrient deficits. Approximately 7% of Turkey's greenhouse emissions originate from agriculture.

Table 2.2. Importance of primary agriculture in the national economy, 2014 or latest available year

Percentage

	Gross Value Added	Employment	Exports	Imports	Total land area	Total water withdrawals
Turkey	**7.4**	**23.6**	**11.2**	**6.0**	**49.9**	**73.8**
OECD	**2.1**	**4.6**	**10.6**	**8.9**	**39.5**	**30.8**
EU28	1.4	3.5	11.3	10.5	43.0	19.3
France	1.5	2.5	13.3	8.8	52.7	12.4
Brazil	4.4	14.2	36.6	4.7	33.0	60.0
China	10.0	34.8	2.2	6.3	54.8	64.6
India	18.0	47.2	11.8	4.6	60.3	90.4
Indonesia	13.4	35.1	16.1	9.8	31.2	81.9
South Africa	2.3	4.6	10.7	6.4	79.4	62.7

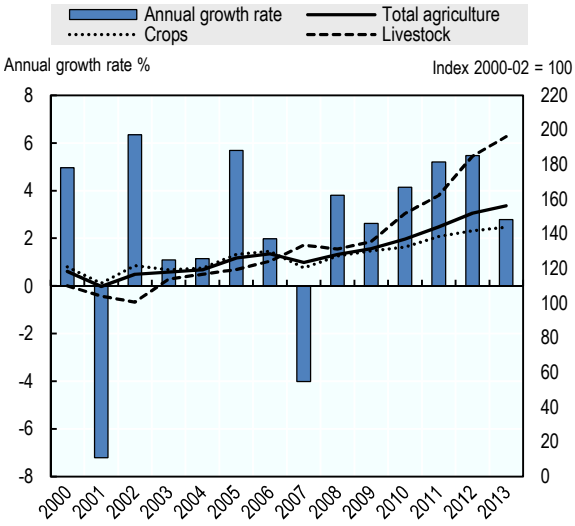
Source: OECD (2016c), OECD System of National Accounts, OECD.Stat, http://stats.oecd.org/, UN Comtrade (2015), On-line database, UN. http://comtrade.un.org/, FAO (2015), AQUASTAT On-line database, FAO, http://www.fao.org/nr/water/aquastat/dbase/index.stm and FAO (2016), FAOSTAT database, FAO Publications, Rome, http://faostat.fao.org/.

2.4. Characteristics of agriculture and the agro-food sector

Agricultural production

Turkey was the world's seventh largest agricultural producer in 2013 (FAO, 2016). Agricultural output has been growing steadily since 2001, with the exception of 2007 and 2014 due to severe drought (Figure 2.2). Overall growth was largely driven by livestock production, with production shifting from crop to livestock products, which now account for 51% of total output value (Figure 2.3). Turkey, however, remains a large crop producer, particularly of horticultural products; it is the top world producer of hazelnuts, cherries, apricots, figs, and quinces (FAO, 2016).

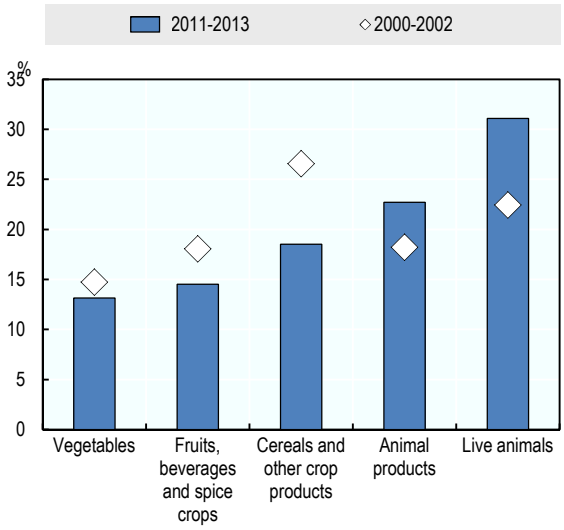
Figure 2.2. Turkey's agricultural output growth, 1990-2013



Source: FAO (2016), FAOSTAT database, FAO Publications, Rome, http://faostat.fao.org.

StatLink http://dx.doi.org/10.1787/888933389450

Figure 2.3. Value of agricultural production by key commodity groups

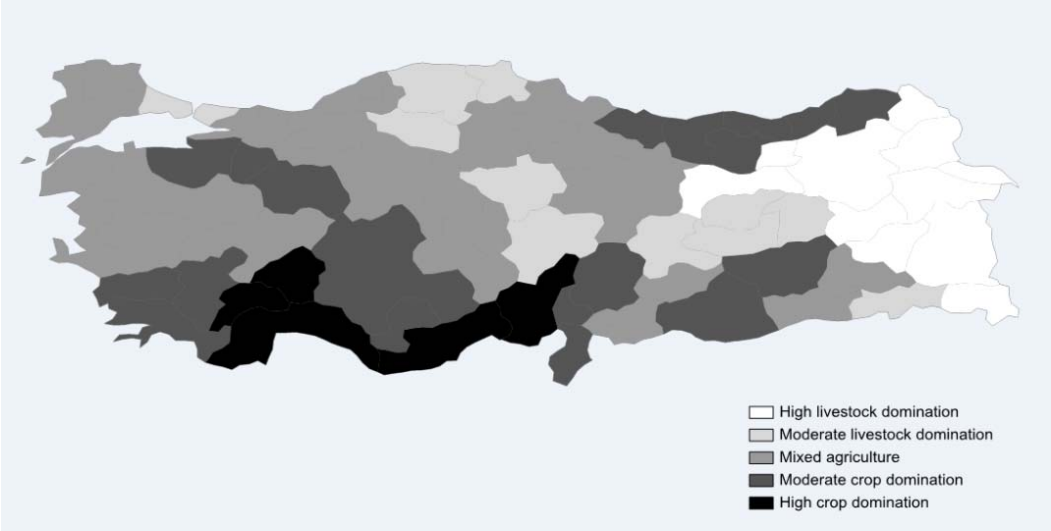


Source: TÜRKSTAT (2015f), Value of Crop and Animal Production, Agricultural Prices and Economic Accounts www.turkstat.gov.tr/PreTablo.do?alt_id=1004 (accessed on 25 June 2015).

StatLink http://dx.doi.org/10.1787/888933389464

A considerable variation in climate and geographical reliefs results in a diversified agricultural production, differences in agricultural production structure across regions, and their different contribution to the national agricultural output (Figure 2.4). The agricultural growth potential in the north-eastern and eastern regions is limited by less favourable natural conditions – higher altitudes with lower temperatures. These regions rely predominantly on animal husbandry, whereas crop production dominates in the southern and western regions with their milder climate. The central parts of Turkey tend to have mixed agriculture (TÜRKSTAT, 2015e; OECD, 2011).

Figure 2.4. Regional specialisation of agriculture, 2012-14



Note: The regional specialisation is defined in terms of the shares of crop and livestock production in their aggregate value.

Source: TÜRKSTAT (2015f), Value of Crop and Animal Production, Agricultural Prices and Economic Accounts (accessed on 25 June 2015).

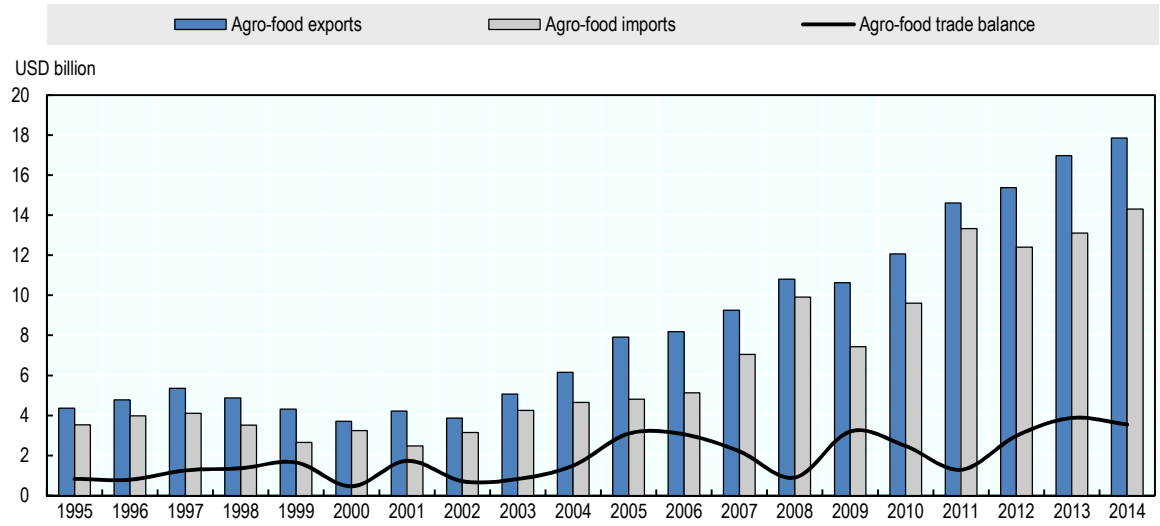
Agro-food trade

Turkey is a net exporter of agro-food products. They account for slightly over 10% of total Turkish exports and 6% of total imports (2012-14). The value of agro-food exports has more than quadrupled between 2002 and 2014. This did not increase the positive agro-food trade balance, however, as imports were also growing fast to meet domestic demand (Figure 2.5).

Turkey's agro-food exports are highly concentrated on fruits and vegetables: in fresh and processed forms they constitute 41% of total exports (2012-14). Processed cereals and products of milling is the second largest and rapidly growing group (15% of total agro-food exports). Agro-food imports are also concentrated on a few groups: cereals, oilseeds, animal fats and oils, and food residues for animal feeds account for around two-thirds of agro-food imports (TÜRKSTAT, 2015b). The European Union is the main origin and destination for Turkish agro-food products. Since the late 2000s, the Middle East and North Africa have become growing markets for Turkey (UN Comtrade, 2015).

Trade reveals Turkey's comparative advantage in agro-food production. The Revealed Comparative Advantage (RCA) indicator compares the country's share in world agro-food exports with its share in world exports of all goods. Turkey's RCA is estimated at 1.54 for agricultural goods (2009-11). The ratio above unity indicates its comparative advantage in agriculture, which is close to its neighbouring peers in agriculture, Greece and Spain. The RCA at 0.97 for food products, in contrast, suggests that in this activity Turkey has a less competitive stance overall (Figure 2.6). The RCAs estimated for individual commodities show that Turkey has a strong advantage in horticultural production, fresh fruit for consumption being particularly competitive, but for all other agricultural product groups it exhibits a disadvantage (see Annex 2.A1 for further details).

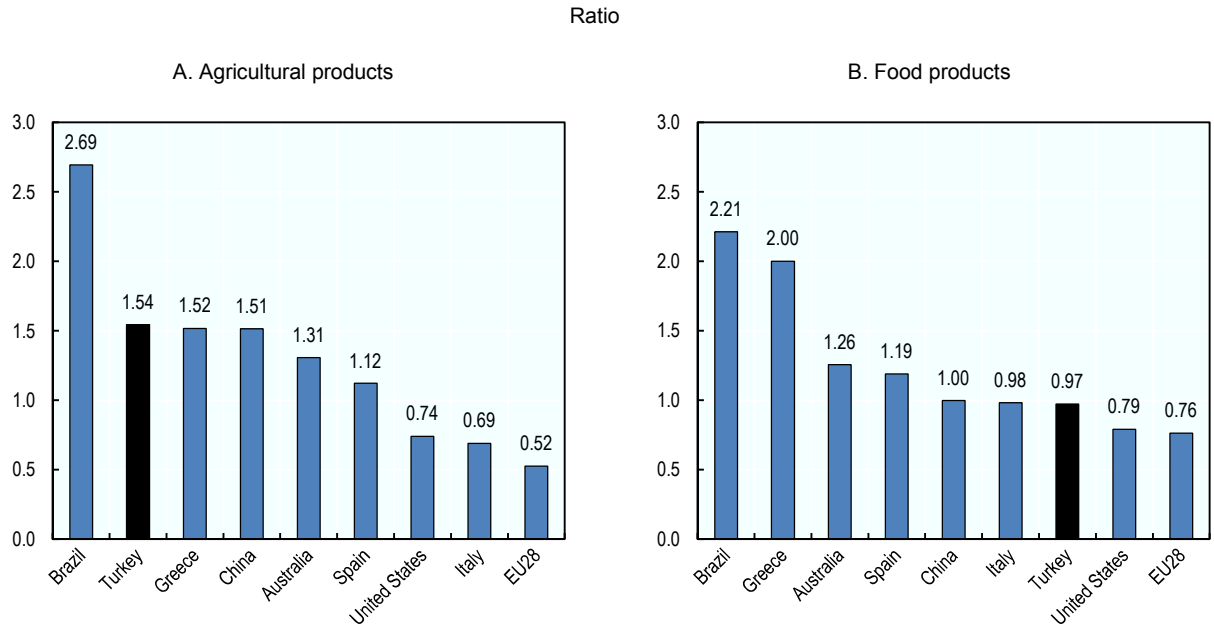
Figure 2.5 Turkish agro-food trade, 1995-2014



Source: UN Comtrade (2015), On-line database, UN. http://comtrade.un.org/.

StatLink http://dx.doi.org/10.1787/888933389471

Figure 2.6. Turkey's revealed comparative advantage in agriculture and food production, 2009-11



Source: OECD (2016d), *OECD-WTO Trade in Value Added (TiVA)* database, http://stats.oecd.org/Index.aspx?DataSetCode=TIVA2015_C1.

StatLink http://dx.doi.org/10.1787/888933389482

Structure of the food and agricultural sectors

Labour situation in rural areas

Turkey's total population has been growing at an average rate of 1.8% per year since 1970, and doubled by 2014. The urban population has quadrupled during this period, surpassing the rural population. Urban migration, mostly from the eastern to north-western areas where major cities are located, absorbed some labour from rural areas. Nevertheless, population growth kept the number of those living in rural areas relatively stable since the 1990s. Today, the rural population accounts for 27% of Turkey's population (WDI, 2016).

Agriculture is the principal employer in the rural economy. Although services are becoming more important as a rural activity, the majority of the employed rural population (60%) work in agriculture. The north-eastern regions have the least diversified rural employment (TÜRKSTAT, 2015c). Unpaid family workers and self-employed dominate, accounting for 47% and 42% of those working in agriculture (TÜRKSTAT, 2015c). Overall, Turkey's population is young, but the share of those above 34 years is higher in small towns and villages, suggesting that agricultural employment may be older than in other economic sectors, although no data is available on the age structure of agricultural employment. The sector's human capital is low, particularly for women, who constitute nearly half of agricultural workers (Chapter 4). Since the ability to find jobs elsewhere is likely to depend significantly on age and education (Burrell, 2005; Larson and Mundlak, 1995), the re-allocation of labour away from agriculture is hindered. These factors also impede on technological and technical efficiency change; for example, during OECD field trip in Turkey, rural extension specialists noted that older farmers are less likely to engage in new technologies.

Farm structure

Around 3 million farms are estimated to operate in Turkey. The holdings between 2 and 5 ha are the most numerous, but those with 10-20 ha occupy the largest share of total land. Almost 60% of farms

operate an area of less than 5 ha and account for less than 20% of total area, while less than 2% of farms of over 50 ha occupy more than 10% of the land (Figure 2.7.A).[1] Farm size distribution varies considerably across regions.

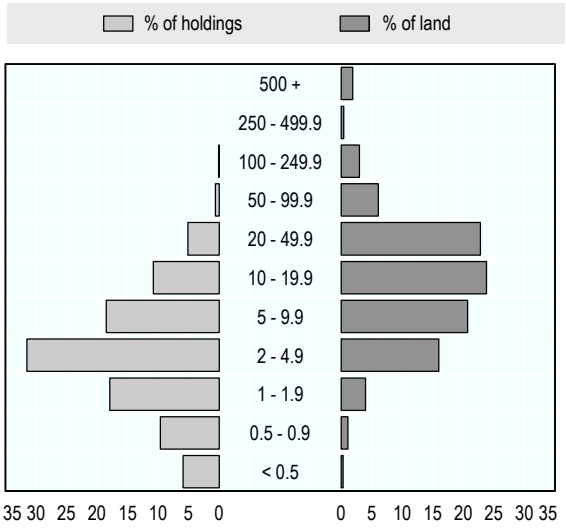
Despite a certain concentration of land in larger holdings, the farm structure is broadly based on a small family enterprise. This contrasts with countries which have a distinctly dualistic agriculture, e.g. Brazil, where numerous smallholders are only minor agricultural resource users, while large farms exploit an overwhelming portion of land (Figure 2.7.B).

A typical farm in Turkey is owned and operated by a single household, with three-quarters of households using only land which they own. Those with own and other's land account for 13% of the farm number, but this group is double that share if total farm area is considered. Farms which only rent land are relatively rare. A farm holding most often cultivates several parcels – 90% of all holding have more than one parcel, while over 60% operate four or more parcels. The latter group accounts for almost three-quarters of total land in farm holdings (TÜRKSTAT, 2008).

The small-family-farm structure in Turkey is often connected to the inheritance provisions of the 1926 Civil Code which stipulated the physical partitioning of land among heirs. However, since at least the 1970s, the farm size structure in Turkey has seen little change (Akder, 2015). The last four agricultural censuses between 1970 and 2001 register almost the same average farm size for the country as a whole (around 6 ha) and the mid-point of total land distribution which falls within the same farm size class (10-20 ha).[2] Furthermore, the group of smaller farms has narrowed with the shares of farms below 5 ha slightly decreasing both in total number and in total land area.

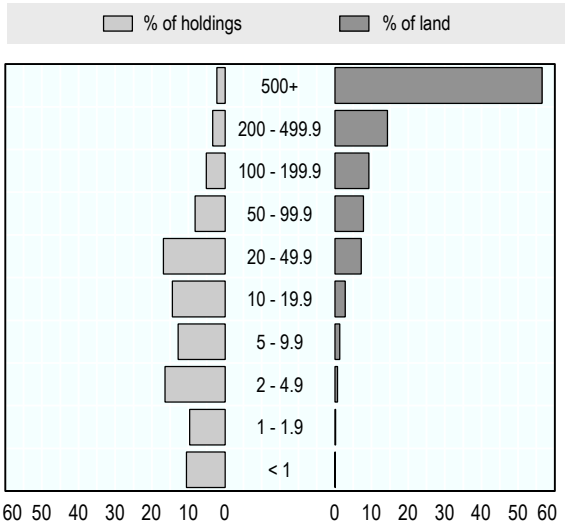
Figure 2.7 Distribution of farm number and agricultural area by holding size

A. Turkey, 2001



Source: TÜRKSTAT (2014) Statistical Indicators, 1923-2013, Publication no: 4361, 2014, Ankara, pp. 169-171, http://ec.europa.eu/eurostat/web/ess/-/turkey-statistical-indicators-1923-2013.

B. Brazil, 2006



Source: IGBE (2006), Censo Agropecurio 2006, Ministério do Planejamento, Orçamento e Gestã, Instituto Brasileiro de Geografia e Estatística, Rio de Janeiro.

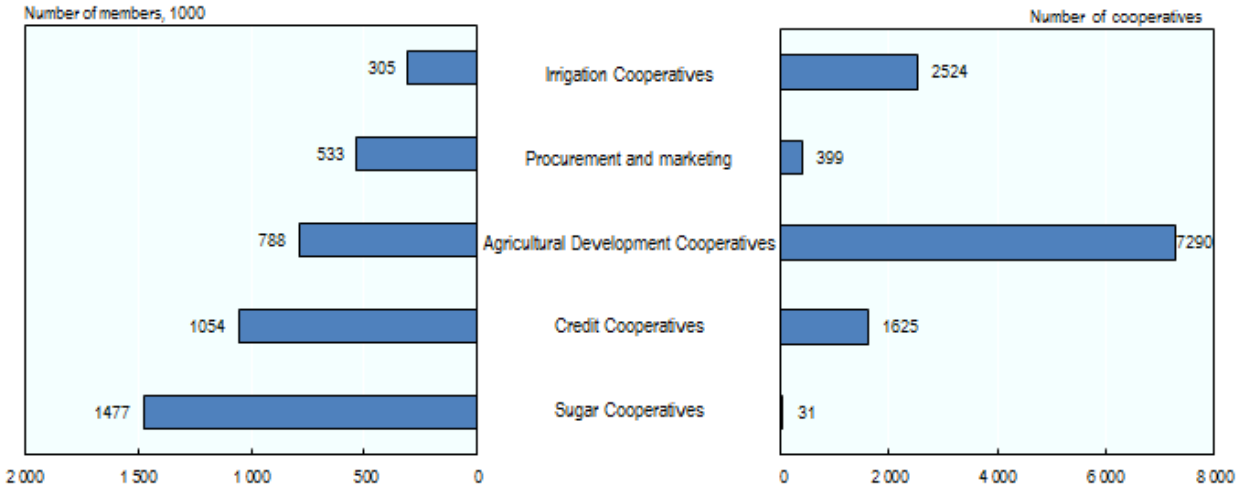
StatLink http://dx.doi.org/10.1787/888933389499

The 2001 Agricultural Census reports there is a high dependence of rural households on agriculture. Around 66% of rural household members over nine years of age were occupied in agriculture, with 86% of these people having no other activity outside agriculture. Of those 14% who had off-farm employment, only half had non-agricultural activity as their main occupation.[3] According to a World Bank survey in 2004, rural households derived on average 78% of their income from agriculture, a share ranging from 63% up to 90% across different regions (Çakmak, 2007).

Upstream and downstream industries

Given the small family-farm agriculture, farmer co-operatives are prominent structures in the agro-food system (Figure 2.8). As institutions that integrate primary producers into the agro-food chain, cooperatives can develop into vertical operations across input supply, production and food processing. Around 12 000 primary agricultural cooperatives of various types operated in 2014, constituting 14% of the total number of cooperatives in Turkey. The most numerous are agricultural development cooperatives, which often focus on a particular development subject. Irrigation cooperatives deal primarily with ground irrigation, while surface irrigation is usually managed by water users' associations. Credit cooperatives can be multi-functional and, beyond their main credit activity, can be engaged in production, marketing and services. Sugar cooperatives are organised around sugar processors, supplying members with inputs, machinery and equipment. This group has the largest membership but concentrated in a small number of establishments. Finally, procurement and sales cooperatives are typically focussed on exported products and are more frequent in coastal areas. Cooperative unions at the national and regional levels act as apex institutions. Agricultural cooperation generally performs below the potential this institution may have in supporting a more modern and inclusive agriculture (Box 2.1).

Figure 2.8. Agricultural cooperatives in Turkey by types, 2014



Source: MOFAL (2016a), Tarim Reformu Genel Mudurlugu- Tarimsal Orgutlenme Tablosu [General Directorate of Agriculture Reform- Agricultural Organization Table]. Retrieved February 24, 2016, from Gida Tarim ve Hayvancilik Bakanligi (Ministry of Food Agriculture and Livestock), www.tarim.gov.tr/TRGM/Belgeler/Tar%C4%B1msal%20C3%96rg%C3%BCtlenme/Tar.%20%C3%96rg%C3%BCtlenmeTablosug%C3%BCncel%200-01.02.2016%20.pdf.

StatLink http://dx.doi.org/10.1787/888933389502

Box 2.1. Issues of agricultural cooperation in Turkey

The government has historically propelled and patronised cooperative organisation in Turkey. Cooperation has been viewed as instrumental for economic and social development, in particular for small farmers. However, agricultural cooperatives today suffer weaknesses which may partly be related to or perpetuated by government support.

Many agricultural development cooperatives exist formally, but in practice do not function. The diagnosis of the situation is difficult, however, because the monitoring of these organisations is weak and there is no screening between good performers and practically dormant cooperatives. Poor management is a serious problem and is a major reason for weak performances. Although the motivation and willingness to cooperate might be there, a lack of training or relevant education results in the lack of cooperative leadership or planned actions. Another reason for weak performances is the limited awareness about cooperation and insufficient training. The activities to create awareness amongst local publics on the advantages of cooperation have been limited, and most likely, ineffective. Cooperatives themselves do not benefit from systematic and structured training and learning programmes. Other issues are the poor financial conditions and financial management. Cooperatives are often insufficiently capitalised since membership fees are too low to cover even basic operational expenses. This issue is acute in cooperatives which have lost members due to rural out-migration. Cooperation between cooperatives is also weak, limiting the benefits which arise from exchanging experiences. Many cooperatives provide little information on their activities, particularly on financial matters, while their members rarely attend cooperative meetings (Okan and Okan, 2013).

In recent years, certain types of support in the livestock sector were provided only though cooperatives. This prompted farmers to organise cooperatives with narrow objectives that lacked long-term purpose. Such establishments often disappeared once the support ceased. A study by Okan and Okan (2013) found that about two-thirds of livestock cooperatives which were established to receive genetically-improved cattle under a government programme have since disappeared. Membership in a cooperative as a condition for the provision of support distorts incentives for cooperation, as well as some of its basic principles.

The weaknesses of cooperation in Turkey are characteristic not only to those operating in food and agriculture. The Turkish Cooperatives Strategy and Action Plan for 2012-16 (MOCT, 2012) identifies a range of economy-wide government actions to improve the performance of cooperatives. They concern areas such as: public service provision for cooperatives; training, consultancy, information and research; capital structure and access to credit; revision of the auditing system; management capacity building; and alignment of cooperative legislation with international standards. However, the most important challenge would be to depart from viewing cooperatives as parastatal institutions and to allow true cooperation principles to drive their establishment and operation.

Source : Akder, H.A. (2015), "Farm Structure of Turkish Agriculture, Structural Adjustment and Rural Development Policy", Consultant report prepared for the OECD; Okan, N. D and C. Okan (2013) *An Overview of Cooperatives in Turkey*, FAO Regional Office for Europe and Central Asia, Policy Studies on Rural Transition, no 2013-3.

State Economic Enterprises (SEEs) is another distinct structure in the upstream and downstream segment of the Turkish agro-food system. Due to past reforms, they have lost their monopoly or monopsony powers, but continue to maintain important market shares. Seven SEEs currently operate in marketing, manufacturing, and trade in products such as grains, sugar, tea, livestock products, tobacco, alcoholic beverages, as well as agricultural inputs (OECD, 2011).

Agricultural co-operatives and SEEs carry out agro-food wholesaling and have traditionally acted as purchasing agencies for the market price regulation. The commissioners appointed by the government are another type of wholesaler. Growers are obliged to sell through these agents, but are free to choose amongst them. Commissioners' services in terms of grading and sorting are generally not well developed and they tend to mix supplies from different small suppliers to create enough volume. In general, Turkish wholesale markets do not play an important role in the development of quality standards and transparency of price formation (Berkum van, 2005).

Food and beverage processing is a major post-farming activity and an important sub-sector of Turkish manufacturing, accounting for 12% of the value added and 14% of employment in this industry (MOSIT, 2014). Forty-one thousand businesses are engaged in these activities. There are numerous SMEs along with a relatively small number of large private and state companies, some of which belong to the top-500 group of Turkish businesses.[4] In 2012, 16 of 29 food and beverage sub-sectors had "very high" or "high" concentration ratios.[5] Bakery and vegetable processing are the least concentrated food processing activities (TGDF, 2014). There is evidence of weak integration between primary agriculture and processing. On average, only 30% of primary production is estimated to be directed for processing

and the capacity utilisation of food processors is at 50%-60% (Tosun et al., 2013). Processors purchase most of the primary products on spot as contracting is not yet widespread, with the exception for some fresh horticultural products and sugar (Berkum van, 2005).

The structure of the downstream industries generally reproduces the overall highly segmented business structure, where low-productivity small and medium firms operate around a small core of modern, high-productivity enterprises.

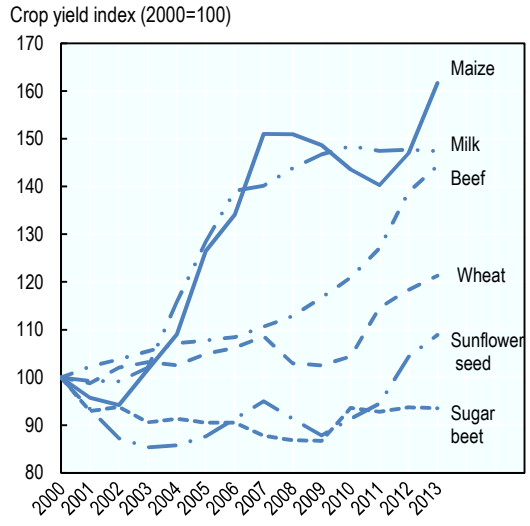
2.5. Agricultural productivity and sustainability trends

Agricultural productivity trends

Turkish agriculture has seen improvements in crop and animal yields since 2000, reflecting the use of better seeds, technologies and increased mechanisation (Figure 2.9). The yields of principal crops and livestock moved closer to the average levels in the European Union, while they surpassed those levels for sunflower and maize. Still, the yields in some key sectors, such as wheat and dairy remain less than half of the EU average (Figure 2.10).

Agricultural productivity improvements are also evident relative to labour input: in 2014, one person employed in agriculture generated a value almost three-quarters higher in real terms as compared to 2000. The gap between labour productivity in agriculture and the non-agricultural economy has narrowed. This catch-up occurred mostly in the first half of the 2000s, but has since lost momentum. Labour productivity in non-agricultural sectors was approximately three times the level in agriculture in 2012-14, a level reached by the mid-2000s (Figure 2.11). This gap is much larger in Turkey than in some other OECD economies, but not as important as in the People's Republic of China (hereafter "China") or Brazil. However, unlike Turkey, Brazil continued since the mid-2000s to catch up in agricultural labour productivity; the productivity convergence continued also in China, although to a lesser extent (Figure 2.12).[6]

Figure 2.9. Trends in crop and livestock yields in Turkey, 2000-13

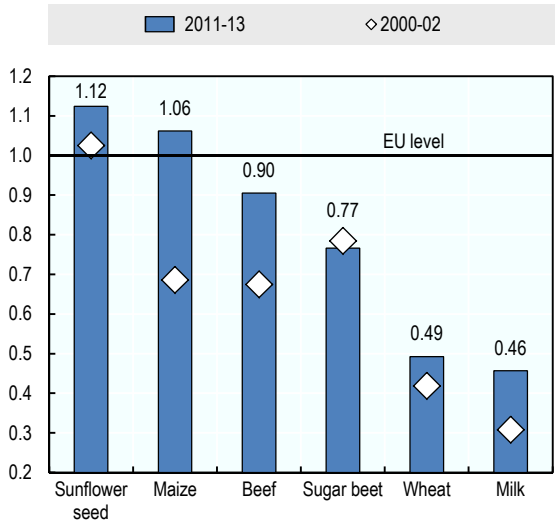


The indexes are based on smoothed three-year yield averages.

Source: FAO (2016), FAOSTAT database, FAO Publications, Rome, http://faostat.fao.org.

StatLink http://dx.doi.org/10.1787/888933389516

Figure 2.10. Crop and livestock yields in Turkey as ratios of yields in the European Union

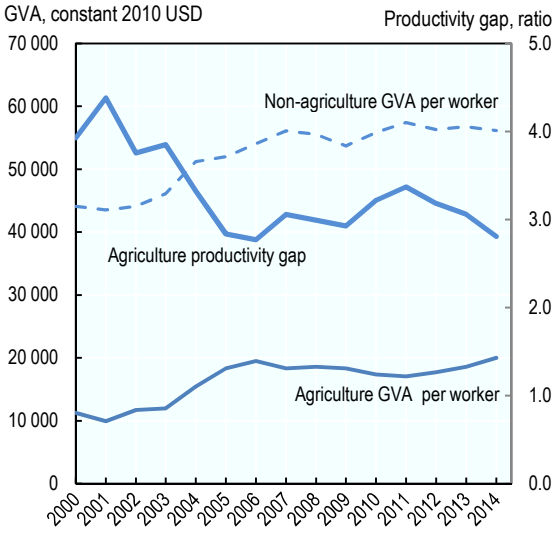


The ratios are based on smoothed three-year yield averages.

Source: FAO (2016), FAOSTAT database, FAO Publications, Rome, http://faostat.fao.org.

StatLink http://dx.doi.org/10.1787/888933389528

Figure 2.11. Labour productivity in agriculture and non-agricultural sectors in Turkey



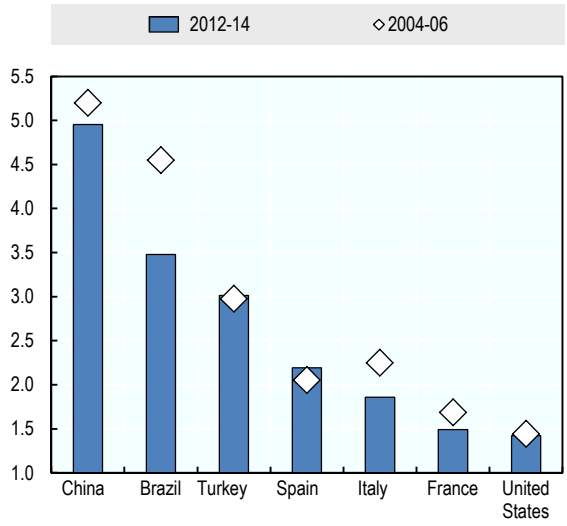
GVA: Gross value added.

Labour productivity gap in agriculture is measured as the ratio between GVA per worker in non-agricultural sectors and GVA per worker in agriculture.

Source: OECD (2016b), *Labour Force Statistics*, OECD.Stat http://stats.oecd.org/; OECD (2016c), *OECD System of National Accounts*, OECD.Stat http://stats.oecd.org/.

StatLink http://dx.doi.org/10.1787/888933389531

Figure 2.12. Labour productivity gap in agriculture: International comparison



For China, Brazil, France and the United States, the bar refers to 2011-2013.

Source: OECD (2016b), Labour Force Statistics, OECD.Stat http://stats.oecd.org/; OECD (2016c), *OECD System of National Accounts*, OECD.Stat http://stats.oecd.org/; ILO (2015), *ILOSTAT Database*, www.ilo.org/ilostat/faces/home/statisticaldata/new_link_10?_afrLoop=265280235144615

StatLink http://dx.doi.org/10.1787/888933389542

The lack of convergence in labour productivity is an indication that agriculture maintains a buffer function in the Turkish economy. Several analysts in Turkey stress the need for a better balance between the key factors employed in agriculture. Çakmak et al. (2008), for example, show that agriculture employs excessive labour and that the sector's efficiency can be increased only if the efficiency of land use is increased. They found labour to be a statistically insignificant contributor to efficiency and to even having a diminishing effect on the efficiency of other factors of production. These authors stress the importance of structural adjustment through which production factors in agriculture can self-rebalance, supported by policies to create alternative job opportunities in rural areas. Dudu et al. (2015) also emphasised the need for policy incentives for labour to move to more efficient uses within the agricultural sector. Atiyas and Bakış (2013), analysing agriculture productivity growth in Turkey between 1960 and 2010, highlighted that such growth was mainly due to the reallocation of labour to other economic sectors.

Shifting agriculture away from its role as a buffer sector is a long-term process that is ultimately dependent on the overall economic growth and the pull of labour from agriculture – not necessarily from the rural economy – that this growth could generate. Structural adjustment to enable the reallocation of labour to more efficient uses within agriculture and, most importantly, outside agriculture to alternative rural or urban activities is likely the fundamental challenge to agricultural productivity growth in Turkey.

The productivity measures discussed above do not provide a full picture, but reflect only the productivity of individual factors that may be achieved through increased use (i.e. at a lower productivity) of others. It is thus important to understand the Total Factor Productivity (TPF) of all factors employed in agriculture.

A range of recent studies have analysed this issue in Turkey (Box 2.2). They differ in analytical focus, estimation methods, data used and country coverage: some focus only on Turkey, while others include international comparisons. These studies also differ in the starting and end-points of analysis, which yields different results in terms of growth rates. As a result, the findings of these studies cannot be directly compared, but they tend to concur on the declining TFP in agriculture up to the early or mid-2000s and the slow or missing technological change in the sector. The recent literature, however, provides limited evidence on agricultural productivity trends beyond the mid-2000s.

Box 2.2. Recent studies on agricultural productivity trends in Turkey

Atiyas and Bakış (2013) analysed TFP growth in Turkey over the period of 1960-2010 for three sectors: agriculture, industry, and services. They estimated Cobb-Douglas production functions for each sector, employing the assumptions of perfect competition, constant returns to scale, and full capacity utilisation. Growth accounting was then performed for the total GDP and for each sector. The study showed that TFP growth in agriculture and services was either very low or negative up to the end of the 1990s. It rose above 1.4% per year in all three sectors in the 2000s, while in agriculture, TFP growth for the first time since the early 1970s exceeded growth in the industry and services sectors. The authors found that TFP increases in agriculture were mainly due to the shift of underemployed labour from agriculture to the services and manufacturing sectors, rather than a technological change or higher R&D expenditures.

Mollavelioğlu et al. (2010) compared the productivity of agriculture in Turkey and 16 EU countries for the period 1995-2005, with a focus on food security and environmental sustainability. The authors used agriculture value added, food security indicators (minimum production level to ensure annual caloric requirement of country's population) and greenhouse gas emissions as the output variables; the data on land, tractors, fertilisers, pesticides and labour were used as input variables. The estimations used the Malmquist index method. Their results showed that TPF for Turkey decreased due to declining technological changes and highlighted the unfavourable productivity performance from the perspective of environmental sustainability. In contrast, an increase in TFP, mainly through technological change, was measured for all EU countries over the period studied.

Ozden (2014) estimated agricultural TFP in Turkey over the period 1992-2012, employing the data envelopment analysis and Malmquist index method. The value of agricultural production was the output variable; the input variables were land, tractors, labour, fertiliser and livestock. An average TFP was estimated to decline at 5.6% per year over the period studied.

Cankurt et al. (2013) analysed TFP, technical change, and technical efficiency change of agricultural production in Turkey and 27 EU countries (EU-15 and EU-12 new members) for the period 1993-2001. The authors employed data envelopment and the Malmquist index methods, and used total agricultural production value as the output variable and agricultural land, agricultural labour, tractors, nitrogenous, potash and phosphate fertilisers, and live animal stocks as input variables. The estimates show a 5.2% decline in TFP in Turkey and the new EU member states, mostly due to the lack of technical change. In contrast, technical change largely drew TFP growth in EU-15 at 1.4%.

Armagan et al. (2010) studied the efficiency and changes in TFP in Turkish agriculture between 1994 and 2003. They also employed the Malmquist index and data envelopment, and used agricultural data at NUTS-1 level. The value of crop production was the output variable; the input variables were the number of tractors, cultivated land area, economically active agricultural population, and fertilisers. The study found decreases in technical efficiency and TFP in almost all regions of Turkey, and related this mainly to the soaring real input prices and low levels of technology adoption. The authors consider the entrance of big firms into agriculture as a way to a more productive sector. This study also highlights regional differences in TFP and agricultural efficiency, with only a few of the most developed regions demonstrating increases, which, however, was insufficient to yield the positive national result.

Avcı and Kaya (2008) evaluated the productivity of agriculture in Turkey and 24 transition economies for 1992-2004. These estimates were also based on the Malmquist index and data envelopment; the agriculture value added was the output variable, and the input variables were the number of tractors, cultivated land, economically active agricultural population, and fertiliser. The study found that TFP change in Turkish agriculture was below the average positive change in transition economies. Scale efficiency made a positive contribution to TFP change, but slow technological change resulted in Turkey falling behind the other economies in productivity growth.

Source: Eruygur, O., M. C. Küçüker, G. Muratoğlu and Y. Muratoğlu, "Challenges and Opportunities for Development of the Agriculture and Food Sector in Turkey and Trends in Agricultural Productivity", Consultant report prepared for the OECD.

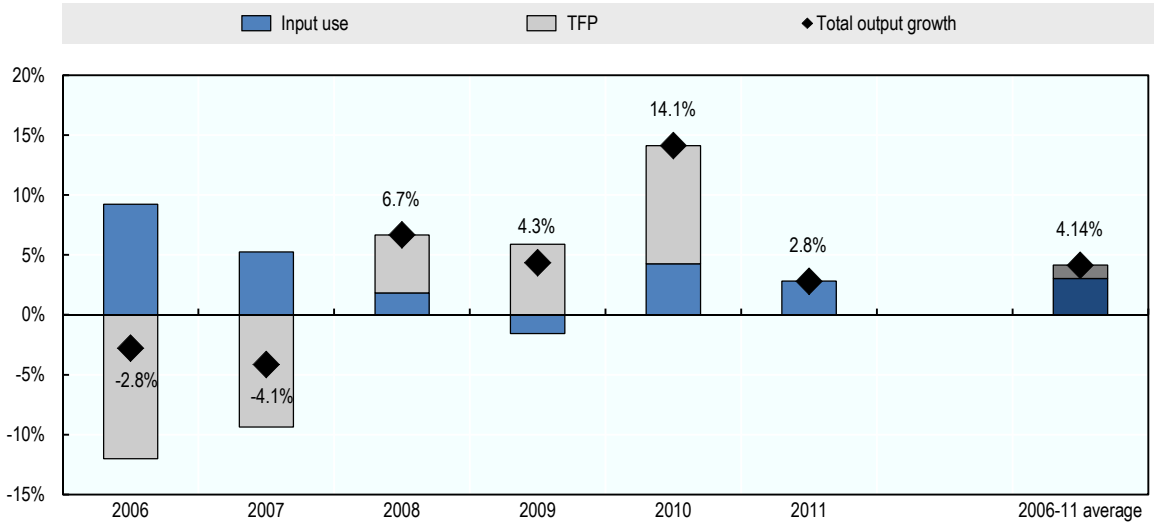
Further insight into the determinants of agricultural productivity growth in Turkey can be obtained from estimates by Eruygur et al. (2015) performed in the context of this review. This analysis uses a parametric method to estimate the Cobb-Douglas production function using the data for 26 NUTS regions of Turkey for the period between 2005 and 2011.[7]

The estimates by Eruygur et al. (2015) show that agricultural Gross Value Added (GVA) increased at an annual rate of 4.14% between 2005 and 2011 (Figure 2.13). This growth was predominantly due to the increased use of inputs such as capital, labour, irrigated land and the intensification of fertiliser use. The effect of these inputs on output growth was partially offset by reductions in total agricultural area. Higher aggregate input use explains nearly three-quarters of agricultural output growth over the period analysed, with the remaining growth coming from improvements in Total Factor Productivity (TFP).

The findings by Eruygur et al. (2015) highlight another important dimension of agricultural productivity in Turkey: TFP performance during 2005-11 was uneven across regions (Figure 2.14).[8] TFP declined in the belt of provinces which runs through Marmara, Central Anatolia, Mediterranean, and Eastern Anatolia, as well as some parts of the Black sea region in the northern Turkey. At the same time, four local clusters in these same regions demonstrated rapid improvement in agricultural productivity with a TFP growth that exceeded 3% per year over the period analysed.

A detailed analysis of the factors explaining these cross-regional disparities in Total Factor Productivity is beyond the scope of this review. However, Eruygur et al. (2015) highlight such factors as the regional movement of labour between agriculture and non-agricultural sectors which may have positively or negatively affected the quality of human capital. Another factor is the shift in land use between agricultural and non-agricultural uses, leading to changes in agricultural land quality. Note that some of the most and least favourably-performing regions are located in areas of large on-going regional infrastructure projects (Eastern Anatolia Project, Eastern Black Sea Project, and South Eastern Anatolia Project). Beyond the shifts in land and labour quality, these projects may have also changed the costs of doing business in the regions, e.g. by reducing transportation costs and widening access to markets, thus stimulating investments and better technologies.

Figure 2.13. Contribution of input use and Total Factor Productivity to agricultural output growth in Turkey



Notes: TFP – Total Factor Productivity. Percentage numbers correspond to annual output growth rates.

Source: Eruygur, O., et al. (2015), "Challenges and Opportunities for Development of the Agriculture and Food Sector in Turkey and Trends in Agricultural Productivity", Consultant report prepared for the OECD.

StatLink http://dx.doi.org/10.1787/888933389551

The regional variability in the performance of TFP underscores the importance of local conditions as determinants of agricultural productivity in Turkey. It also highlights the need to consider the shifts in the quality of agricultural human resource and land due to non-agricultural investment and the trade-offs of these shifts for agricultural growth. The regional heterogeneity of TFP performance may be an additional evidence of agricultural productivity in Turkey being a challenge of the overall economic development. A reduction of disparities in regional development is an essential part of that challenge.

Figure 2.14. Agricultural TFP growth by region

Annual growth rates between 2005 and 2011

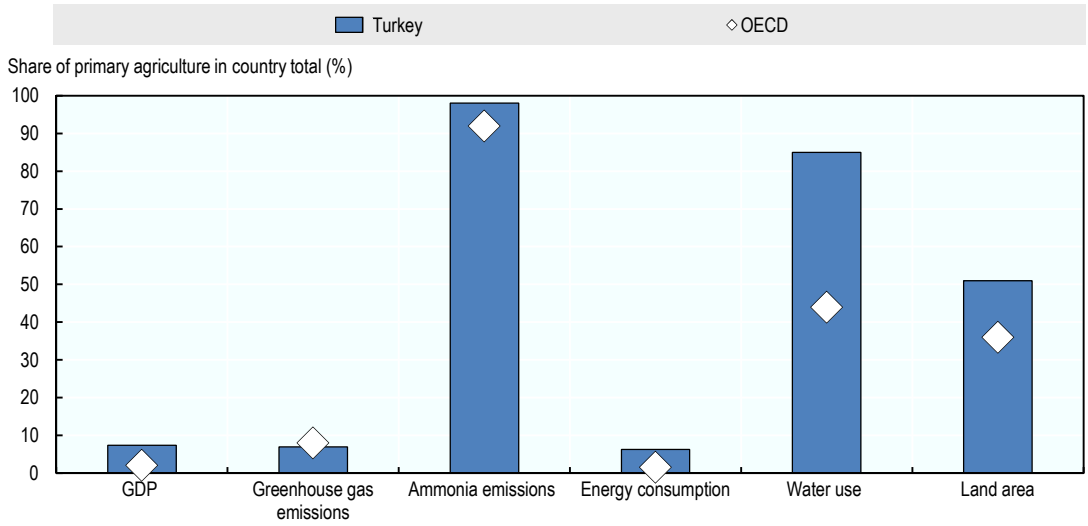
Source: Presentation based on estimates by Eruygur, O., et al. (2015), "Challenges and Opportunities for Development of the Agriculture and Food Sector in Turkey and Trends in Agricultural Productivity", Consultant report prepared for the OECD.

Although a relatively large number of studies have been undertaken to date, the evidence on productivity performance of Turkish agriculture remains fragmented and leaves a great deal of uncertainty about the most recent trends. However, such analysis is essential to understand agricultural productivity and its determinants. The lack of more comprehensive and up-to date estimates is largely due to agricultural data constraints. The new national agricultural information system could substantially improve agricultural statistics and data availability that is critical to agricultural productivity analysis. This would also be a necessary input into the formulation of more effective policies to support agricultural growth.

Sustainability trends in Turkey

Agriculture in Turkey plays a key role in natural resource use and can be a significant source of environmental pressure on water and air in some locations. The sector is a large user of national land and water, with the degree of exploitation of these resources in agriculture exceeding OECD average levels (Figure 2.15). Agriculture in Turkey also accounts for a significantly higher share of energy consumption compared to the OECD average, but this share is comparable to the relative importance of the sector in Turkish GDP. Agriculture's contribution to GHG emissions is close to the OECD average.

Figure 2.15. The environmental profile of agriculture in Turkey



Note: Latest available data.
Source: OECD (2016g), *OECD AEI Agri-Environmental Indicators database*, www.oecd.org/tad/sustainable-agriculture/agri-environmentalindicators.htm.

StatLink http://dx.doi.org/10.1787/888933389560

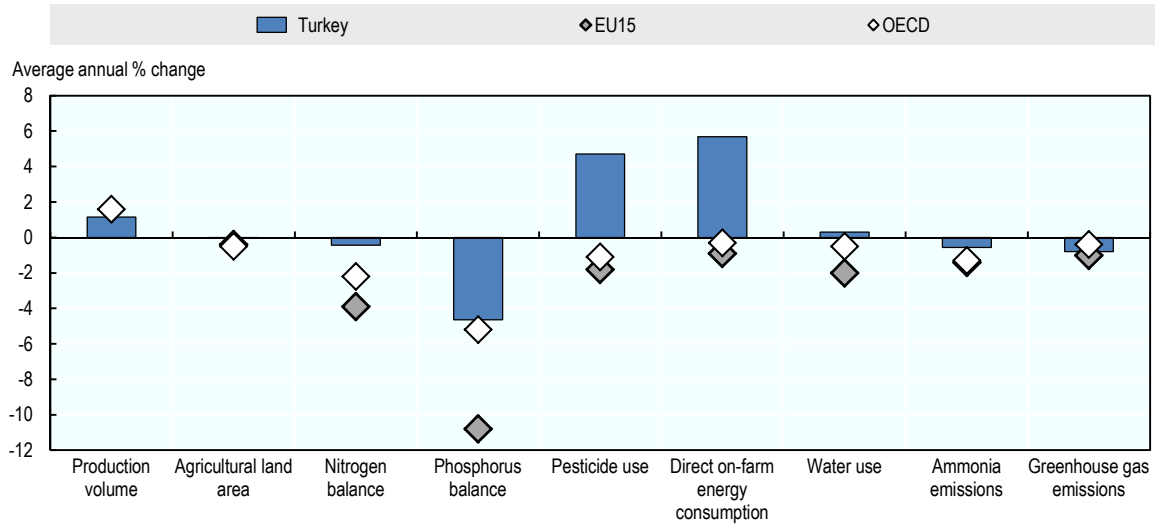
The intensity of input use per hectare of agricultural land is not particularly high in Turkey as compared to many OECD countries, but it has substantially increased over the last two decades. While the agricultural land area has declined since 2000, per hectare use of mineral fertiliser has gone up by about 25% and pesticide use by 50% for the same period, with sometimes significant fluctuations from year to year.

The rates of mineral fertiliser application have increased since 2000; however this was accompanied by a reduction of the overall nitrogen and phosphorous surpluses, partly due to a decrease of the livestock population[9] and improvements in crop nutrient uptake (Figure 2.16). Nitrogen surpluses vary depending on the region, within a range between 6 kg and 93 kg of nitrogen per hectare (Özbek and Leip, 2015). The highest surpluses are in the Aegean, Marmara and Mediterranean regions, possibly contributing to water quality problems. These regions are also those with more intensive use of pesticides, partly related to horticulture. In other regions, the concern is more with an insufficient use of mineral fertilisers given crop needs.

Despite the relatively low intensity of input use, water pollution is a problem in several areas and could increase. The latest data on water quality show that 20% to 50% of surface water monitoring sites are either in the course of being polluted or very polluted by nitrogen[10]. This includes the Ergen, Akarçay, Gediz, Sakarya, and Susurluk watersheds. Several lakes also show significant levels of phosphorus pollution (MOEU, 2014). However, the lack of any comprehensive monitoring of nutrients and pesticides in agricultural areas prevents a broader assessment of the situation.

Water availability is a central resource-related issue of agricultural productivity. Agricultural freshwater withdrawals have trended upward over the last two decades due to the expansion of irrigated areas (Figure 2.16). The intensity of freshwater resources, corresponding to the ratio between gross freshwater abstractions and total available renewable freshwater resources is 20% for the country as a whole (OECD, 2015a). This indicates a moderate to medium water stress on average. But water stress tends to increase with rising demand by agriculture, and could worsen in view of the potential impacts of climate change on both supply and demand of water. More than 90% of irrigation water withdrawals are distributed through surface irrigation, which is relatively inefficient compared to drip or spray irrigation, thereby suggesting room for more efficient water use.

Figure 2.16. Trends in agri-environmental indicators in Turkey, 2000-10



Source: OECD (2016g), *OECD AEI Agri-environmental Indicators database*, www.oecd.org/tad/sustainable-agriculture/agri-environmentalindicators.htm.

StatLink http://dx.doi.org/10.1787/888933389573

Soil erosion is another key issue for the productivity and sustainability of agriculture (OECD, 2008). Erosion problems are rooted in the landscape configuration and soil and climate conditions, notably the sloping lands which have an increased risk of erosion. Farm practices, such as early grazing or overgrazing, constitute an important source of erosion risk in several provinces and on almost 64% of rangeland. It is a major cause of soil erosion in Eastern Anatolia (MOFWA, 2012). With an estimated two-thirds of agricultural land at significant risk, mainly due to water, the maintenance of soils as a natural asset for agricultural production is a key to ensuring that productivity growth in agriculture is coherent with environmental sustainability.

Emissions of greenhouse gas from agriculture have trended downwards since 1990, from 30 million tonnes of CO_2 equivalent to 26 million tonnes of CO_2 equivalent in 2010. This trend combines two countervailing effects: the increase in the use of fertilisers generating additional GHG emissions, and the fall in livestock numbers (cattle, sheep and goat) which decreases emissions. Improvements in farm practices may have also contributed by increasing the environmental efficiency of farms.

Turkey is considered as a biodiversity hotspot given the variability of its micro-climatic zones, its highly diverse ecosystems and plant genetic resources, and the number of endemic species. About three-quarters of European flora and fauna species can be found here (OECD, 2008). Protected areas represent 5.3% of total land. Wetlands are also an important component of biodiversity, and their area has remained stable at about 0.4% of total land over the last 20 years. Agriculture, in view of the development of irrigation, constitutes a risk for wetland conservation.

Climate change is a challenge for the productivity and sustainability of agriculture. Turkish agriculture is facing the unfavourable impact of climate hazards, and this trend is likely to continue. Mean and minimum temperatures have trended upward since 1960 and are projected to increase due to climate change. Precipitation should decrease by up to 10% in northern Turkey, and by 20% in the south (IPCC, 2012; MetOffice, 2012). Such climatic changes could decrease crop yields and increase water stress, especially in the south. The projected increases in water stress could affect in particular the sustainability of resources already over-used, e.g. groundwater resources. There is also stronger competition for water use from a growing population, tourism, and other economic activities.

Summary

- Turkey has made important progress in economic development since the early 2000s. This has allowed economic disparities across regions to be reduced, the business sector to develop at a faster rate, and to significantly improve social conditions.
- Overall growth, however, is less dynamic recently, and the country has yet to reach the OECD average levels of economic and social development.
- There have been improvements in crop and animal productivity, and the gap between labour productivity in the agriculture sector and the non-agriculture economy has narrowed. However, as is the case for the overall economy, a loss of productivity growth momentum seems to have been occurring in agriculture.
- The available evidence on agricultural productivity performance is partial and fragmented. However, such evidence is essential to understand productivity determinants in agriculture so as to better target policy to productivity growth. Improved and more easily available agricultural data is necessary to support such analysis.
- It is evident that the fundamental lever for higher agricultural productivity is the re-allocation of labour resources from low-productivity uses within agriculture to more productive uses within and outside this sector.
- This is a long and evolutionary process that depends on the country's overall economic growth. This is not only a long-term but also a socially sensitive process as it involves a movement towards more land- and capital-intensive agriculture, with the accompanying pressure to accommodate excess labour elsewhere. This is all the more so given that agriculture is broadly based on small family enterprises with relatively low human capital.
- Key agri-environmental issues are water scarcity, water quality, and soil erosion. Although environmental pressures from agriculture are below the OECD average due to lower input use per hectare (fertilisers, pesticides, and energy), input intensity is rising, input use remains inefficient in general, and some regions already face significant water quantity and quality problems. The expansion of irrigated areas, combined with an expected decrease in precipitation due to climate change, may increase water stress.

Notes

1. The last available agricultural census data on farm structure in Turkey date back to 2001. The most recent Agricultural Holdings Structure Survey by TÜRKSTAT was carried out in 2006. The publication of the new Agricultural Census results was planned for 2014, but as of April 2016 this has not yet taken place (see Annex 2.A3 on agricultural data issues).
2. The "mid-point" is the hectare-weighted median of land distribution capturing the degree of land use concentration. It corresponds to a farm size that separates the farm size distribution into two parts: 50% of the total area of the national farmland operated by the farms of a larger size and the other 50% by the farms of smaller size than the hectare-weighted median. The mid-point of distribution is a more robust measure of farm average size compared to the mean and the median farm size statistics. With a large number of very small farms in the farm population, the mean and the median are not sufficiently sensitive to describe changes in farm structures and thus cannot capture adequately consolidation of land and other resources into large farms. For example, the mean size of US crop farms has changed little over the past 30 years, whereas the mid-point size increased at an average annual rate of 2.4% between 1982 and 2012 (as measured in cropland ha) (OECD, 2016i).

3. It is worth noting that off-farm employment of farm households covers seasonal work in agriculture. Many seasonal workers are landless and arrive from other rural regions, mainly from Southeast Anatolia. Some work with their family members and have primitive living conditions. Social exclusion, health issues and other social problems, as well as fatal traffic accidents during the transportation of these workers, have attracted the attention of media and academics and, to some extent, of the politicians. This group is socially vulnerable from the perspective of mechanisation and other innovations in harvesting. This, for example concerns cotton picking where the number of cotton pickers has increased from 17 in 2000 to 1 050 in 2014 (Akder, 2015).
4. Twenty food and beverage processors were among the largest 500 firms in Turkey in 2014. Türkiye Şeker Fabrikaları (Turkey Sugar Factories), a state-owned enterprise, is the largest food and beverage processor ranking the 19th large Turkish company. It is followed by private company Eti Gıda producing biscuit products, chocolate and baby food, ranking 31st. Coca Cola, Ak Gıda and Konya Şeker are other leading firms in the sector. Ak Gıda is the owner of Ülker Brands with a large share in food and beverages. Konya Şeker is a partnership of several producer cooperatives and Türkiye Şeker Fabrikaları known for its "Torku" branded products ranging from biscuits, chocolate and yoghurt (ISO, 2014).
5. "Very high" concentration ratio indicates a turnover share of four companies above 70% and 'high concentration ratio a turnover share of four companies between 50% and 70%. In the processing of beer, distilled alcoholic beverages, and margarine, eight companies produce 100% of output.
6. It is worth noting that the estimates of agricultural labour productivity and their cross-sectoral and international comparisons warrant care. Several authors point out the sensitivity of such estimates to the ways both the value added and labour employed in agriculture are measured (Gollin et al., 2013; Cai and Pandey, 2015; Herrendorf and Schoellman, 2015). Gollin et al. (2013), for example, estimated labour use in agriculture by adjusting for the hours worked and the quality of human capital. For Turkey, these adjustments have reduced the measured agricultural productivity gap by half compared to that obtained with non-adjusted labour data.
7. This work attempted to obtain more robust model estimation through the generation of agricultural capital estimates, accounting for the volatility in productivity due to weather shocks, and accounting for the regional heterogeneity. A description of the underlying methodology and data is contained in Annex 2.A2 A general caveat on the quality of agricultural data evoked in the section on farm structure applies to these estimates as well (Annex 2.A3). The availability of the data influenced the choice of the method and necessitated techniques to solve econometric problems in the series.
8. The farm-level and regional heterogeneity has been also shown by Çakmak and Dudu (2010) who estimated agricultural efficiency in Turkey based on household data. They found high deviation in mean efficiencies for different regions, with the western and southern parts of the country being relatively more efficient. Similarly, Armagan et al. (2010) measured significant differences in TFP performance across regions.
9. Livestock population, however, tends to increase significantly since 2010, especially as regards cattle, sheep and goats.
10. This concerns the 25 measurement sites which are part of the project "Monitoring and Basin Determining Reference Points" conducted by the Ministry of Forestry and Water Affairs under the Water Frame Directive. The project looks at physical-chemical, chemical, biological and hydromorphological indicators.

References

Acemoglu D., S. Johnson and J. Robinson (2004), "Institutions as the Fundamental Cause of Long-Run Growth", *National Bureau of Economic Research (NBER) Working Paper* No 10481, MIT Press, Cambridge.

Acemoglu D. and M. Ucer (2015), "The Ups and Downs of Turkish Growth, 2002-15: Political Dynamics", The European Union and the Institutional Slide NBER Working Paper No. 21608, October 2015, *National Bureau of Economic Research*, Cambridge Massachusetts, www.nber.org/papers/w21608.pdf.

Aghion, P. and S. Durlauf (2006), *Handbook of Economic Growth*, Volume 1A, 1st Edition, North Holland.

Akder, H.A. (2015), "Farm Structure of Turkish Agriculture, Structural Adjustment and Rural Development Policy", Consultant report prepared for the OECD.

Amadou, D.I. (2011), "STOCKCAPIT: Stata Module to Calculate Physical Capital Stock by the Perpetual-Inventory method", *Statistical Software Components S457270*, Boston College Department of Economics, revised 17 June 2011.

Armagan, G., A. Ozden and S. Bekcioglu (2010), "Efficiency and Total Factor Productivity of Crop Production at NUTS1 Level in Turkey: Malmquist Index Approach", *Qual Quant*, Vol. 44, 573-581.

Atiyas, İ. and O. Bakış (2014). "Aggregate and Sectoral TFP Growth in Turkey: A Growth Accounting Exercise", *Iktisat Işletme ve Finans*, Vol. 29(341), pp. 09-36.

Avcı, A. and A. Kaya (2008), Geçiş Ekonomileri ve Türk Tarım Sektöründe Etkinlik ve Toplam Faktör Verimliliği Analizi (1992-2004) [Efficiency and Total Factor Productivity Analysis in Agriculture Sector in Turkish Economy and Transition Economies]. *Ege Academic Review*, Vol. 8(2), pp. 843-860.

Barro, R. and X. Sala-i-Martin (1995), *Economic Growth*, McGraw-Hill, Cambridge.

Barro, R.J. and X. Sala-i-Martin (1999), "Determinants of Economic Growth: Implications of the Global Evidence for Chile", *Cuadernos de Economia* (Chile), Vol. 36, No. 107, pp. 443–78.

Berkum, van S. (2005), "Agricultural and Food Industry Structure", in Burrell A. and A. Oskam, (Eds.), *Turkey in the European Union: implications for agriculture, food and structural policy*, Wageningen University, CABI Publishing.

Burrell, A. (2005). "Turkey's Rural Population and Agricultural Workforce", in Burrell A. and A. Oskam (eds.), *Turkey in the European Union: implications for agriculture, food and structural policy*, Wageningen University, CABI Publishing.

Cai, W. and M. Pandey (2015), "The Agricultural Productivity Gap in Europe", *Economic Inquiry*, Vol. 53 (4), pp. 1807-1817, http://onlinelibrary.wiley.com/doi/10.1111/ecin.12214/abstract.

Çakmak,E., (2010), "Agricultural Water Pricing: Turkey", in OECD , *Sustainable Management of Water Resources in Agriculture*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264083578-14-en.

Çakmak, E. and H. Dudu (2010), "Agricultural Policy Reform in Turkey: Sectoral and Micro Implications", in B. Karapınar, F. Adaman, G. Özetan (eds.), *Rethinking Structural Reform in Turkish Agriculture: Beyond the World Bank's Strategy,* Nova Publishers, New York.

Çakmak, E., H. Dudu, N. Öcal (2008), *Türk Tarımında Etkinlik: Hanehalkı Düzeyinde Nicel Analiz*, TEPAV Yayınları, Ankara.

Çakmak, E.H. (2007), *Different Perspectives on Agriculture in Turkey*, Report for Undersecretariat of Treasury, Ankara.

Cankurt, M., B. Miran, and C. Gunden (2013), "A Comparative Analysis on Productivity and Efficiency of Agricultural Production of the EU and Turkey", *Journal of Food, Agriculture and Environment*, Vol. 11(2), pp. 433-439, http://world-food.net/a-comparative-analysis-on-productivity-and-efficiency-of-agricultural-production-of-the-eu-and-turkey/.

Conference Board (2015), *The Conference Board Total Economy Database*, May, www.conference-board.org/data/economydatabase.

Dudu, H., E. Çakmak, N. Öcal (2015), "Drivers of Farm Efficiency in Turkey: A Stochastic Frontier Analysis". *World Journal of Applied Economics*, Vol. 1(1), pp. 45-63, http://journal.econworld.org/index.php/econworld/article/view/5.

Edwards, S. (1997), "Openness, Productivity, and Growth: What Do We Really Know", *National Bureau of Economic Research (NBER) Working Paper No. 5978*, MIT Press, www.nber.org/papers/w5978.

Eruygur, O., M. C. Küçüker, G. Muratoğlu and Y. Muratoğlu (2015), "Challenges and Opportunities for Development of the Agriculture and Food Sector in Turkey and Trends in Agricultural Productivity", Consultant report prepared for the OECD.

European Commission (2014), *Turkey 2015 Report*, Commission Staff Working Document Accompanying the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions EU Enlargement Strategy, Brussels, November 2014, SWD(2015) 216 final.

Eurostat (2015), *Employment by sex, age and detailed economic activity database*, http://ec.europa.eu/eurostat/data/browse-statistics-by-theme, accessed on 3 February 2016.

FAO (2016), *FAOSTAT database*, FAO Publications, Rome, http://faostat.fao.org/.

FAO (2015), *AQUASTAT On-line database*, FAO, www.fao.org/nr/water/aquastat/dbase/index.stm.

Gollin, D., D. Lagakos and M.E. Waugh (2013), *The Agricultural Productivity Gap* (No. w19628), National Bureau of Economic Research, Cambridge, Massachusetts.

Grossman, G. and E. Helpman (1991), *Innovation and Growth in the Global Economy*, MIT Press, Cambridge, Massachusetts.

Hansen, G.D. and E.C. Prescott (2002), "Malthus to Solow", *American Economic Review*, Vol. 92, pp. 1205-1217.

Harberger, A.C. (1978), "Perspectives on Capital and Technology in Less developed Countries", in M.J. Artis and A.R. Nobay (eds.) *Contemporary Economic Analysis*, Croom Helm, London.

Harris, R. and J. Moffat (2011), "Plant-Level Determinants of Total Factor Productivity in Great Britain, 1997-2006", *SERC Discussion Paper 64*, Spatial Economics Research Center, London School of Economics, London.

Herrendorf, B. and T. Schoellman (2015), "Why is Measured Productivity so Low in Agriculture?", *Review of Economic Dynamics*, Vol. 18, Issue 4, pp. 1003–1022.

IGBE (2006), *Censo Agropecurio 2006*, Ministério do Planejamento, Orçamento e Gestã, Instituto Brasileiro de Geografia e Estatística, Rio de Janeiro.

ILO (2015), ILOSTAT Database, ILO, Geneva, www.ilo.org/ilostat/faces/home/statisticaldata/new_link_10?_afrLoop=265280235144615.

Imrohoroğlu, A., S. İmrohoroğlu, M. Üngör (2014), "Agricultural Productivity and Growth in Turkey", *Macroeconomic Dynamics*, 18, 2014, pp. 998–1017, Cambridge University Press. http://dx.doi.org/10.1017/S1365100512000727.

IPCC (2012), *Managing the Risks of Extreme Events and Disasters to Climate Change Adaptation*, Cambridge University Press, Cambridge and New York.

ISO (2014), *Turkiye'nin 500 Buyuk Sanayi Kurulusu (Turkey's 500 Largest Industry Establishments),* Istanbul Chamber of Industry, www.iso.org.tr/Sites/1/content/500-buyuk-liste.html?j=5024132.

Larson, D. and Y. Mundlak (1995), "On the Intersectoral Migration of agricultural Labour"*, Policy Research Working Paper,* N°1425, The World Bank, Washington DC, February.

MetOffice (2012), *Climate: Observations, Projections and Impacts – Turkey*, Meteorological Office of the United Kingdom.

Ministry for EU Affairs (2014), National Action Plan for EU Accession PHASE -1 (November 2014 - June 2015), Ministry for EU Affairs.

MOCT (2012), *Turkish Cooperatives Strategy and Action Plan 2012-2016,* General Directorate of Cooperatives, Ministry of Customs and Trade, Ankara. http://social.un.org/coopsyear/documents/Turkish-cooperatives-action-plan-2012.pdf.

MOCT (2015), *Cooperative Statistics Bulletin,* Ministry of Customs and Trade, Ankara.

MOEU (2014), *Environmental Indicators: 2013*, Ministry of Environment and Urbanization, Republic of Turkey. www.csb.gov.tr/db/ced/editordosya/CevreselGosterge_EnvironmentalIndicators2013_(ENG).pdf.

MOFAL (2016a), *Tarim Reformu Genel Mudurlugu- Tarimsal Orgutlenme Tablosu [General Directorate of Agriculture Reform- Agricultural Organization Table]*. Retrieved February 24, 2016, from Gida Tarim ve Hayvancilik Bakanligi (Ministry of Food Agriculture and Livestock), www.tarim.gov.tr/TRGM/Belgeler/Tar%C4%B1msal%20%C3%96rg%C3%BCtlenme/Tar.%20%C3%96rg%C3%BCtlenmeTablosug%C3%BCncel%200-01.02.2016%20.pdf.

MOFAL (2016b), Tarım Sektörü Entegre Yönetim Bilgi Sistemi (TARSEY) [Integrated Management Information System (TARSEY)]) on-line page, Ministry of Food, Agriculture and Livestock, Ankara, www.tarsey.gov.tr/#.

MOFWA (2012), *Action Plan of Combating Erosion: 2013-2017*, Ministry of Forestry and Water Affairs, Ankara.

Mollavelioğlu, S., H. Mihci, S. Çağatay and A. Ulucan (2010), "Assessment of Sustainability of the European Union and Turkish Agricultural Sector", *NEW MEDIT, Mediterranean Journal of Economic, Agriculture and Environment*, Vol. 9, No.3, pp. 13-21, http://newmedit.iamb.it/edizioni_new_medit,229,229,2010,91,306,assessment-of-sustainability-of-the-european-union-and-turkish-agricultural-sectors.htm.

MOSIT (2015), "Gida ve Icecek Sektor Raporu 2015/2", *Food and Bevarages Sector Report* 2015/2, Ministry of Science Technology and Innovation, Ankara.

OECD (2016a), "Income inequality" (indicator), http://dx.doi.org/10.1787/459aa7f1-en (Accessed on 22 February 2016).

OECD (2016b), *Labour Force Statistics*, OECD.Stat, http://dotstat.oecd.org/?lang=en.

OECD (2016c), *OECD System of National Accounts*, OECD.Stat http://dotstat.oecd.org/?lang=en.

OECD (2016d), *OECD-WTO Trade in Value Added (TiVA)* (database), http://stats.oecd.org/Index.aspx?DataSetCode=TIVA2015_C1.

OECD (2016e), "Poverty rate" (indicator). DOI: http://dx.doi.org/10.1787/0fe1315d-en (Accessed on 22 February 2016).

OECD (2016f), "Productivity Statistics", OECD.Stat, http://stats.oecd.org/Index.aspx?DataSetCode=PDB_LV.

OECD (2016g), *OECD AEI Agri-environmental Indicators* (database), www.oecd.org/tad/sustainable-agriculture/agri-environmentalindicators.htm.

OECD (2016h), *OECD Economic Outlook 2016* (database), https://stats.oecd.org/index.aspx?DataSetCode=EO.

OECD (2016i), "Cross Country Comparison of Farm Size Distributions", *OECD Food, Agriculture and Fisheries Papers*, No. 94, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/5jlv81sclr35-en.

OECD (2015a), *2013 Edition of the OECD Environmental* (database), OECD.Stat. http://stats.oecd.org//Index.aspx?DataSetCode=TAD_ENVINDIC_2013.

OECD (2015b), *Agricultural Policy Monitoring and Evaluation 2015*, OECD Publishing, Paris. http://dx.doi.org/10.1787/agr_pol-2015-en

OECD (2014a), *Agricultural Policy Monitoring and Evaluation 2014: OECD Countries*, OECD Publishing, Paris. http://dx.doi.org/10.1787/agr_pol-2014-en

OECD (2014b), *OECD Economic Surveys: Turkey 2014*, OECD Publishing, Paris. http://dx.doi.org/10.1787/eco_surveys-tur-2014-en

OECD (2014c), *OECD Economic Outlook,* Vol. 2014 Issue 2, No.96, November 2014, OECD Publishing, Paris. http://dx.doi.org/10.1787/eco_outlook-v2014-2-en.

OECD (2014d), *Society at a Glance 2014: OECD Social Indicators*, OECD Publishing, Paris. http://dx.doi.org/10.1787/soc_glance-2014-en.

OECD (2013), *Environment at a Glance 2013: OECD Indicators*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264185715-en.

OECD (2011), *Evaluation of Agricultural Policy Reforms in Turkey*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264113220-en.

OECD (2008), *Environmental Performance of Agriculture in OECD Countries Since 1990*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264040854-en.

Okan, N. D. and C. Okan (2013), *An Overview of Cooperatives in Turkey*, FAO Regional Office for Europe and Central Asia, Policy Studies on Rural Transition, no 2013-3, www.fao.org/3/a-ar427e.pdf.

Özbek, F.Ş. and A. Leip (2015), "Estimating the gross nitrogen budget under soil nitrogen stock changes: A case study for Turkey", *Agriculture, Ecosystems & Environment*, Vol. 205, pp. 48–56.

Ozden, A. (2014), "Total Factor Productivity Growth in Turkish Agriculture: 1992-2012", *Bulgarian Journal of Agricultural Science*, 20(2), pp. 469-473, www.agrojournal.org/20/02-32.html

TGDF (2014), "Turkiye Gida ve Icecek 2014 Envanteri" (Turkey Food and Beverage 2014 Inventory), Federation of Food and Drink Industry Associations of Turkey, Istanbul

Tosun, D., M. Yercan and N. Demirbas (2013), "The place and importance of cooperatives in food supply chain in Turkey", *Proceedings - 24th International Scientific-Expert Conference of Agriculture and Food Industry,* pp. 511-515, Sarajevo.

TÜRKSTAT (2016), *National Accounts Statistics*, www.turkstat.gov.tr/ (accessed on 02 February 2016).

TÜRKSTAT (2015a), *Economic activity by years, NACE Rev.2, rural,* Labour Force Survey, www.turkstat.gov.tr/PreTablo.do?alt_id=1007 (accessed on 18 June 2015).

TÜRKSTAT (2015b), *Exports by Economic Activities (ISIC, Rev.3)*, Foreign Trade Statistics, www.turkstat.gov.tr/PreTablo.do?alt_id=1046 (accessed on 26 June 2015).

TÜRKSTAT (2015c), *Employment Status by Year and Sex,* Labour Force Survey, www.turkstat.gov.tr/PreTablo.do?alt_id=1007 (accessed on 18 June 2015).

TÜRKSTAT (2015d), *Imports by Economic Activities (ISIC, Rev.3)*, Foreign Trade Statistics, www.turkstat.gov.tr/PreTablo.do?alt_id=1046 (accessed on 26 June 2015).

TÜRKSTAT (2015e), *Value of agricultural production – level1 regions*, in regional statistics, www.turkstat.gov.tr/UstMenu.do?metod=istgosterge (accessed on 07 July 2015).

TÜRKSTAT (2015f), *Value of Crop and Animal Production*, Agricultural Prices and Economic Accounts www.turkstat.gov.tr/PreTablo.do?alt_id=1004 (accessed on 25 June 2015).

TÜRKSTAT (2014) *Statistical Indicators, 1923-2013*, Publication no: 4361, 2014, Ankara, pp. 169-171, www.turkstat.gov.tr/Kitap.do?metod=KitapDetay&KT_ID=0&KITAP_ID=160.

TÜRKSTAT (2008), Tarımsal İşletme Yapı Araştırması 2006 [Agricultural Business Structure Survey 2006], *Haber Bülteni [News Bulletin]*, No 196, 17 Aralık 2008. (Farm Structure Survey 2006).

UN Comtrade (2015), On-line database, UN. http://comtrade.un.org/.

UNDP (2015), *Human Development Report 2015: Work for Human Development*, United Nations Development Programme, http://hdr.undp.org/en/2015-report.

WDI (2015), World Development Indicators Database, World Bank, http://data.worldbank.org/data-catalog/world-development-indicators.

Annex 2.A1

Turkey's revealed comparative advantage in agriculture

Revealed Comparative Advantage (RCA) is a simple indicator of international competitiveness of economic sectors, estimated as the following ratio:

$$RCA = S_x / S_{total}$$

where: S_x – country's share in the value of world exports for sector X, or product group X, or product X

S_{total} – country share in world exports of all goods

RCA exceeding unity (1) indicates that country has comparative advantage in a particular sector (product group, or product).

The RCAs for the agriculture sector and for the food sector as a whole are estimated on the basis of exported value added. These data comes from the *OECD-WTO Trade in Value Added (TiVA)* database. Exported value added provides a more precise estimate of competitiveness as it excludes the value of intermediate inputs embedded in exports. This differs from the conventional approach to use the gross value of exports to estimate the RCA.

Table 2.A.1 compares the results for agriculture using both values: exported value added and gross exports. When the results for agriculture are compared, both metrics yield similar results in terms of comparative advantage for Turkey and the majority of selected countries (except China and the United States). However, the two metrics produce variations in RCA levels, possibly reflecting the different weights of intermediate inputs in production.

Table 2.A1.1. Revealed comparative advantage in agriculture and food manufacturing, 2009-11

Ratio

	Agriculture		Food manufacturing
	Based on gross exports	Based on value added	Based on value-added
Turkey	1.24	1.54	0.97
Brazil	3.98	2.69	2.21
Greece	2.17	1.52	2.00
China	0.34	1.51	1.00
Australia	1.70	1.31	1.26
Spain	1.80	1.12	1.19
United States	1.25	0.74	0.79
Italy	0.96	0.69	0.98
EU28	0.77	0.52	0.76

Source: OECD (2016d), *OECD-WTO Trade in Value Added (TiVA)* (http://stats.oecd.org/Index.aspx?DataSetCode=TIVA2015_C1); UN Comtrade (2015), On-line database, UN. http://comtrade.un.org/.

Additional insight can be drawn from the estimation of the RCAs for specific product groups. However, the data on exported value added is not available iuch disaggregation. The product-specific RCAs below are therefore based on the conventional measurement using the gross export values.

Turkey has a strong advantage in horticultural production, with Turkish RCA for that product group higher than for Greece and Italy, although slightly lower than for Spain (Table 2.A.2). Within this group, fresh fruit for consumption are particularly competitive, with Turkish RCA at 3.85. For all other agricultural product groups, Turkey shows a comparative disadvantage.

Table 2.A1.2. Revealed export comparative advantage in agricultural commodity groups, 2012-14

	Cereals, vegetable oil seeds and vegetable oils	Horticultural products	Animal products	Agricultural products as raw materials for textiles
Turkey	0.36	2.02	0.56	0.55
Australia	1.42	0.44	1.48	6.00
Brazil	1.82	0.53	0.82	0.74
China	0.15	1.67	1.07	0.32
Greece	0.65	1.22	0.85	3.44
Italy	0.41	1.26	0.62	0.40
Spain	0.51	2.17	0.90	0.46
United States	1.72	0.84	0.82	2.22
European Union[1]	0.55	0.64	0.90	1.30

1. Data for the European Union refer to 2011-13.

Source: UN Comtrade (2015), On-line database, UN. http://comtrade.un.org/.

Annex 2.A2

Estimation of Agricultural Total Factor Productivity in Turkey based on NUTS-2 regional data: Data and model description

Data employed

Agricultural productivity estimates performed in the context of this review by Eruygur et al. (2015) use the data at the level of 26 NUTS-2 regions of Turkey.

The official statistics do not report the values of agricultural physical capital stock either at the national of at the regional (NUTS-2) level. These values were calculated as part of the estimations. Firstly, the series of total investment (reported by the Ministry of Development) and GDP (reported by the TÜRKSTAT) were used to produce the national physical capital stock value using the stockcapit routine for the Stata (Amadou, 2011). This procedure uses the investment and GDP values to calculate the physical capital stock according to Harberger's (1978) perpetual inventory method. The agricultural investment and agricultural GDP series were then applied to obtain the national agricultural physical capital stock by the same routine. The shares of agricultural capital within total national capital stock were calculated for each year. They were multiplied by Penn World Table (PWT v.8.1) total physical capital stock values for Turkey to obtain the agricultural capital stock values consistent with the PWT's total physical capital stock data for Turkey.

To allocate the calculated national agricultural capital stock value across the NUTS-2 regions, agricultural machinery and equipment and livestock data (from TÜRKSTAT) was used to obtain the regional shares. Agricultural capital stock values were proxied for each NUTS-2 region by summing up the total value of machinery and equipment and total value of livestock. The regional value of machinery and equipment per each NUTS2 region is obtained by multiplying regional machinery and equipment quantities by the corresponding average market prices. The regional value of livestock is taken directly from TÜRKSTAT. The regional sums for each year were used to calculate the share of each NUTS2 region within Turkey during the analysed period. These shares are then applied to allocate the previously calculated PWT database-consistent agricultural capital stock values across the NUTS2 regions.

The data on investment come from the Ministry of Development; data for fertiliser use are from the Ministry of Food, Agriculture and Livestock and that on irrigated land from the General Directorate of State Hydraulic Works (DSI). All other data are from TÜRKSTAT.

Model setup

Agricultural total factor productivity (TFP) is measured using a Cobb-Douglas log-linear agricultural production function:

$$y_{it} = \beta_i + \beta_e e_{it} + \beta_k k_{it} + \beta_{al} al_{it} + \beta_{irrs} irrs_{it} + \beta_f f_{it} + \beta_X X_{it} + \beta_T t + \varepsilon_{it} \quad (1)$$

where y_{it}, e_{it}, k_{it}, al_{it}, $irrs_{it}$, f_{it} are, respectively, the logarithms of real gross agricultural output, agricultural employment, agricultural capital stock, agricultural land, share of irrigated land, high nitrate fertiliser use per area in NUTS2 region i in time t (i = 1,…, N; t=1,…T); and X_{it} is a vector of the TFP determinant variables.

For the TFP calculation, equation (1) is estimated and the elasticities of output with respect to inputs are obtained (β_e , β_k , β_{al} , β_{irrs} and β_f). Agricultural TFP corresponds to agricultural output not explained by factor inputs (agricultural employment, agricultural capital stock, agricultural land and fertiliser), or:

$$ln\, TFP_{it} \equiv y_{it} - \hat{\beta}_e\, e_{it} - \hat{\beta}_k k_{it} - \hat{\beta}_{al}\, al_{it} - \hat{\beta}_{irrs}\, irrs_{it} - \hat{\beta}_f f_{it} = \hat{\beta}_i + \hat{\beta}_X X_{it} + \hat{\beta}_T t + \hat{\varepsilon}_{it} \quad (2)$$

The vector of TFP variables X_{it} is included in the right-hand-side of equation (1). This differs from the approach to execute regression without including this vector and estimating the TFP using the equation (2) as a second step. Such two-step approach was not applied to exclude the effect of omitted variable which may yield statistically biased factor elasticities and TFP estimates (Harris and Moffat, 2011).

The regression emphasises macroeconomic and structural factors of TFP growth in agriculture, such as inflation, exchange rate, trade openness, high-tech export share in the economy, and rural development support and human capital in the sector (Edwards, 1997; and Acemoglu et al., 2004).

The inflation variable is used as the indicator of macroeconomic (in)stability deemed to negatively affect the economic performance of a region. TRY/USD rate is included into the regression model to capture the sensitivity of agricultural producers to exchange rate variations.

NUTS-2 regional openness is represented as the ratio of regional exports to regional Gross Value Added, similarly to the measurement of market openness as a ratio of export to GDP common in the growth literature. Grossman and Helpman (1991) and Barro and Sala-i-Martin (1995) have argued that more open countries benefit more from technological diffusion and its enhancing effect on TFP. Furthermore, according to Barro and Sala-i-Martin (1999) this same ratio can also be considered as an indicator of region's size.

The model also includes a time trend and variables for time-invariant and variant region-specific fixed effect. The time trend accounts for (Hicks-neutral) technical change and captures the impact on TFP of improvements in technology that are common to all NUTS-2 regions.

The time-invariant regional effects are captured by using the long-term weather characteristics of the regions through Thornthwaite's Moisture Index (MI) and Thermal Efficiency Index (TEI). Thornthwaite Moisture Index generally reflects the aridity or humidity of the soil and climate and is calculated from the collective effects of precipitation, evapotranspiration, soil water storage, moisture deficit and run-off. Thornthwaite's Thermal Efficiency Index is the ratio of temperature to calculated evapotranspiration value and uses the idea of the water required for growth (Thornthwaite, 1948).

Annex 2.A3

Agricultural data issues in Turkey

Agricultural data in Turkey is an area where the need for substantial improvement is recognised by stakeholders, analysts, and the government.[1] This concerns a broad range of issues, including the improvements in basic metrics, such as agricultural area, animal numbers, quantities produced, farm numbers and farm structure, and others. The information flows from the provinces to the national government bodies involved in data aggregation and generation of agricultural statistics, such as the Ministry of Food, Agriculture and Livestock and TÜRKSTAT, require a strong network infrastructure and rationalisation.

Improvements in the area of statistics are part of the Turkey's EU *acquis*. One of the closing benchmarks of the Statistics Chapter in the accession negotiations between the European Union and Turkey states that: "Turkey submits to the Commission (Eurostat) a detailed description on progress made in setting up the farm register, including a timetable and means for its completion. Moreover, Turkey submits a detailed description of the foreseen methodology and the organisational set up to be used for the collection of statistics on crop, livestock, meat production, milk production, dairy products and agro-monetary statistics as well as livestock, meat production, milk production and dairy statistics, showing substantial progress towards the compliance with the acquis." Another Chapter on Agriculture and Rural Development as an opening benchmark of the chapter negotiations states that: "Turkey presents to the Commission a detailed strategy referring also to sensitive products such as cereals, sugar, milk, livestock, fruit and vegetables (including targets, deadlines, responsible authority and cost estimates) to ensure sound and reliable statistical information about agriculture and rural development, in order to reach a satisfactory level to start negotiations" (Ministry for EU Affairs, 2014).

The most recent 2015 Turkey Report accompanying the EC's communication to the European Parliament and other EU bodies concludes that further efforts across the board in the area of statistics are needed, especially to align agricultural statistics with the EU acquis. The report notes that no agricultural census has been carried out in Turkey since 2001. In particular, the document highlights the necessity for greater coverage and availability of the farm registry, agricultural labour index, and agricultural production data (EC, 2014).

In this context, the Turkish Ministry of Food, Agriculture and Livestock initiated an ambitious project in 2008, currently under the name of Integrated Management Information System (TARSEY). At present, it is at the stage of monitoring the pilot projects. TARSEY has a broad scope and would be potentially of great benefit beyond the advantages that may arise from a well-performing agricultural data system. It is also regarded as a step towards the EU acquis to provide the necessary basis for the implementation of the Common Agricultural Policy.

TARSEY has two main pillars. The first includes the agricultural and meteorological stations which are to be set-up across Turkey. They will provide atmospheric parameters such as soil temperature, humidity, and phenological records. The relationships between yields of selected agricultural products and soil-topography-climatic data will be studied. The monitoring of climate change and drought, satellite image data, and ground measurements will serve as a basis for the estimates of yield, agricultural area and areas sown.

1. This annex draws on MOFAL (2016b), Akder (2015), and Eruygur et al. (2015).

The second TARSEY pillar is the Agricultural Information System (TBS) with its mobile application. TBS integrates a broad range of registration and tracking systems: the Farm Registration System (TIKAS), Cooperative Credit Tracking System (KKKS), Specialty Products Practice (OU), Under-cover Registration System (OCS), Plant Protection Products Registration and Tracking System (BKS), soil, plants and irrigation water Analysis Laboratory Registration System (TA), the Plant Ecological Requirements Database Application (BEGVET), Marketing Information System (PBS), Good Agricultural Practice Inspection and Certification System (İTU), Organic Farming Control and Certification System (ORG), Irrigation Facility Information System (SU), Certified Seed Registration and Tracking System (STR), Fertilizer Tracking System (GT), Veterinary Medicinal Products Registration and Tracking System (VET), Aquaculture Registration System, Beekeeping Registration System, Food Security Information System (plants) (GGBS), Cattle Recording System (Encoding) and Small Cattle Registration System (KKKS. TBS is generally may not be limited to the list above. This integrated system will be used to carry out authorisations and inspections in an integrated way.

The TBS mobile application will be a means to communicate to farmers information on each parcel of land, including rainfall received and expected, pest control information, fertiliser use, and quantities produced on these plots under normal conditions.

Chapter 3

THE ECONOMIC AND INSTITUTIONAL ENVIRONMENT FOR ENTREPRENEURSHIP AND INVESTMENT IN TURKEY

This chapter provides an overview of the overall performance of the Turkish economy and outlines the macroeconomic developments and challenges ahead. It then looks at regulations that govern entrepreneurship and access to natural resources, and the extent to which they affect the adoption of innovative practices. This chapter also presents policies related to trade, investment, finance and taxation, and discusses their impact on the capacity of firms to invest and take advantage of market opportunities.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

3.1. Macroeconomic policy environment

Macroeconomic and institutional conditions determine the overall growth of national economies, which in the context of Turkey has particular importance for agricultural development. The general growth and job creation in non-agricultural sectors is necessary to absorb excess labour in agriculture and to make more resources available for investment in this sector and the rural economy overall. Economic growth is also essential to reduce the lag of rural Turkey in human development which would increase the capacity of rural people to capture growth opportunities within and outside agriculture. In sum, the growth of the general economy is key to enabling a better balance between the factors employed in the agricultural sector to make it more productive and efficient.

The macroeconomic framework has also specific repercussions on innovation as an activity of a medium- to long-term horizon. A stable macroeconomic development, regulations that promote growth and efficient functioning institutions are a prerequisite to foster innovation. Where there is economic and political instability and weak institutions, potential innovators will perceive significant risks to long-term undertakings and unlikely to risk investing in activities that would not generate rapid returns.

During the 1990s, the Turkish economy grew unevenly as recessions alternated with periods of high growth. The financial crises in 2000-01 necessitated recourse to IMF assistance and the adoption of a more disciplined macroeconomic policy that focussed on reigning in inflation and reducing the fiscal deficit. The structural reforms that followed improved conditions for doing business. These policy changes, together with favourable trends in domestic and external demand, supported high economic growth at 7% per year up to 2007 (Table 3.1). However, the surge in energy prices and the onset of the global financial crisis in 2008 moved the economy into recession. The overall solid macroeconomic framework and timely monetary measures helped the return to high growth during the following two years.

Table 3.1. Turkey's key indicators of macroeconomic policy

1990	1995	2000	2005	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017e
Real GDP growth, %													
9.3	7.2	6.8	8.4	0.7	-4.8	9.2	8.8	2.1	4.2	3.0	4.0	3.9	3.7
General government financial balance[1]													
..	..	-7.9	-0.8	-2.7	-6.0	-3.4	-0.6	-1.7	-1.3	-1.2	-1.0	-1.9	-1.3
Current account balance[1]													
-1.3	-1.2	-3.8	-4.4	-5.4	-1.9	-6.1	-9.6	-6.1	-7.7	-5.5	-4.4	-4.8	-4.6
Exchange rate, (TRY per USD)[2]													
0.0026	0.05	0.62	1.34	1.29	1.54	1.50	1.66	1.79	1.90	2.19	2.71	2.94	2.95
Inflation, annual %, CPI all items													
60.3	89.1	54.9	8.2	10.4	6.3	8.6	6.5	8.9	7.5	8.9	7.7	7.9	7.3
Unemployment rate, %[3]													
7.5	7.1	6.0	9.5	10.0	13.0	11.1	9.1	8.4	9.0	10.0	10.3	10.1	10.2

1. As a percentage of GDP.

2. Period average.

3. End year, as a percentage of total labour force

Source: OECD (2016c), *OECD Economic Outlook 2016 Database,* https://stats.oecd.org/index.aspx?DataSetCode=EO; IMF (2016a), *World Economic Outlook Database*, April 2016, International Monetary Fund, www.imf.org/external/pubs/ft/weo/2016/01/weodata/index.aspx.

The period of speedy recovery was nevertheless brief – between 2012 and 2015, GDP growth decelerated to around 3% per year. The economy's vulnerability to external shocks remains high. Despite the decline in oil prices, inflation continues to be stubborn and above the government's target. Inflation control requires monetary tightening. This implies allowing the exchange rate to strengthen and thus erode the country's export competitiveness, which is also of concern in view of Turkey's strong dependence on energy imports and a persistently large current account deficit. Careful anti-inflation steering is also required to avoid high capital inflows that would exacerbate the private sector's leverage, which has soared since the early 2000s. Turkey's gross external financing relies predominantly on short-term inflows, rather than FDI, which means considerable exposure to shifts in the market sentiment and exchange rate fluctuations (Oxford Economics, 2015).

The macroeconomic vulnerabilities, however, concur with the factors of resilience. The loan defaults in the financial sector have been limited. Public finance is robust overall, with a modest budget deficit. This favourable position in terms of fiscal and private sector debt has been the central anchor of Turkey's macroeconomic credibility (OECD, 2014a).

Turkey's GDP growth is projected to remain below its potential at 4% in 2015 and 3.9% in 2016 (OECD, 2016c). While the short-term outlook predicts a moderate and more balanced growth, this is unlikely to create enough jobs to absorb the expanding workforce and to attain unemployment reduction targets. Economic growth has so far been driven predominantly by domestic consumption and, to a lesser degree, by domestic savings, generating a considerable external deficit. The production and employment structure is largely oriented towards the domestic market, with a low share of tradable output and below-potential integration into global value chains. To achieve higher and sustained long-term growth, an important rebalancing of economy's drivers must occur in favour of greater reliance on external rather than domestic demand, and on domestic rather than foreign savings. This would involve advancing structural reforms in areas such as product and market regulations, labour market, education, and the social security system (OECD, 2016d; OECD, 2014a). In 2016, the government launched a new Action Plan which is intended to move on reforms in these areas.

3.2. Regulatory environment

The development of Turkey's business sector has been dynamic since the early 2000s, but it continues to be dominated by low-productivity businesses. The business structure is highly segmented: numerous micro-, small- and medium-sized enterprises co-exist with a relatively small segment of large listed corporations and high-technology businesses. A considerable potential for productivity gains across the economy exists by improving firm-level productivity and re-allocating resources to higher-productivity firms. Part of this challenge for Turkey is to reduce the informal business activities that occur outside the formal framework of tax, labour, finance and social regulations. An inclusion of broader business segments into a formal regulatory framework would create a more level-playing field and enable more efficient resource allocation across different businesses (OECD, 2014a; OECD, 2016d).

The regulatory environment can facilitate or impede business structures to evolve towards more productive ones. Regulations influence the size and behaviour of firms, the ease of entry into and exit from markets, they set standards and impose the administrative burden on doing business. Regulations determine the conditions for competition, and thus the incentives for companies to increase productivity. Empirical evidence shows that competition-restraining regulations slow the rate of catch-up with the technological frontier, where labour productivity is highest (OECD 2007, based on Conway et al., 2006). There is evidence that good product market regulations are associated with increased inflows of foreign direct investment and therefore technology spill-overs (Nicoletti et al., 2003).

Turkey's accession process to the European Union has been a factor in driving changes to the national regulatory framework. Turkey – EU accession negotiations were launched in October 2005. Among other aspects of this process, there is the alignment of Turkey's regulations with the EU framework. The country's commitments and the implementation benchmarks on regulations concern all

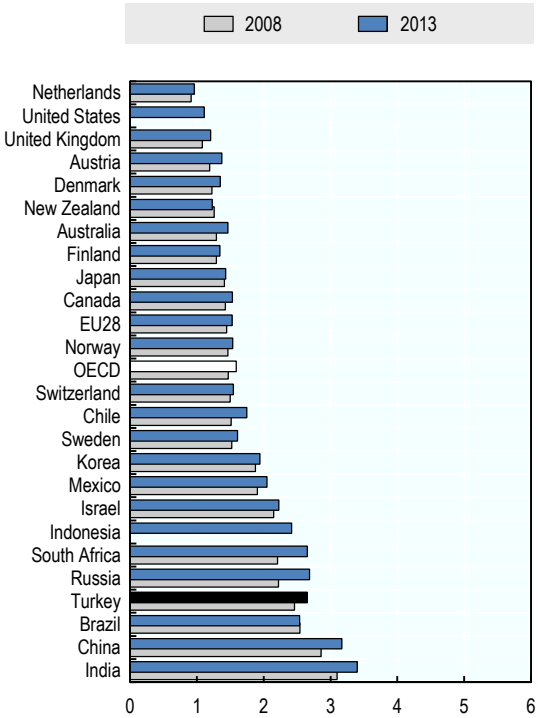
the principal areas of economic activity, such as free movement of goods, labour and capital, company and labour laws, competition, intellectual property, financial services, taxation, environmental and consumer protection. Of the 34 Chapters of EU acquis, 15 have been opened for negotiations since the start, of which one has been finalised (April 2016). The latest report by the European Commission noted different degrees of Turkey's preparedness for EU membership across the regulatory areas mentioned above (Annex 3.A1).

The OECD Product Market Regulation (PMR) indicators measure the extent to which the national regulatory frameworks promote or inhibit competition in product markets. They cover key regulations in the areas of state control, barriers to entrepreneurship, and barriers to trade and investment, and quantify them as a whole and according to specific dimensions. As measured by the integrated PMR indicator Turkey's overall regulatory framework is the most rigid among OECD countries and also compared to some emerging economies (Figure 3.1). The regulations are particularly restrictive in terms of state control, reflecting state ownership of the largest firms and other forms of state control in sectors such as electricity, gas, telecommunications, transport infrastructure, water management, and water pricing. State control also extends to some pricing in the retail sector. Turkey's regulatory barriers to entrepreneurship are also the highest across the OECD area, while foreign trade regulation is less restraining only that in Mexico.

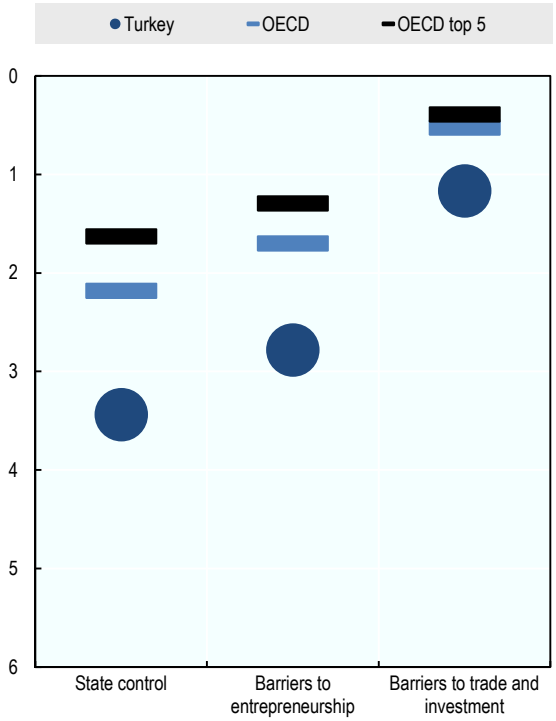
Figure 3.1. OECD's Integrated Product Market Regulation (PMR) indicator

Scale from 0 (least) to 6 (most) restrictive

A. Integrated PMR index, international comparison, 2008 and 2013



B. Turkey's Integrated PMR index by principal components, 2013



Note: OECD top 5 refers to the average of the scores for the top five performers among OECD countries – the Netherlands, the United Kingdom, the United States, Austria and Denmark. Data for the United States refer to 2008.

Source: OECD (2014b), *OECD Indicators of Product Market Regulation database*, www.oecd.org/eco/growth/indicatorsofproductmarketregulationhomepage.htm

StatLink http://dx.doi.org/10.1787/888933389588

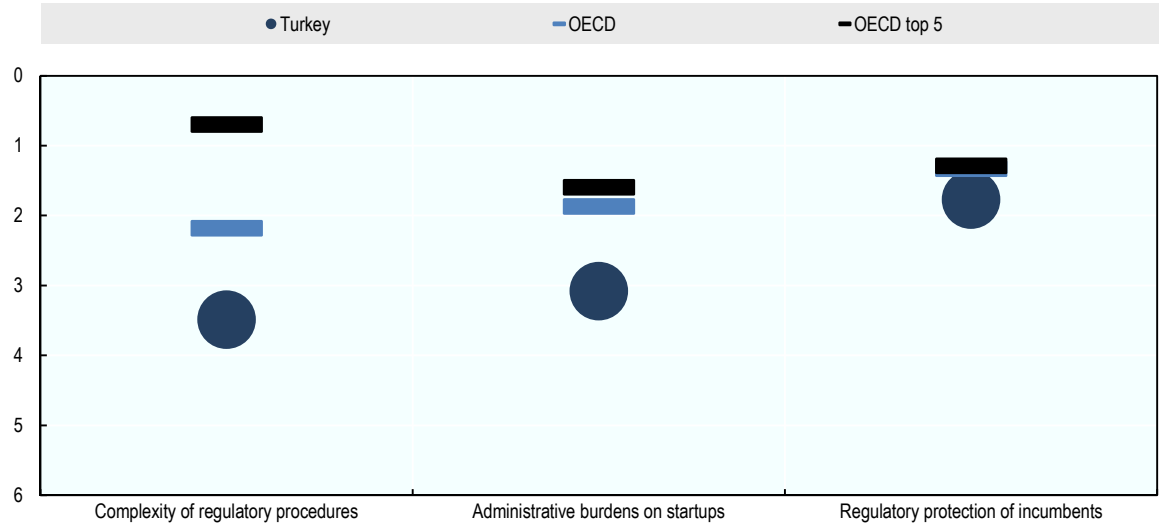
Entrepreneurship regulations

Low barriers to entering markets favour competition and productivity growth as new companies tend to exploit technological or commercial opportunities which have been neglected by more established companies. While entry and growth of new firms is important, so is their ability to exit. This facilitates structural adjustment and the expansion of more efficient companies (OECD, 2010a).

Regulatory barriers to entrepreneurship cover such aspects as ease of entry into business and exit from it, the complexity of regulations involving time and costs that businesses spend to comply with these regulations, as well as regulatory protection of incumbents. Turkey's high – relative to OECD levels – barriers to entrepreneurship stem from the complexity of its regulatory procedures, especially the system of licences and permits, and the high burden placed on start-ups, particularly in the services sectors (Figure 3.2). Turkey's regulatory stance on protection of incumbents is less rigid, but is more constraining for new business than on average in the OECD area.

Figure 3.2. Barriers to entrepreneurship indicator for Turkey by regulatory area, 2013

Scale from 0 (least) to 6 (most) restrictive



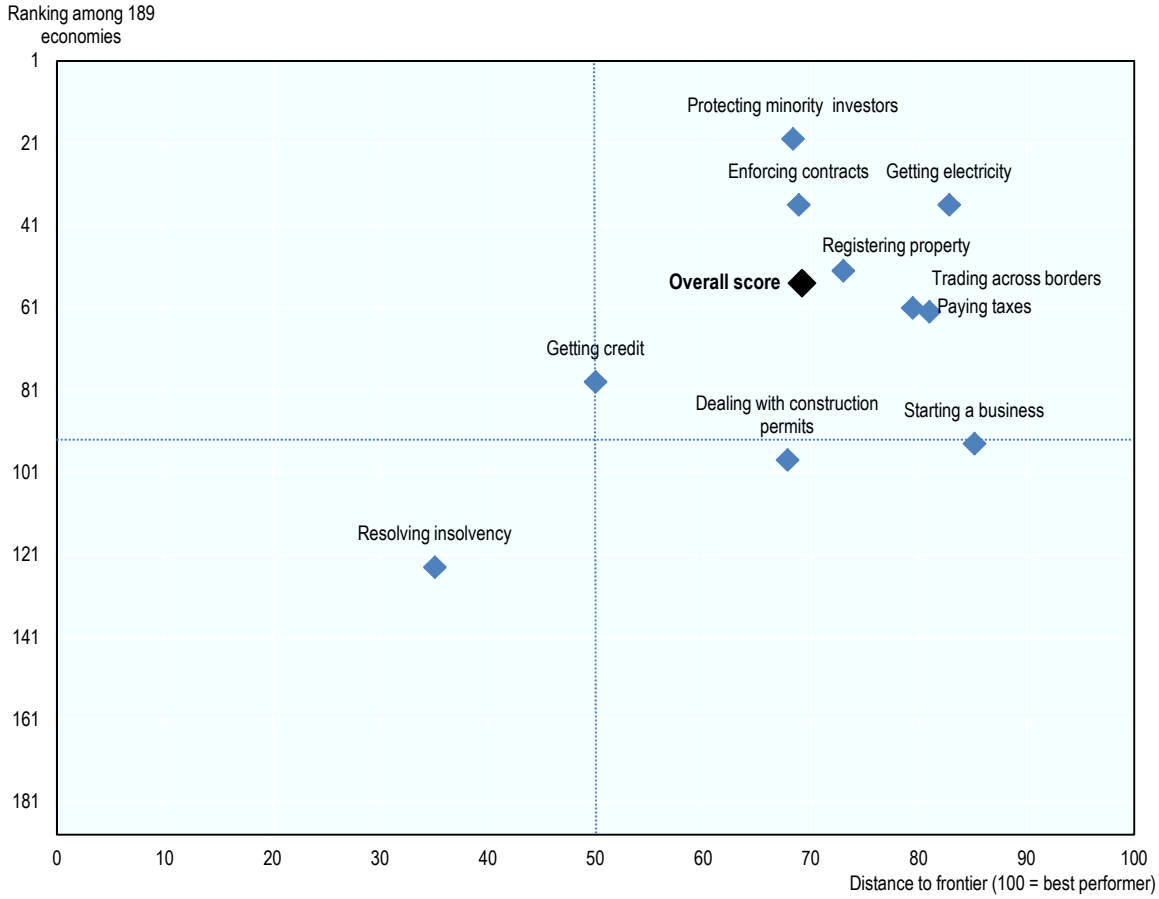
Note: OECD top 5 refers to the average of the scores for the top five performers among OECD countries: Slovak Republic, New Zealand, Netherlands, Italy and the United States on the aggregate barriers to entrepreneurship indicator. Data for the United States refer to 2008.

Source: OECD (2014b), *OECD Indicators of Product Market Regulation database*, www.oecd.org/eco/growth/indicatorsofproductmarketregulationhomepage.htm.

StatLink http://dx.doi.org/10.1787/888933389592

Regulations translate into direct and indirect costs for business and, together with other factors such as the efficiency of the public administration, the degree of development of service sectors, etc. determine the conditions for doing business (Figure 3.3). Based on the assessment of key functions to operate a business, the World Bank's *Doing Business* ranks Turkey 55th among the 189 economies surveyed. This average ranking disguises different degrees of progress in various areas. Thus, local entrepreneurs view practices for resolution of insolvencies the least favourably. As of 2015, insolvency procedures lasted 4.5 years with recovery rates of 19%. Business perceptions are also modest on dealing with construction permits, starting a business, and ease of getting credit. Starting a business required eight different procedures in 2015 (as opposed to six in 2013) and took on average 7.5 days (six in 2013), with the average cost of procedures reaching 16.6% of per capita income (12.7% in 2013) (World Bank, 2014; World Bank, 2016). However, business managers in Turkey are relatively positive about protection of minority investors, electricity services, and contract enforcement.

Figure 3.3. Turkey's position in the World Bank's Ease of Doing Business, 2016



Note: The country ranking is computed on the basis of distance to frontier scores; the "distance to frontier" measure shows the distance of each economy to the "frontier", which represents the highest performance observed on each of the topics across all economies included in Doing Business. An economy's distance to frontier is indicated on a scale from 0 to 100, where 0 represents the lowest performance and 100 the frontier.

Source: World Bank (2016), *Doing Business 2016: Measuring Regulatory Quality and Efficiency*, www.doingbusiness.org/reports/global-reports/doing-business-2016.

StatLink http://dx.doi.org/10.1787/888933389602

Regulations on land and natural resources

Regulations are central to ensure the sustainable use of natural resources. They influence access to land, water and biodiversity resources, and determine the impact of food and agricultural production on these resources.

Turkey has made significant progress on environmental legislation and regulations in the last decade. As a candidate country, Turkey must accept the EU *acquis* in the area of environment as these stipulate a common set of rights and obligations for all EU member countries. The negotiations on the *acquis* chapter "Environment and Climate Change" were opened in 2009 and concern "over 200 major legal acts covering horizontal legislation, water and air quality, waste management, nature protection, industrial pollution control and risk management, chemicals and genetically modified organisms (GMOs), noise and forestry" (EC, 2016). The EU *acquis* also includes international environmental agreements already adopted by Turkey: the UN Convention to Combat Desertification, Convention on Biological Diversity, and the Ramsar Convention for the protection of wetlands. The approximation of legislation is on-going in the framework of the EU Integrated Environmental Approximation Strategy

(2007-23), which identified the measures for harmonisation of Turkish legislation with the EU *acquis* up to 2023.

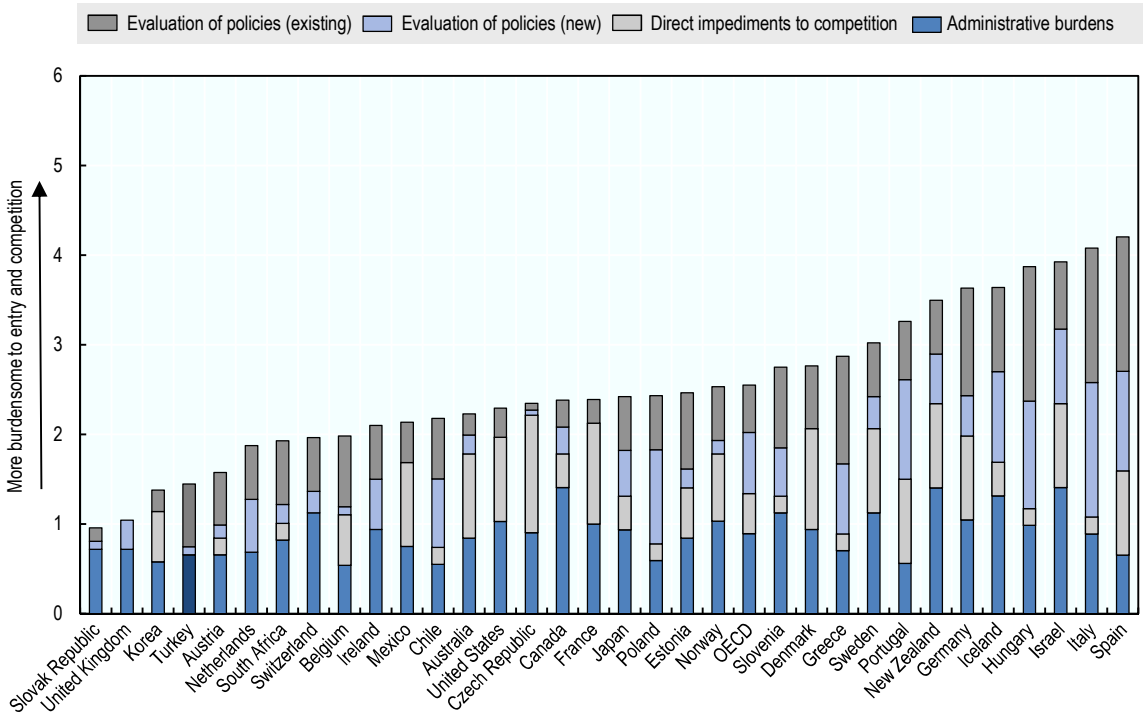
Several general environmental laws and regulations adopted since the early 2000s concern the agricultural sector (Annex 3.A2). These include the Law and Regulation on Organic Agriculture (amended in 2014); Regulation on the Protection of Waters against Pollution Caused by Nitrates from Agricultural Sources No. 25377 (2004); the Law on the Organisation and Responsibilities of the State Hydraulic Works; and the Regulation on Wetland Protection (2002). The broader 1983 Law on the Environment was amended in 2006 to incorporate the polluter-pay principle, possible development of economic instruments, greater transparency and citizen participation, and implementation of environmental responsibility (OECD, 2008).

The Law on Soil Conservation and Land Use No. 5403 (2005) provides a regulatory framework for land use and conservation. It sets out "the rules and principles for determining land and soil resources and their classification, preparing land utilisation plans, preventing non-purpose utilisation, and defining the tasks and obligations to ensure land and soil preservation" (FAO, 2016). Since the adoption of this law, further legislation and associated decrees have been introduced that amend or develop specific aspects of land use. These laws are intended to improve soil quality, reduce the risks of soil degradation, and encourage land consolidation and prevent its further fragmentation by subjecting farmland transactions to minimum requirements on the "viable" size of farms and transferred land parcels (Chapter 5). Beyond these direct objectives, land consolidation may also have an indirect effect on the environment, e.g. possibly allowing for improved water and inputs management (fertilisers and pesticides), due to better land quality and economies of scale.

This progress notwithstanding, the environmental and land regulation in Turkey remains insufficient in various areas from the perspective of the EU *acquis* (EC, 2015). This gap concerns environmental regulations relevant to the agricultural sector. For water management, Turkey is currently developing River Basin Management Plans. The water quality monitoring network is still under development, a code for good agricultural practices is being drafted, and action plans will have to be created. The legislative framework for nature protection has not been adopted yet. Regarding chemicals, the regulation and registration process is not aligned with the EU acquis.

On a broader international scale, Turkey compares modestly in terms environmental regulation stringency. The country ranks 84th out of 140 countries in this regard and 78th out of 140 countries for its enforcement (WEF, 2015). This suggests that Turkey has yet to substantially develop its environmental regulations, especially in the areas of air, water, and nature conservation (OECD, 2008; EC, 2015). The Burden on the Economy due to Environmental Policies indicator (BEEP)[1] ranks Turkey 31st out of 34 OECD countries (Figure 3.4). The BEEP indicator for Turkey is explained primarily by the level of administrative burden placed by environmental policies and the lack of evaluations on existing environmental policies, suggesting room for improving the cost-efficiency of existing environmental policies. This indicator is not specific to agriculture, however, and should be interpreted with caution as situations may differ across sectors.

Figure 3.4. Indicator of the Burdens on the Economy due to Environmental Policies (BEEP)



Source: OECD (2016a), "Burdens on the Economy due to Environmental Policies indicator", www.oecd.org/eco/growth/BEEP%20Indicator_Data%20and%20questionnaire%20responses%20.xlsx.

StatLink http://dx.doi.org/10.1787/888933389617

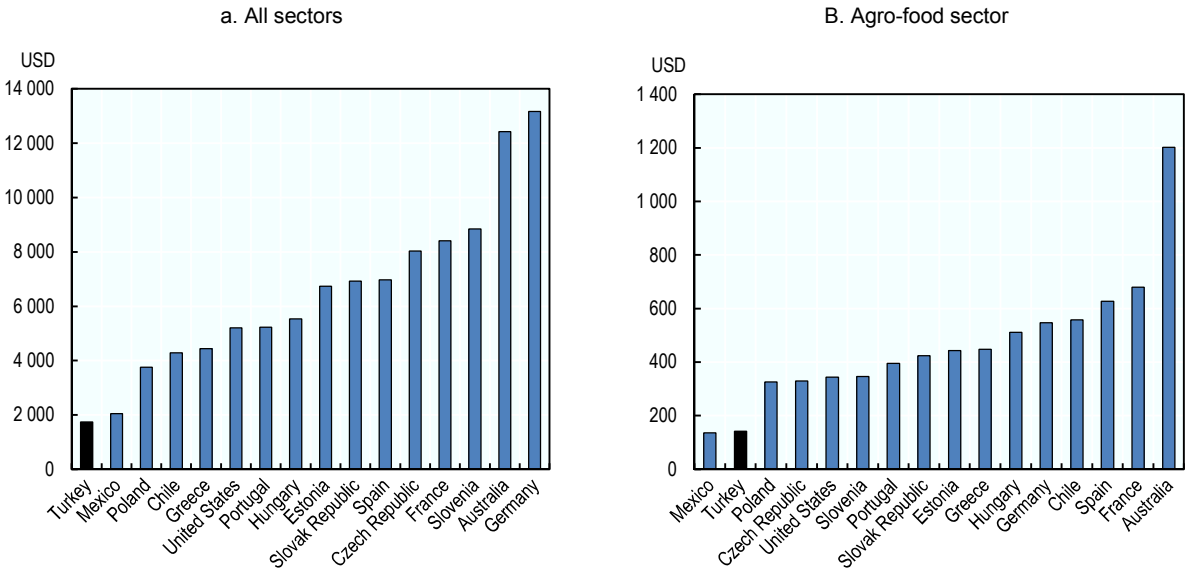
3.3. General trade and investment policy

The expansion of markets worldwide has been a main driver behind technological innovation and productivity gains as larger-sized markets become available to innovators and consumers (OECD, 2010b). Countries that have shown high performances in innovation commonly based their growth strategies on opportunities coming from international markets. International openness results in more competition domestically and thus increases the pressure on companies operating on the domestic market to innovate in order to hold up to competition.

In addition to increasing market size and acting as competition drivers for innovation, trade and FDI operate as immediate channels of technology, know-how and managerial expertise, and have indirect effects on innovation. Inward FDIs not only bring innovation to businesses directly involved, but may have spill-over effects on other companies in the same industry. This may come through a competition effect when domestic businesses improve their processes and products in response to FDI; through demonstration effect when domestic actors imitate better practices of companies with foreign capital; or through labour market effects when training of local workers prompts a learning process that can, with time, reach out to the rest of the economy. FDI spill-overs may go through the businesses upstream or downstream the firm with FDI which may face the need to meet new standards to adapt to the requirements of the foreign firm (Havarnek and Irsova, 2012).

Turkey enjoys a central geographic location with proximity to the largest regional markets. However, its per capita exports measured in value added terms are quite low in relation to a number of comparative OECD countries, both across all sectors (Figure 3.5.A) and for the agro-food sector (Figure 3.5.B).

Figure 3.5. Turkey's per capita exported value added in international comparison, 2011



Note: Agro-food refers to the agriculture and the food products, beverages and tobacco sectors.

Source: OECD (2015e) *Historical population data and projections (1950-2050)*, https://stats.oecd.org/index.aspx?Datasetcode=POP_PROJ and OECD-WTO (2015) *Trade in Value Added (TiVA) Database*, https://stats.oecd.org/index.aspx?queryid=66237.

StatLink http://dx.doi.org/10.1787/888933389625

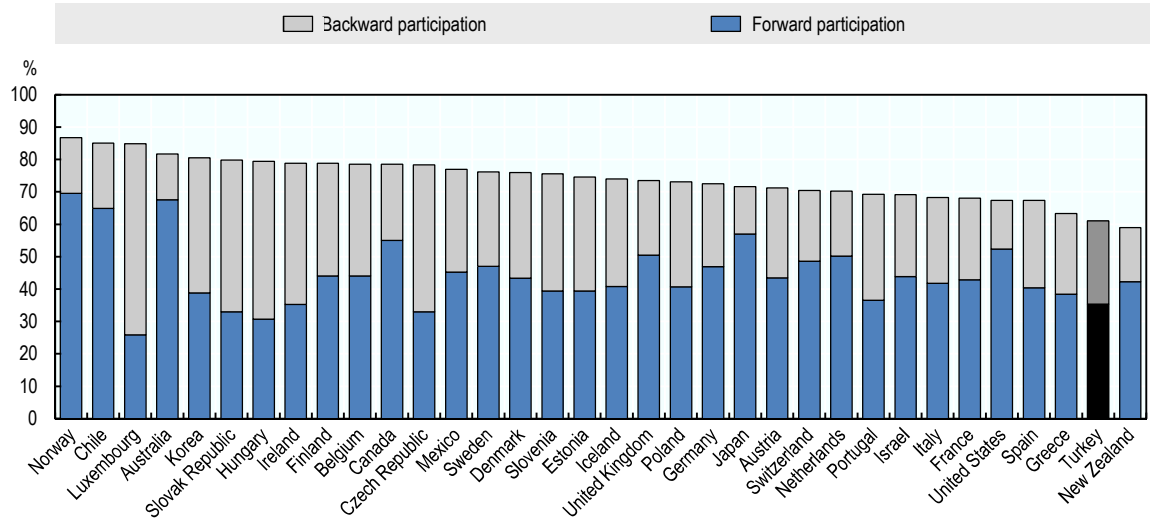
The role of trade in enhancing a country's competitiveness and innovation can also be revealed by the degree of its participation in global value chains, and thus its exposure to globally competitive productions and processes. OECD's Global Value Chains (GVC) participation index estimates in value added terms the shares of imports and exports of intermediate goods in a country's gross exports, i.e. the shares measuring, respectively, the country's backward and forward participation in GVCs. Across all OECD countries, these shares are low for Turkey, both for all national exports and the agro-food group (Figure 3.6). This may suggest that some opportunities across the economy to increase competitiveness by being part of global production lines remain unexploited.

The estimate for the agricultural sector reveals that 57% of the sector's gross exports represent the intermediates of the global value creation, of which 10% are the intermediates that have flowed into Turkey (backward GVC participation) and 47% are the agricultural products directed to further value adding abroad (forward GVC participation). For the food, beverage and tobacco industries, GVC participation attains 43% of the gross exports of these industries, of which foreign intermediates entering Turkey constitute 17% (OECD-WTO, 2015).

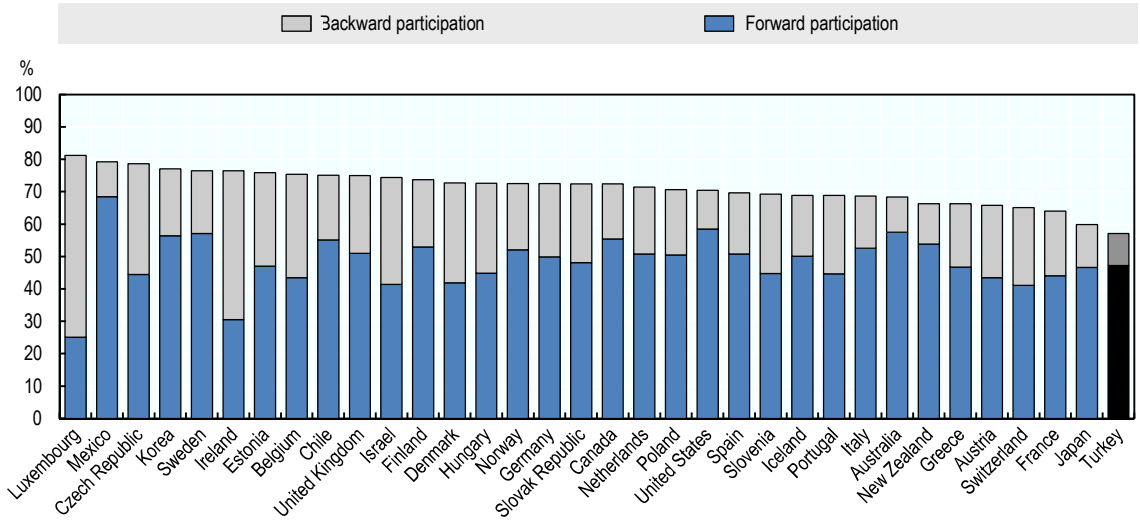
Figure 3.6. Turkey's backward and forward participation in global value chains[1], 2011

As a percentage of country's gross exports

A. Exports of all sectors



B. Agriculture exports[2]



1. Backward participation in GVC corresponds to the share in a country's gross exports of foreign value added and forward participation to the share in a country's gross exports of domestic value added embedded in exported intermediate goods.

2. "Agriculture" refers to TiVA sector C01T05.

Source: OECD-WTO (2015) *Trade in Value Added (TiVA) Database*, https://stats.oecd.org/index.aspx?queryid=66237.

StatLink http://dx.doi.org/10.1787/888933389632

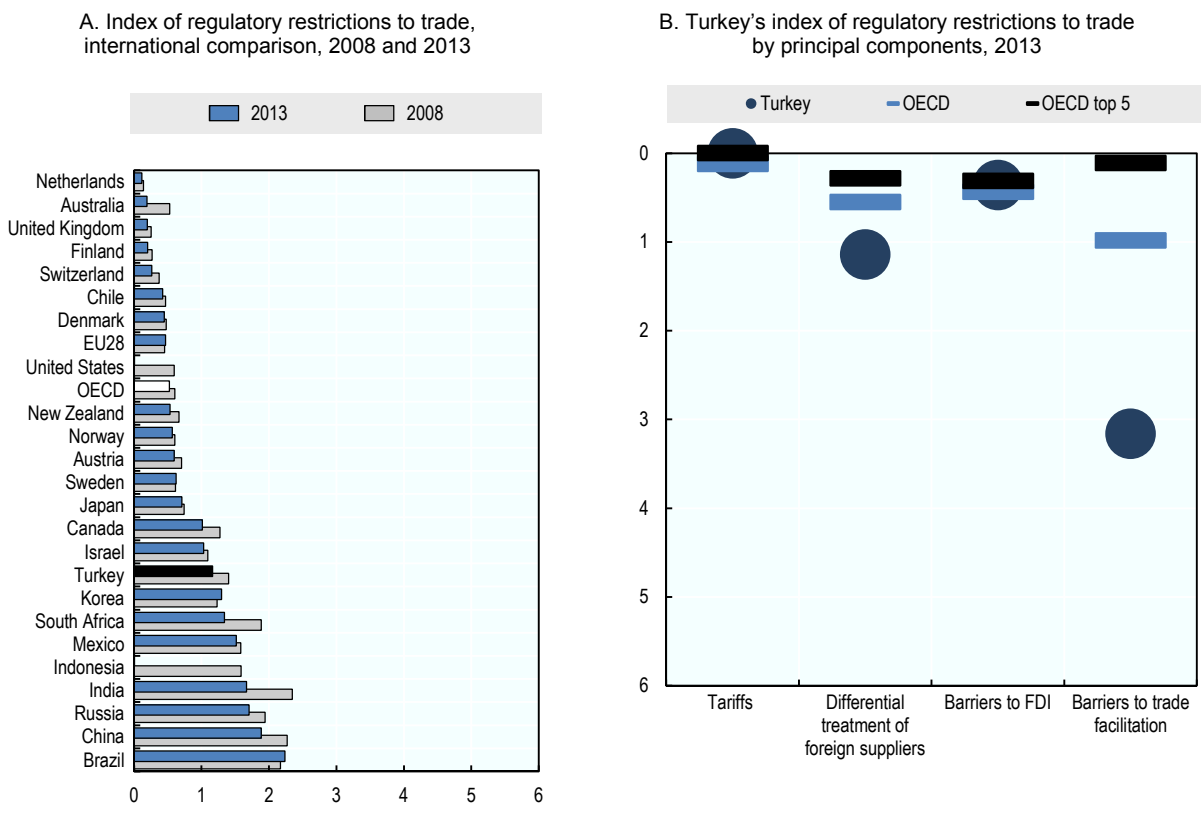
Barriers to trade in goods and services

Trade policies can facilitate or impede the integration of the economy into international markets. Protection of domestic markets through tariff and non-tariff barriers weakens competitive pressure on local producers, thereby affecting their incentive to innovate and their capacity to do so if protection relates to capital and intermediate goods.

WTO commitments constitute Turkey's overarching trade policy framework. Since 1995, Turkey is also a member of the Customs Union (CU) with the European Union. The EU – Turkey CU provides for a common customs tariff, and free movement of industrial goods and processed agricultural products. The CU, however, does not cover primary agricultural products,[2] although these are subject to a preferential trade regime that has been progressively expanded (Larson et al., 2014). Beyond trade with the European Union, Turkey has more than a dozen of FTA agreements with countries and country groups in Europe outside the European Union, in the Middle East, the North Africa and other parts of the world.

Figure 3.7. Index of regulatory restrictions to trade and investment

Scale 0 to 6 (most restrictive)



Notes: The tariff index is based on an average of effectively applied tariff, scaled within a range between 0 and 6 points, whereby a tariff below 3% is attributed zero points and a tariff above 19.6%, 6 points.

Barriers to trade facilitation measure the extent to which the country uses internationally harmonised standards and certification procedures, and Mutual Recognition Agreements (MRAs) with at least one other country.

OECD top 5 refers to the average of the scores for the top five performers among OECD countries – Netherlands, Belgium, Australia, United Kingdom and Finland. Indices for EU28 and OECD are the simple average of member-country indices.

Source: OECD (2014b), *OECD Indicators of Product Market Regulation database*, www.oecd.org/eco/growth/indicatorsofproductmarketregulationhomepage.htm.

StatLink http://dx.doi.org/10.1787/888933389641

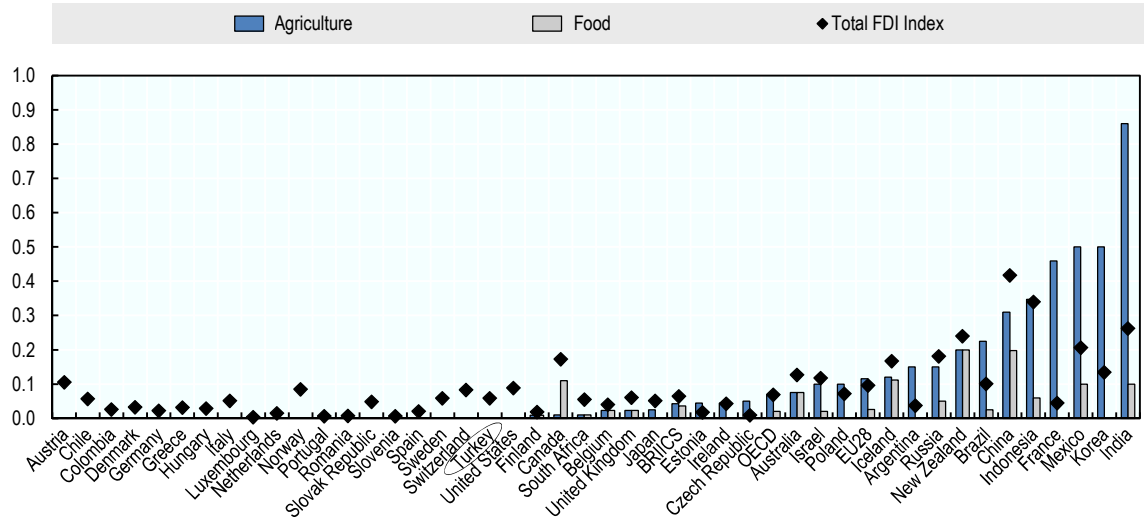
OECD's index of regulatory restrictions to trade evaluates countries' trade regime along several key dimensions. Based on this index, Turkey's overall stance is more restrictive than in most OECD countries (Figure 3.7.A). Although the country's tariff and FDI regimes are liberal, there is a considerable gap in trade facilitation through internationally harmonised standards, certification procedures, and mutual recognition agreements (Figure 3.7.B). A further multi-dimensional benchmarking of trade facilitation based on OECD Trade Facilitation Indicators shows that Turkey lags behind in particular in border agency co-operation, simplification of formalities, disciplining the fees and charges, availability of information and consultations with traders (OECD, 2015d). Turkey's ratification in 2016 of the WTO's Trade Facilitation Agreement provides an impetus to reduce the existing impediments to trade in this area. The analysis of the impacts of trade facilitation shows that improvements in this area would not only boost trade flows while cutting trade costs, but also support further backward and forward GVC linkages, with the most significant effect tending to be on "high and medium-high tech industries", and, importantly for Turkey, for "medium-low tech industries" (Moïsé and Sorescu, 2015).

Foreign direct investment regime

Since the early 2000s, Turkey has actively implemented a policy to attract foreign investment. The Foreign Direct Investment Law (2003) and related regulations eliminated most restrictions on foreign investors and granted them the same legal status as Turkish companies under the Commercial Code (Government of Turkey, 2015). Other important steps to promote FDI were the creation of the Investment Support and Promotion Agency of Turkey, termination of FDI screening, streamlining of administrative procedures, and advancement of bilateral conventions on foreign investment.

Figure 3.8. OECD FDI Regulatory Restrictiveness Index by sector, 2014

Scale from 0 to 1 (most restrictive)



Source: OECD (2016b), *Foreign Direct Investment (FDI) Statistics - OECD Data, Analysis and Forecasts*, www.oecd.org/corporate/mne/statistics.htm.

StatLink http://dx.doi.org/10.1787/888933389651

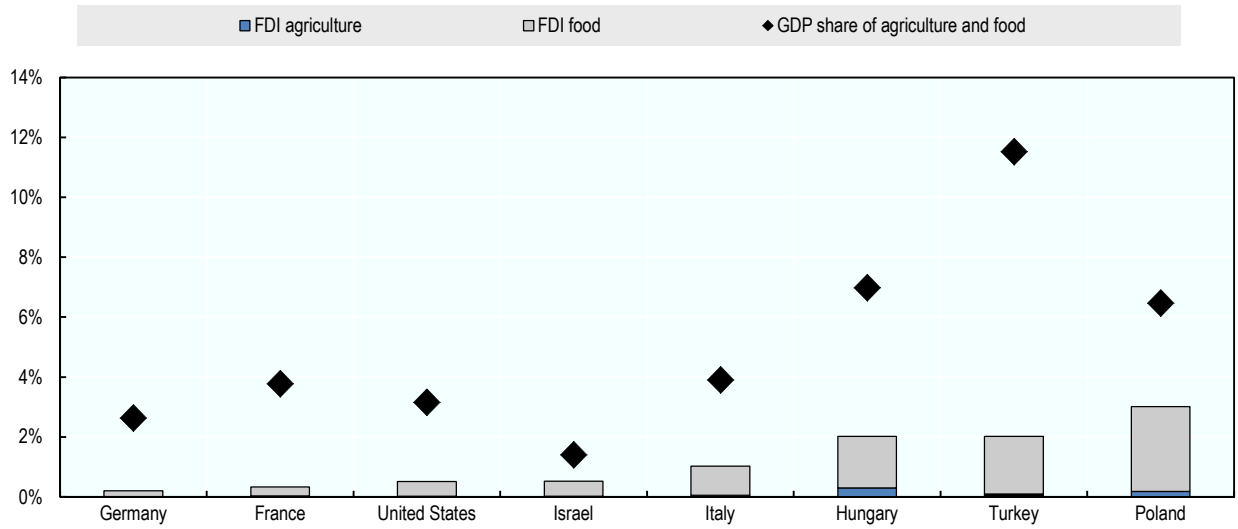
Turkey's FDI regulation today is less constraining than on average across the OECD area, as measured by the OECD FDI Regulatory Restrictiveness Index (Figure 3.8). The existing restrictions concern certain requirements for local participation in activities such as mining, air and maritime transport, and financial advisory services. Policies to promote FDI, together with improvements in intellectual property protection, the removal of the minimum interest rate requirement, investment incentive schemes,[3] and the introduction of a more flexible equity acquisition regulation, have led to strong increase in FDI inflows.

According to UNCTAD, Turkey became the largest FDI recipient in West Asia and was among the 15 most attractive investors in 2014-16 (UNCTAD, 2015). Since the beginning of the 2000s, Turkey's total inward FDI stock has almost doubled relative to GDP, reaching 21% in 2014. This share, however, remains below the OECD average (31%) and far behind the top FDI recipients in the OECD area (OECD, 2016b). Over 70% of total FDI in Turkey goes to the services sector, reflecting its arguably weak competitiveness in tradable sectors (OECD, 2014a).

Turkey applies no restrictions to foreign investments in the agriculture and the food sectors. As in many countries, these sectors attract a small share of total inward FDI, which flow predominantly into food processing. At the same time, agro-food FDI inflows are relatively more important to the Turkish overall economy than in some OECD countries where agriculture and food sectors have modest weights, for example France, Germany, and the United States (Figure 3.9). However, even with relatively higher penetration, FDI in the agriculture and food sectors in Turkey is below the potential which the aggregate share of these sectors in the country's GDP may suggest.

Figure 3.9. Inward FDI stock in the agriculture and food processing sectors, 2012

As a percentage of GDP



Source: OECD (2016b), *Foreign Direct Investment (FDI) Statistics – OECD Data, Analysis and Forecasts,* www.oecd.org/corporate/mne/statistics.htm.

StatLink http://dx.doi.org/10.1787/888933389661

3.4. Finance policy

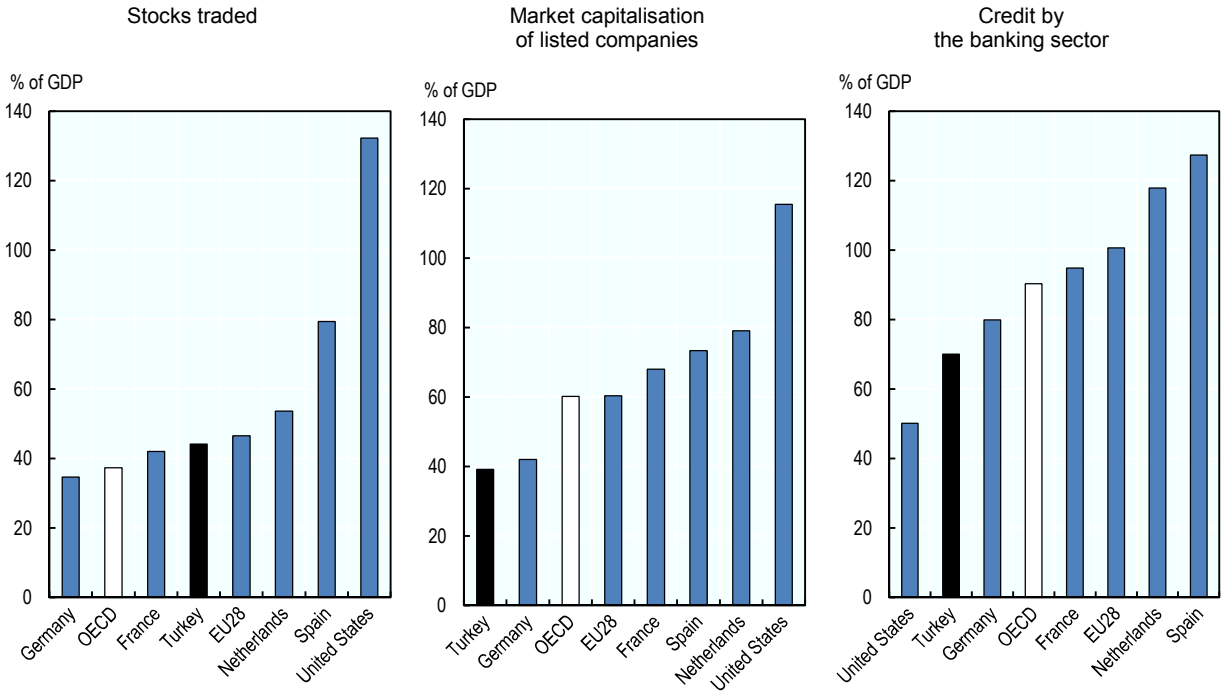
Efficient financial services facilitate investment and thereby productivity growth. Financial markets have a particular aspect with regard to innovation which typically requires external funding, in particular by start-up businesses. A well-functioning domestic financial system with sufficient provision of varied services to borrowers with different profiles facilitates the innovation process. As innovation depends on long-term investment, long-term financing is of critical importance. A good domestic

financial system is also important from the perspective of innovating SMEs as they are likely to depend more on domestic sources of finance as compared to large businesses, which are capable of drawing on international funding. This is particularly relevant in the context of the agro-food sector in Turkey where SMEs and small farming enterprise dominate.

General features of financial markets

Considering the size of the bank credit, market capitalisation of listed companies and the value of stocks traded relative to GDP, Turkey's financial markets are fairly small in international comparison, although there has been rapid expansion since the early 2000s (Figure 3.10).

Figure 3.10. Selected indicators of financial markets, 2014[1]



1. Or latest available year.

Source: WDI (2015), *World Development Indicators Database*, *World Bank*, http://data.worldbank.org/data-catalog/world-development-indicators.

StatLink http://dx.doi.org/10.1787/888933389678

The performance of financial markets as perceived by local businesses is evaluated in the global competitiveness report of the World Economic Forum. It positions Turkey close to the OECD average levels on most of the analysed dimensions (Figure 3.11). However, its aggregate ranking is low, mainly due to the low business perception on the strength of legal rights.[4] The ease of obtaining credit and the availability of venture capital are the areas generally least appreciated by businesses across the OECD area, but more so in Turkey. The World Bank's *Doing Business* also diagnoses the ease of obtaining credit as one area where Turkey needs to advance in particular[5] (World Bank, 2016).

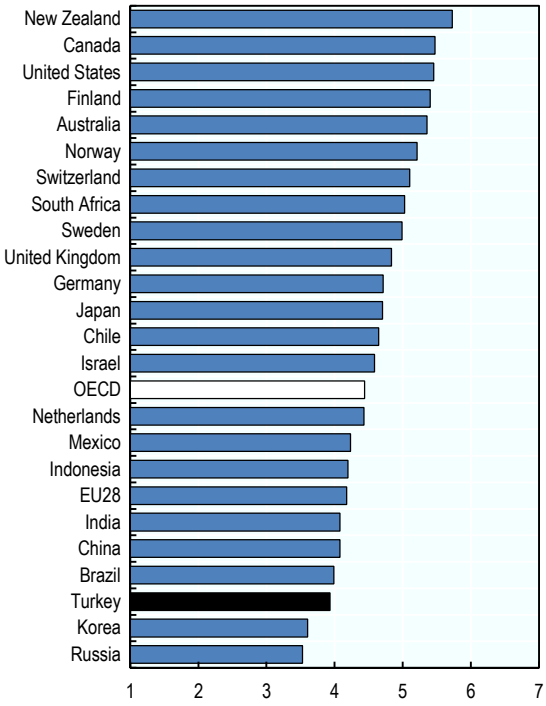
Banks dominate the financial markets in Turkey, accounting for around 87% of the financial sector assets (EC, 2015). Domestic bank sector grew dynamically over the 2000s in response to the high demand for finance from the business sector and soaring household consumption. Bank loans to the private sector more than quadrupled relative to GDP between the early 2000s and the mid-2010s (WDI, 2015). Loans have strongly outpaced deposits, and the funding gap has led to a stronger reliance on wholesale funding from international markets and increased foreign liability in the banking system

(OECD, 2014a). Despite the recent erosion of financial soundness indicators, the rate of non-performing loans remains relatively low (IMF, 2016b). The robustness of the banking system has been helped by macro-prudential measures and inter-agency coordination to control credit growth. Turkey has also been strengthening the supervisory framework of the banking sector by implementing the progressive Basel Accords. The sector, nevertheless, runs a number of risks, such as maturity mismatch between a bank's debt on external borrowings and the returns on own lending. Banks are also indirectly exposed to exchange rate risks through the lending to the non-financial corporate sector; in view of slower economic growth, they are also exposed to higher risks in their SME and household loan portfolios (OECD, 2014a).

Figure 3.11. Global Competitiveness Index: Financial market development, 2015-16

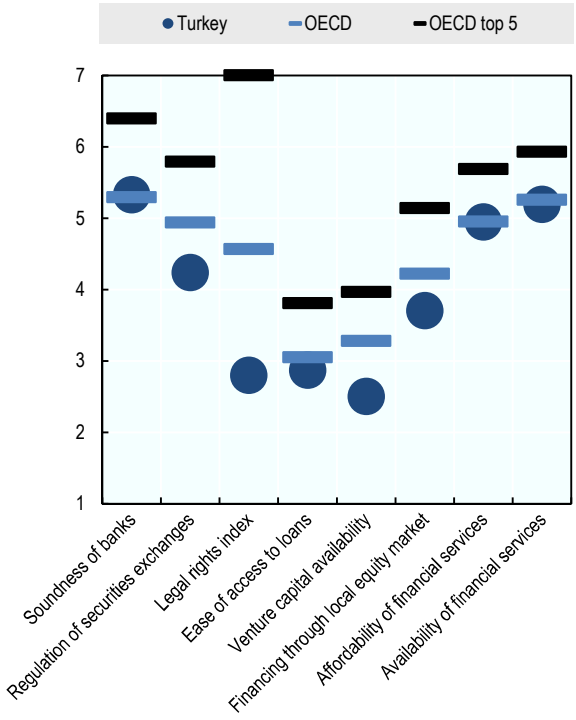
Scale 1 to 7 (best)

A. Total index of financial market development, international comparison



Note: Indexes for BRIICS and OECD represent simple averages of member-country indexes.

B. Turkey's index of financial market development by component



Note: Legal rights index has been rescaled from a 1 to 10 scale.

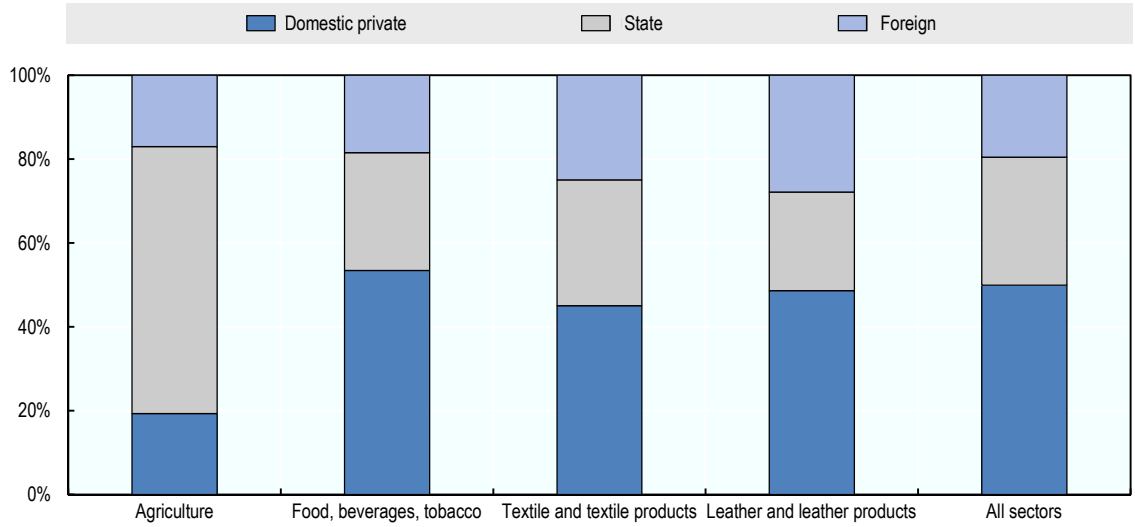
Source: WEF (2015), *The Global Competitiveness Report 2015-2016: Full data Edition*, World Economic Forum Geneva 2015, http://reports.weforum.org/global-competitiveness-report-2015-2016.

StatLink http://dx.doi.org/10.1787/888933389684

Agriculture and agriculture-based manufactures comprise a small part of the bank's credit portfolio. As of the end-third quarter of 2015, loans to primary agriculture accounted for only 2.6% of total bank loans, and to the industries processing agricultural products – food, textiles and leather industries – altogether accounted for another 6.5%. State funds represent the dominant source of bank lending to primary agriculture, making up almost two-thirds of bank loans held by this group of borrowers (Figure 3.12), a reflection of the agricultural sector's reliance on subsidised credit provided through the state Ziraat Bank.

Figure 3.12. Banks' agriculture and food portfolio by source of credit

As of the end of 3rd quarter 2015



Source: BRSA (2015), Banking Regulation and Supervision Agency Statistical data On-line, www.bddk.org.tr/WebSitesi/english/Statistical_Data/Statistical_Data.aspx.

StatLink http://dx.doi.org/10.1787/888933389693

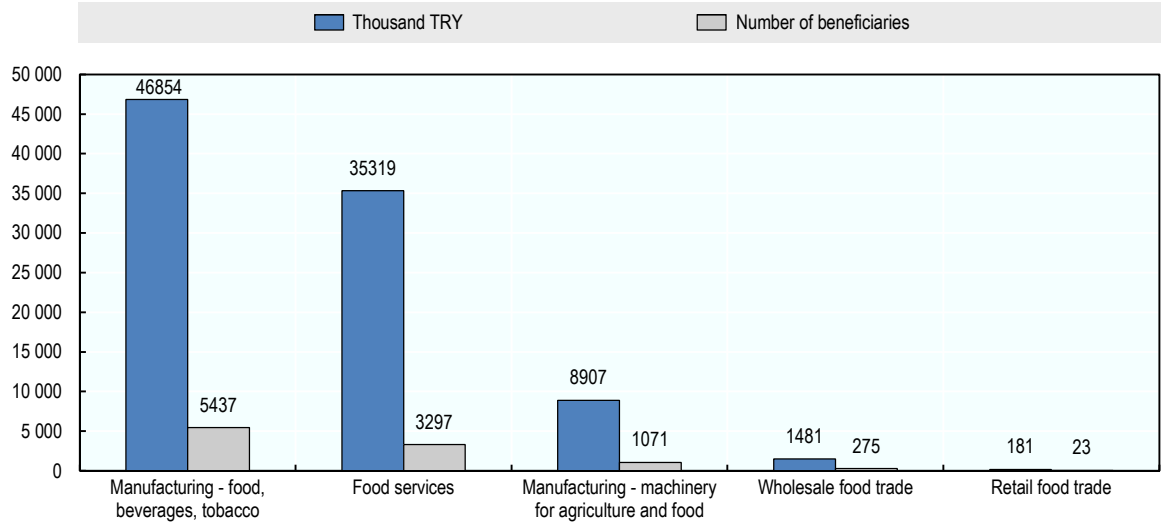
Typically, only large and commercially oriented agri-businesses are connected with formal credit institutions, such as banks, agricultural credit cooperatives and sales cooperatives, the latter providing mostly in-kind loans (e.g. fertilisers and fuel). Smaller commercial farms rely for finance mostly on input suppliers, traders, and informal lenders,[6] while numerous other agricultural households make no recourse to borrowing. The latest available data for mid-2000s suggest that the majority of farm households are credit constrained and only a small share makes investments.[7] The agricultural credit system in Turkey thus faces a sector dominated by small and often low-productive and semi-subsistence farms with insufficient income generation and a lack of collateral. This constrains the formal or informal borrowing despite the long-standing policy to subsidise agricultural credit.

Beyond subsidised credit for agriculture, Turkish policy includes broad-based interest concessions as part of the investment incentive framework – a combination of tax and interest concessions for investors undertaking specific projects, in particular in the regions with lagged development (see next section).

Specific financial assistance is also provided to small and medium enterprises (SMEs).[8] The SME Development Organisation (KOSGEB) offers various financial facilities to SMEs in the form of grants and preferential loans. SMEs engaged in activities upstream and downstream of agriculture are among the beneficiaries (Figure 3.13). In 2013-15, the majority of KOSGEB's funding allocated to agribusiness SMEs went to agro-processors and food service enterprises.[9] In addition to KOSGEB's assistance, a Credit Guarantee Fund operates for SMEs, worth of TRY 1 billion (USD 370 million). The Fund offers guarantees on SME loans for up to 80% of the loan amount, within a general limit of TRY 1.5 million (USD 556 000) per SME and a limit of TRY 2 million (USD 471 000) for SMEs included in the risk group. The financial assistance described above is complemented by a number of tax concessions to SMEs (see next section).

Figure 3.13. KOSGEB's financial assistance to agri-food SMEs

Aggregate assistance and participation in 2013-15



Note: The total amount of assistance and the number of participants cover the following support schemes offered by KOSGEB: Cooperating-Leaguing Support, General Support, SME Project Support, Emerging Enterprises Market SME Support. Thematic Project Support scheme and Entrepreneur Support scheme are not covered as the sectoral allocation of the assistance is not available for these schemes.

Source: Data provided by KOSGEB directly to the OECD.

StatLink http://dx.doi.org/10.1787/888933389702

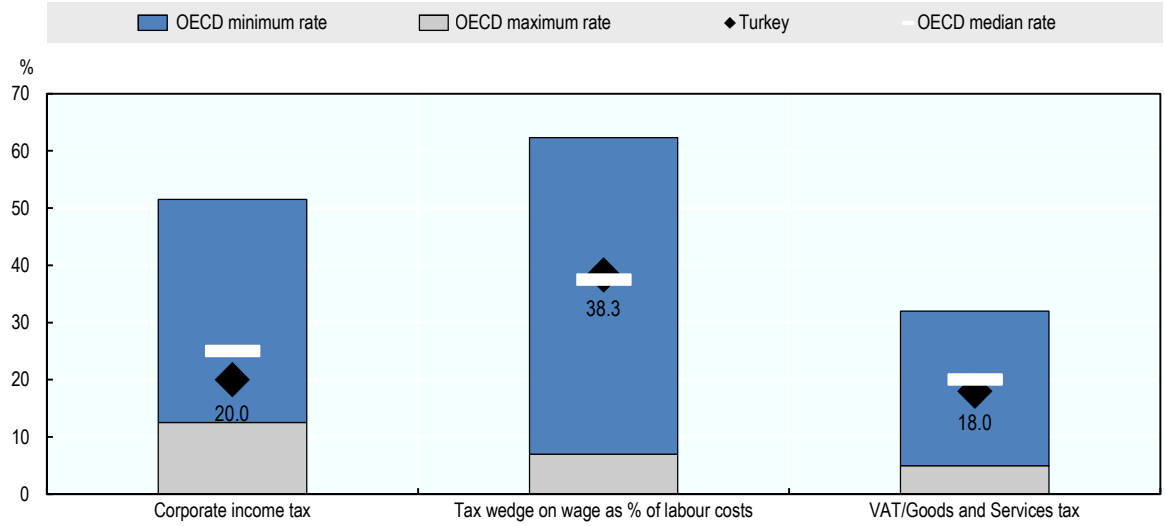
3.5. Tax policy

The principal link between tax policy and innovation is that taxation affects the returns to innovation and thus decisions of firms and individuals to invest. Taxation also influences the relative prices of production factors and therefore priority areas for innovation. Beyond that, taxation often acts as a targeted tool to stimulate innovation, e.g. through preferences to private businesses that invest in R&D, offering preferential regimes to young innovative companies, and VAT concessions on innovative products. Furthermore, tax policy can steer innovation towards specific areas, e.g. to address particular societal concerns and towards greener technologies and practices, or environmental R&D. Tax policies can also work on the consumer side of innovation by creating incentives for households to purchase products with particular characteristics, e.g. by providing consumer tax concessions on newly-developed national products or environmentally-friendly goods.

General tax policy profile

Turkey's tax revenues are nearly 28% of GDP (in 2013), which is below the OECD average of 34%; this percentage, however, has been increasing since the late 2000s. Compared to the OECD-total structure of tax revenues, Turkey relies to a greater degree on proceeds from consumption taxes and to a lesser degree from taxes on income and property (OECD, 2015b). Corporate income tax, tax wedge on wages,[10] and sales tax are the key business taxes. Turkish businesses enjoy lower rates of income taxation compared to the majority of OECD countries, while wage and sales taxation rates are very close to the OECD medians, but relatively high compared to the minimum rates of these taxes across OECD area (Figure 3.14).

Figure 3.14. Key business tax rates in Turkey, international comparison, calendar year 2015



Note: Corporate income tax rate is the basic combined central and sub-central (statutory) corporate income tax rate. Tax wedge on wage includes labour costs paid in income tax and employee and employer social security contributions; OECD aggregate rates for VAT/Goods and services tax do not include data for the United States.

Source: OECD (2015c), *OECD Tax Database*, www.oecd.org/tax/tax-policy/tax-database.htm.

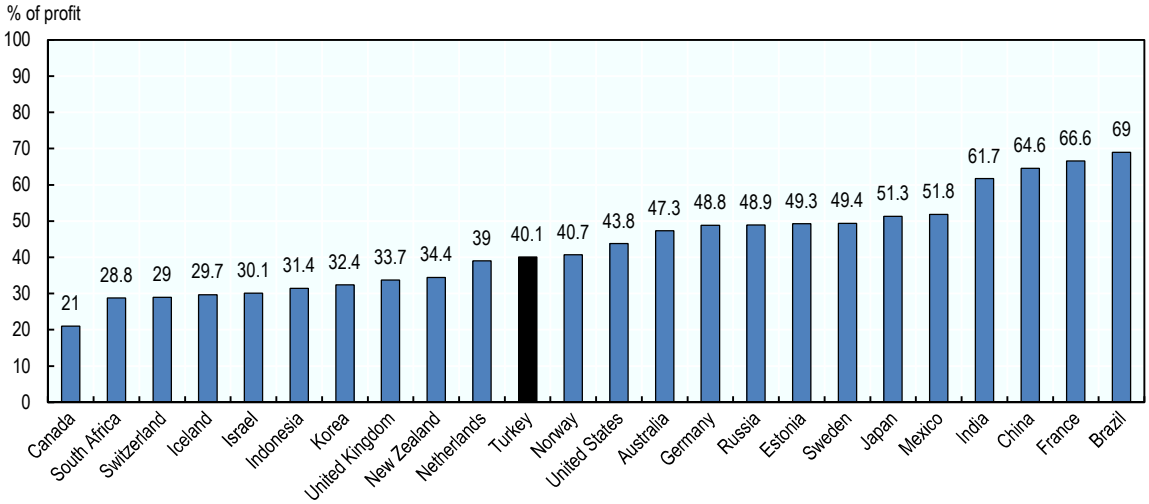
StatLink http://dx.doi.org/10.1787/888933389714

An indication of the aggregate burden on profit from an array of taxes imposed on business may be drawn from the World Bank-PwC's *Paying Taxes* survey, which evaluates that a "case study" business in Turkey returns in taxes 40% of the net profit before all taxes borne (Figure 3.15). This places Turkey somewhere in the middle range among the key OECD and non-OECD economies, but at a substantial distance from the OECD countries with the least burdensome tax regimes for companies, e.g. Canada. The same holds for the transactions costs involved in complying with tax requirements, such as the time required to do that and the number of taxes payable (Figure 3.16). In the aggregate ranking of the best performers on these indicators (number of payments, time, and total tax rate), Turkey scored 56th out of 189 economies surveyed.

As the World Bank-PwC's business taxation indicators relate to a "case study" company, a number of assumptions about the profile of such a business are employed. Among these assumptions, is that only companies that perform general industrial and commercial activities and which do not participate in foreign trade are considered. Both these criteria narrow the inference that can be made from these estimates with respect to agriculture and agro-processing firms. However, to the extent the latter face a taxation regime similar to World Bank-PwC's "case study" company, the estimates remain instructive.

Overall, Turkey has made progress in adapting corporate taxation to international norms, but needs to improve the system to discourage informal business operations and reduce distortions in treatment of larger-scale formal companies and the rest of the business sector. Simplified taxation rules provide benefits, in particular to help smaller business to operate formally. However, both size-dependent differences in statutory taxation and in-practice divergence in financial transparency differentiate effective tax burdens for large and small firms. The magnitude of tax differences seems to have reached distortive proportions that discourage modern businesses as well as large indivisible investments[11] (OECD, 2014a). This is fully applicable to agriculture-based manufactures and downstream services where a segment of large companies co-exist with numerous small and often semi-formal businesses. Beyond the possible distortions from different tax treatment of large- versus smaller-scale business, some activities remain informal and outside business taxation. This in particular relates to primary agriculture, where only a small part of legal entities fall under business taxation, and the majority of farm households are exempt from it.

Figure 3.15. Total tax rate on company profits for Turkey, international comparison, calendar year 2015

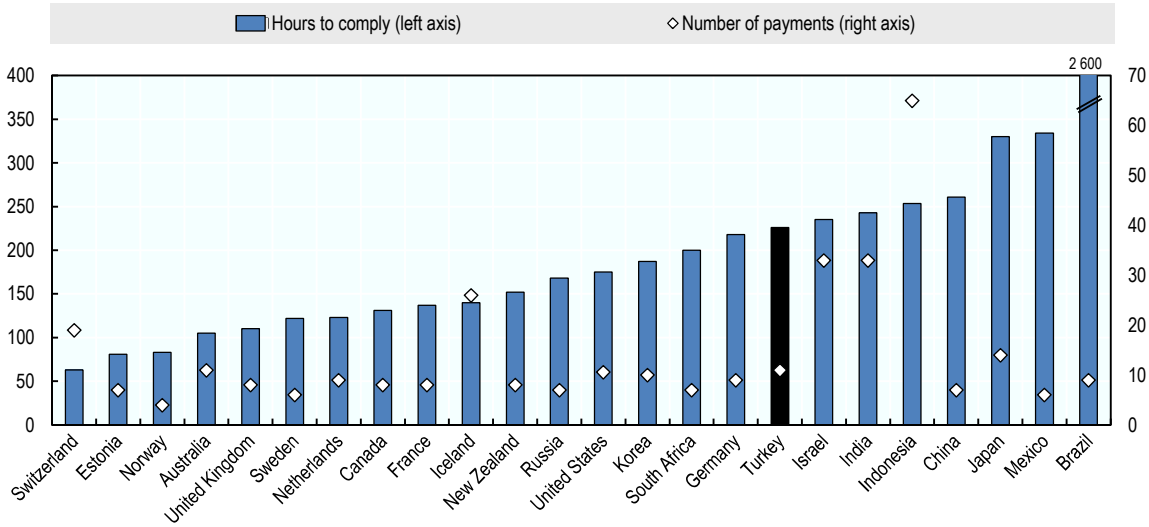


Note: The evaluation uses a concept of a "case study company" defined on the basis of a set of criteria, including the legal form of business (limited liability), start date of operation (January 2012), geographic location (country's one or two largest business cities), origin of ownership (100% owned by domestic natural persons), type of activity (general industrial and commercial), size (own capital amount, number of employed, turnover, etc.). The total tax rate is the sum of taxes and contributions payable after accounting for allowable deductions and exceptions related to commercial profit of businesses before all taxes borne. The groups of taxes covered include: profit or corporate income tax; employer's social contributions and labour taxes; property taxes; turnover taxes and other (such as municipal fees and vehicle and fuel taxes).

Source: WB and PwC (2015), *Paying taxes 2015 - The Global Picture*, PwC, World Bank Group and IFC, Washington, DC. www.pwc.com/payingtaxes.

StatLink http://dx.doi.org/ 10.1787/888933389722

Figure 3.16. Number of taxes for a business company and hours required to comply, calendar year 2015[1]



1. See note to Figure 3.15.

Source: WB and PwC (2015), *Paying taxes 2015 - The Global Picture*, PwC, World Bank Group and IFC, Washington, DC. www.pwc.com/payingtaxes.

StatLink http://dx.doi.org/10.1787/888933389735

Tax concessions

Broad-based tax incentives for investment

Turkey provides various tax incentives as part of an economy-wide investment incentive framework. Tax concessions constitute the core of this framework but they are also combined with preferences for investors on import tariffs, interest rates, and facilitated access to land. Several concession regimes are applied, from a general scheme to schemes for specific regions and specific investment activities. The structure of concessions and eligibility criteria emphasise technological development, economic diversification, and a reduction of regional development disparities (Box 3.1).

Box 3.1 Investment incentive policy framework in Turkey

The Investment Incentive Certificate seeks to stimulate investment in Turkey. Beyond the broad rationale to boost investment and reduce the current account deficit, it aims to promote technology transfers and the clustering of activities, and to reduce the disparities in regional development.

The holders of Investment Incentive Certificates benefit from a set of tax and non-tax concessions based on criteria, such as "capacity conditions" and minimum level of investment, which varies according to different types of certificate.

Concessions available through the Investment Incentive Certificate concern business taxes in large part, including a reduced corporate tax rate, VAT exemption and VAT refunds, and an exemption from the income withholding tax. Other quasi-tax measures concern employer and employee social security contributions: the holders of the Certificate benefit from government coverage of these payments (for a fixed number of years). Beyond tax concessions, investors are exempt from customs duties on imported or domestic machinery and equipment, they can receive interest rate subsidies, and the government can allocate land to implement projects.

The concessions are designed to reduce differences in development levels between country regions. The scope of support and scale of concessions increases the as development level of the region in which investments are made becomes lower (Figure 3.17). For this purpose, all country regions are classified into six groups, from the most (Group 1) to the least developed (Group 6). The regions of the Group 1 are located in the western parts of the country, around big cities such as Ankara, Istanbul, Antalya and Izmir, while the regions of Group 6 are concentrated in south-eastern Turkey.

Figure 3.17. Concessions of Turkey's investment incentive framework

Incentives	Customs duty exemption	Vat exemption	Corporate income tax reduction	Social Security contribution employer	Land allocation	Interest subsidy	Income withholding tax exemption	Social Security contribution employee	VAT refund
General scheme	√	√							
1st and 2nd region	√	√	√	√	√				
3rd to 5th region	√	√	√	√	√	√			
6th region	√	√	√	√	√	√	√	√	
Large scale investments	√	√	√	√	√	Not applicable	6th region only	6th region only	
Prioritised investments	√	√	√	√	√	√	6th region only	6th region only	
Strategic investments	√	√	√	√	√	√	6th region only	6th region only	√

Source: Adapted from KPMG Turkey (2015), *Investment in Turkey 2015*, www.kpmg.com/TR/en/IssuesAndInsights/ArticlesPublications/Documents/investment-in-turkey-2015.pdf.

Box 3.1 Investment incentive policy framework in Turkey (*cont.*)

This framework also promotes large-scale investments and their channelling to strategic and priority areas. The *large-scale investment scheme* applies to projects that exceed TRY 50 million (USD 19 million) in twelve activities which potentially foster technology and R&D capacity. These include knowledge-intensive industries, petroleum, fertiliser, and mining industries. *Strategic investment schemes* cover investments in areas where product imports exceed domestic production capacity and can generate sufficient value-added. Investments under *prioritised investment schemes* should be directed to activities falling under a relatively long list of priorities. None of these relate to agro-food area, but this scheme is applicable to products developed as a result of R&D supported by the government (Chapter 6), which in principle makes agro-food investments also eligible. Private sector investments in all levels of education may also be supported through prioritised investment schemes. Large-scale, strategic and priority investment schemes provide a broader scope of concessions compared to general and mostly regional schemes, as well as for more generous levels of concessions (e.g. greater reductions in corporate tax rates and longer periods during which investors can benefit from government coverage of social security payments).

Investments which are undertaken in Organised Industrial Zones receive enhanced concessions on income tax and social security contributions across all investment incentive schemes (except the general scheme) compared to general conditions in each scheme.

Source: ISPA (2015), *Invest in Turkey*, www.invest.gov.tr/en-US/Pages/Home.aspx; KPMG Turkey (2015), *Investment in Turkey 2015*,www.kpmg.com/tr/en/issuesandinsights/articlespublications/pages/investment-in-turkey-2015.aspx.

The agriculture and food sectors are covered by general and regional investment schemes, with investments going to integrated livestock operations, aquaculture, greenhouses, production of food and beverages, cold storage, and licenced warehouses (Government of Turkey, 2015). The information on the share of agro-food in total investment benefitting from these incentive schemes, however, is not available.

Other tax concessions for businesses

Tax concessions are also part of the policy set to support SMEs. As in the investment incentive framework above, SMEs benefit from VAT exemption on imported and domestically-purchased machinery and equipment, as well as from customs duties on imported goods. These concessions are provided along with public grants and concessional credit schemes for SMEs, and government credit guarantees on loans for SMEs (see previous section).

Venture capital funds and investment trusts benefit from tax incentives under the Tax Process Law. The revenues of venture capital funds or investment trusts established in Turkey are exempted from corporate tax and the withholding tax rate is set at zero.

Tax incentives for business R&D

In 2008, Turkey introduced considerable tax concessions to stimulate business R&D. This includes R&D spending deductions from taxable corporate income, reductions in personal income taxes for researchers, and reductions in employer's social security contributions. The concessions are enhanced for businesses established in Technology Development Zones (Box 3.2).

Following the introduction of these concessions, the share of tax incentives in total government support to business R&D increased from 29% in 2008 to 47% in 2013 (Figure 3.18). Turkey was one of the few OECD countries, along with Belgium, Ireland, and France, which have recently shifted support to business R&D towards tax concessions. Tax incentives, as direct public assistance to business R&D, are aimed to direct private R&D towards socially desirable levels. They may have an advantage over direct public funding in that they allow firms greater flexibility to decide on topics and areas of research. At the same time, direct public funding can be better targeted to the sectors and areas identified as national priorities, and to providing the incentives to improve specific dimensions of firms' R&D, e.g. to foster their capacity development, raise their level of innovation activity, or provide more

incentives to collaborate with other R&D actors. R&D tax concessions linked to company's profits and the minimum number of R&D personnel may create bias against other R&D performers, such as smaller firms and start-ups, which do not generate sufficient profits or R&D employment to become eligible.

Box 3.2. Tax incentives for business R&D in Turkey

The 2008 Law on Support for Research and Development Activities (the R&D Law) provides broad-based tax incentives for companies that conduct R&D:

- *R&D Allowance*: (i) 100% of R&D and innovation expenditures are deductible from taxable profits for corporate tax purposes, provided that the companies making these expenditures are located in R&D Centres and employ at least 30 R&D personnel (15 R&D personnel for high-tech sectors and for food and agriculture industry); (ii) 100% of research and development expenditures incurred for eligible projects oriented to new technology and knowledge research are deductible from taxable profits.

- Personal Income Tax: Under certain conditions, the salaries of R&D and support personnel are exempt from income tax up to 31 December 2023 in the following percentages: 95% for those having a PhD degrees, 90% for those with master's degrees, and 80% for those with undergraduate degrees.

- *Social Security Premium*: 50% of the employer's contribution of social security premiums for each R&D and support personnel is covered by the government for five years.

- *Stamp Duty Exemption*: All documents made out in respect of R&D and innovation facilities within the scope of the R&D Law are exempt from Stamp Tax.

Technology Development Zones benefit from a special set of tax incentives, largely based on the concessions provided by the R&D law:

- Income derived from software and R&D activities in technology development zones by taxpayers doing business in these zones are exempt from income and corporate tax until 31 December 2023.

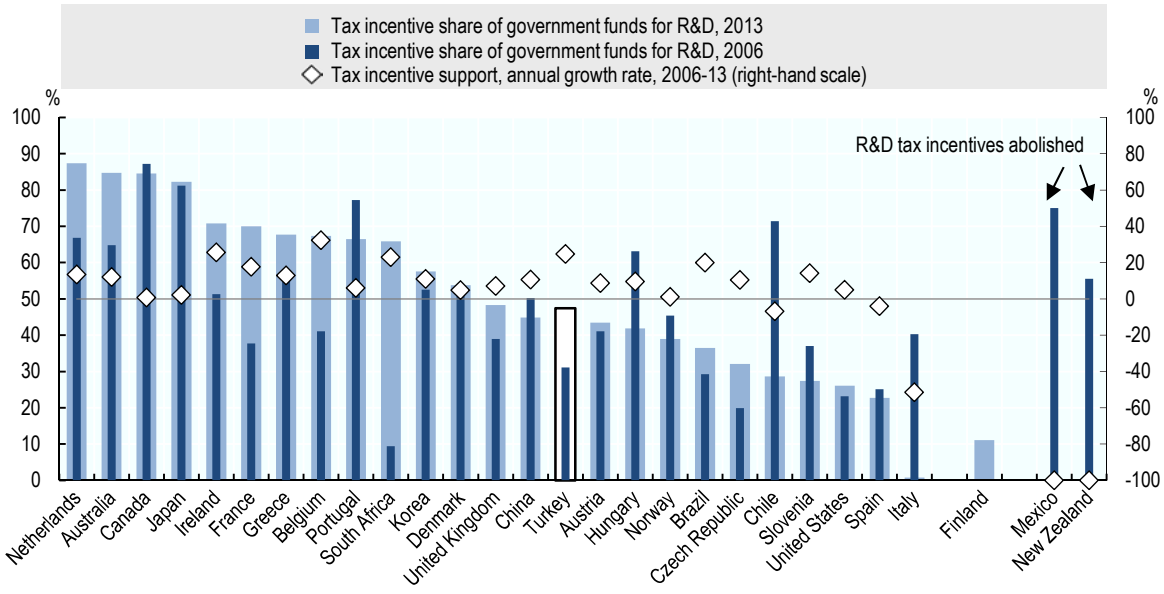
- Wages of researchers, software programmers and R&D personnel involved in R&D activities in TDZs are exempt from income tax and stamp tax until 31 December 2023.

- 50% of employer's contribution to social security premiums is covered by government for each R&D and support personnel during five years.

- Delivery of goods and services which are produced exclusively in TDZs (in the form of system management, data management, business applications, sectorial or industrial, internet, mobile and military command control application software) are exempt from VAT until 31 December 2023.

Source: MOSIT, direct communication; KPMG Turkey (2015), *Investment in Turkey 2015*, www.kpmg.com/tr/en/issuesandinsights/articlespublications/pages/investment-in-turkey-2015.aspx.

Figure 3.18. Change in government support for business R&D through direct funding and tax incentives, 2006-13



1. For Turkey, 2006 data is replaced by 2008 data.

Source: OECD (2015f), *OECD Science, Technology and Industry Scoreboard 2015: Innovation for growth and society*, http://dx.doi.org/10.1787/sti_scoreboard-2015-en.

Summary

- Macroeconomic and institutional conditions have particular importance for agricultural development in Turkey. With high economic growth, the excess labour from agriculture can be absorbed and investment in the rural economy increased. This is essential to achieve a better balance between the factors employed in the agricultural sector to make it more productive and efficient.
- Economic growth decelerated in recent years and is projected to remain below its potential in the short term; a rebalancing of the economy's drivers is required to achieve higher and sustained long-term growth. Vulnerability to external shocks remains high; the potential for productivity gains across the economy needs to be realised through productivity improvements at the firm level and the re-allocation of resources to higher-productivity firms. These challenges require that the structural reforms in areas such as product and market regulation, labour market, education, and social security system progress further.
- Turkey's overall regulatory framework is the most rigid among OECD countries, in particular in terms of state control and regulatory barriers to entrepreneurship. The conditions for doing business are estimated to be less favourable than in the majority of OECD countries; resolving insolvencies, obtaining credit, and starting a business need to be improved in particular.
- Regulations on land and natural resources are being developed and consolidated under the impetus of the EU *acquis* process. The room for progress remains, particularly with regard to implementation, monitoring systems, and policy assessment. The existing environmental regulations need a better evaluation and could take more cost-efficient forms.
- Recent reforms of the land and inheritance regulations, and land consolidation works, are expected to help reduce overly-fragmented farmland and improve its use, with potential

benefits for agricultural productivity, management of natural resources, and attractiveness of rural areas.

- Turkey's tariff and FDI regimes are liberal, but conditions are less favourable towards facilitating trade through internationally harmonised standards, certification procedures, and mutual recognition agreements. Turkey's per capita exports of value added are low compared to other OECD countries, as is its integration into global value chains, including the agro-food sector. This suggests an untapped potential to improve competitiveness through greater integration into global value chains.
- Finance policy facilitates access to credit for investors who engage in regional development, "prioritised" and "strategic" areas, while credit support to the agricultural sector has been a long-standing policy; financial assistance is also focussed on small businesses.
- Tax concessions are used actively to provide a broad-based stimulus for investment, and have been recently made an important stimulus for business R&D.
- The rigidity of other business regulations may be eroding the benefits provided through credit and tax concessions.
- Small and micro-enterprises are a large segment of the business sector in Turkey, but operate in informality. Such enterprises are disconnected from policy incentives or disincentives that are built into formal tax or credit regimes.
- A disconnect from the formal regulatory framework and its policy incentives is likely to be more pronounced in the agricultural sector, where numerous semi-subsistence or subsistence households constitute a large part.

Notes

1. The Burden on the Economy due to Environmental Policies (BEEP) indicator aggregates in a single index "information on administrative burdens related to environmental licenses, differential treatment among incumbents and new entrants and the procedures to evaluate economic effects of environmental policies." The indicator includes the following elements: i) barriers to entry and competition – aiming to capture direct characteristics of environmental policies and permits that may inhibit or slow down entry and provide an advantage to incumbent; ii) (Lack of) Evaluation of economic effects of environmental policies in policymaking – focusing on the potential implications for competition, entry and more generally economic outcomes of procedures applied in the environmental policy making process, *ex ante* and *ex post*. The indicator is calculated using information from a cross-country questionnaire undertaken in 2013. The measured burdens are generally a result of national implementation of environmental policies, hence within the reach of national policymakers, even if in some cases related to supra-national policies, for example in the European Union (Kozluk, 2014).
2. The EU-Turkey CU does not cover agriculture, the services sector and public procurement.
3. See Box 3.1 for the description of the investment incentive schemes.
4. In the WEF's index of financial market development, the legal rights index measures the degree to which collateral and bankruptcy laws protect borrower's and lenders' rights; this index is sourced from the World Banks' *Doing Business* reports.
5. On the ease of obtaining credit, respondents were asked: "In your country, how easy is it to obtain a bank loan with only a good business plan and no collateral?"

6. Tradesmen, money brokers, commissioners, or wealthy locals may act as informal lenders. Some authors cite studies dating back to mid-1990s which report that informal sources of lending range from 10% to 60% of rural credit in various regions (Tanrivermis and Bayaner, 2006).

7. According to a World Bank survey of 4 000 rural households in Turkey which was conducted in mid-2000s, 63% of households had never borrowed on any occasion from any type of lender, including from informal sources. Over 70% of households were credit constrained, i.e. those who needed loans but did not apply, or who applied but were rejected. Households were limited in savings and taking advantage of investments: only 9% of those surveyed made investment outlays in the year preceding the survey (World Bank, 2006).

8. SMEs are defined in Turkey as companies employing less than 250 persons with revenue or turnover of less than TRY 40 million (USD 15 million) per year (ISPA, 2015).

9. These data do not cover two additional support schemes (Thematic Project Support and Entrepreneur Support) for which the information disaggregated by type of SME activity is not collected.

10. The tax wedge on wage is the combined central and sub-central government income tax plus employee and employer social security contribution taxes, as a percentage of labour costs defined as gross wage earnings plus employer social security contributions; the tax wedge includes cash transfers (OECD, 2015c).

11. At the same time, important tax incentives are provided for large-scale investment projects in certain sectors (Box 3.1).

References

BRSA (2015), Banking Regulation and Supervision Agency Statistical data On-line, www.bddk.org.tr/WebSitesi/english/Statistical_Data/Statistical_Data.aspx.

Conway, P. et al. (2007), "Product market regulation and productivity convergence", *OECD Economic Studies*, Vol. 2006/2, OECD Publishing, Paris. http://dx.doi.org/10.1787/eco_studies-v2006-art9-enhttp://dx.doi.org/10.1787/eco_studies-v2006-art9-en.

EC (2016), "European neighbourhood policy and enlargement negotiations", the European Commission http://ec.europa.eu/enlargement/policy/conditions-membership/chapters-of-the-acquis/index_en.htm.

EC (2015), "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Turkey Progress Report 2015", European Commission, Brussels, 10 November 2015, SWD(2015) final, http://ec.europa.eu/enlargement/pdf/key_documents/2015/20151110_report_turkey.pdf.

FAO (2016), "FAOLEX legislative database: Turkey: Law No. 5403 on Soil Preservation and Land Utilization", http://faolex.fao.org/.

Government of Turkey (2015), "OECD Food and Agricultural Review: Innovation for Agricultural Productivity and Sustainability in Turkey: Questionnaire", Responses to the OECD received from the Turkish Government.

Havarnek, T. and Z. Irsova (2012), "Survey article: Publication Bias in the Literature of Foreign Direct Investment Spillovers", *The Journal of Development Studies*, Vol. 48, No. 10.

IMF (2016a), *World Economic Outlook* (database), April 2016, International Monetary Fund, www.imf.org/external/pubs/ft/weo/2016/01/weodata/index.aspx.

IMF (2016b), *Financial Soundness Indicators* (database), International Monetary Fund, www.imf.org/external/np/sta/fsi/eng/fsi.htm.

ISPA (2015), *Invest in Turkey*, The Republic of Turkey Prime Ministry, Investment Support and Promotion Agency (ISPA) on-line, www.invest.gov.tr/en-US/Pages/Home.aspx.

Koźluk,T. (2014), "The Indicators of the Economic Burdens of Environmental Policy Design: Results from the OECD Questionnaire", *OECD Economics Department Working Papers*, No. 1178, OECD Publishing, Paris. http://dx.doi.org/10.1787/5jxrjnbnbm8v-en.

KPMG Turkey (2015), *Investment in Turkey 2015*, www.kpmg.com/TR/en/IssuesAndInsights/ArticlesPublications/Documents/investment-in-turkey-2015.pdf.

Larson, D. F., W. Martin, S. Sahin and M. Tsigas (2014), "Agricultural Policies and Trade Paths in Turkey", *World Bank Policy Research Working Paper* N 7059, October 2014, Washington DC.

Moïsé, E. and S. Sorescu (2015), "Contribution of Trade Facilitation Measures to the Operation of Supply Chains", *OECD Trade Policy Papers*, No. 181, OECD Publishing, Paris. http://dx.doi.org/10.1787/5js0bslh9m25-en.

Nicoletti G., S. S. Golub, D. Hajkova, D. Mirza and K.-Y. Yoo (2003), 'The Influence of Policies on Trade and Foreign Direct Investment', *OECD Economic Studies* No. 36, 2003/1, OECD Publishing, Paris, www.oecd.org/eco/growth/33638319.pdf.

OECD (2016a), "Burdens on the Economy due to Environmental Policies indicator", www.oecd.org/eco/growth/BEEP%20Indicator_Data%20and%20questionnaire%20responses%20.xlsx.

OECD (2016b), *Foreign Direct Investment (FDI) Statistics* - OECD Data, Analysis and Forecasts, www.oecd.org/corporate/mne/statistics.htm.

OECD (2016c), *OECD Economic Outlook 2016* (database), https://stats.oecd.org/index.aspx?DataSetCode=EO.

OECD (2016d), *OECD Economic Surveys: Turkey 2016*, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/eco_surveys-tur-2016-en.

OECD (2015a), "Turkey", in *OECD Economic Outlook, Volume 2015 Issue 1*, OECD Publishing, Paris. http://dx.doi.org/10.1787/eco_outlook-v2015-1-43-enhttp://dx.doi.org/10.1787/eco_outlook-v2015-1-43-en.

OECD (2015b), *OECD Revenue Statistics 2015 – Turkey*. www.oecd.org/tax/revenue-statistics-turkey.pdf.

OECD (2015c), *OECD Tax* (database), www.oecd.org/tax/tax-policy/tax-database.htm.

OECD (2015d), *OECD Trade Facilitation Indicators* (database), www.oecd.org/trade/facilitation/indicators.htm.

OECD (2015e), "Historical population data and projections (1950-2050)", OECD.*Stat*, https://stats.oecd.org/index.aspx?Datasetcode=POP_PROJ.

OECD (2015f), *OECD Science, Technology and Industry Scoreboard 2015: Innovation for growth and society*, OECD Publishing, Paris. http://dx.doi.org/10.1787/sti_scoreboard-2015-en.

OECD (2014a), *OECD Economic Surveys: Turkey 2014*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-tur-2014-en.

OECD (2014b), *OECD Indicators of Product Market Regulation* (database), www.oecd.org/eco/growth/indicatorsofproductmarketregulationhomepage.htm.

OECD (2013), *National Treatment for Foreign-Controlled Enterprises: Including Adhering Country Exceptions to national Treatment 2013*, www.oecd.org/daf/inv/investment-policy/national-treatment-instrument-english.pdf.

OECD (2010a), *Measuring Innovation: A New Perspective*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264059474-en.

OECD (2010b), *The OECD Innovation Strategy: Getting a Head Start on Tomorrow*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264083479-en.

OECD (2008), *OECD Environmental Performance Reviews: Turkey 2008*, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/9789264049161-en.

OECD (2007), "Product Market Regulation and Productivity Convergence", Chapter 5 in OECD, *Economic Policy Reforms 2007: Going for Growth 2007*, OECD Publishing, Paris. http://dx.doi.org/10.1787/growth-2007-en.

OECD-WTO (2015) *Trade in Value Added (TiVA)* (database), https://stats.oecd.org/index.aspx?queryid=66237.

Oxford Economics (2015), *Country Economic Forecast: Turkey*, 7 August 2015.

Tanrivermis H. and A. Bayaner (2006), "Members'Perception and the Role of Agricultural credit Cooperatives in Agricultural Finance in Turkey", in *New Medit*, Vol. 5, No.3, September.

UNCTAD (2015), *World Investment Report 2014*, United Nations, 2014, http://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=937.

WB and PwC (2015), *Paying taxes 2015 - The Global Picture*, PwC, World Bank Group and IFC, Washington, DC. www.pwc.com/payingtaxes.

WDI (2015), *World Development Indicators* (database), World Bank, http://data.worldbank.org/data-catalog/world-development-indicators.

WEF (2015), *The Global Competitiveness Report 2015-2016: Full data Edition*, World Economic Forum Geneva 2015, http://reports.weforum.org/global-competitiveness-report-2015-2016/.

World Bank (2016), *Doing Business 2016: Measuring Regulatory Quality and Efficiency,* World Bank and the International Finance Corporation, World Bank Publications, Washington, DC. www.doingbusiness.org/reports/global-reports/doing-business-2016.

World Bank (2014), *Doing Business 2014: Understanding Regulations for Small and Medium-Size Enterprises*, World Bank and the International Finance Corporation, World Bank Publications, Washington, DC. www.doingbusiness.org/reports/global-reports/doing-business-2014.

World Bank (2006), *Turkey Rural Finance Study*, Volume 1: Main Report, Report No. 69968v1, May 2006, Washington D.C.

Annex 3.A1

Status of Turkey's negotiations on EU membership

Negotiation chapters	Negotiations opened	Negotiations closed	Levels of preparation to assume membership as of November 2015
1 – Free movement of goods			Good
2 – Freedom of movement of workers			Early stage
3 – Right of establishment and freedom to provide services			Early stage
4 – Free movement of capital	19 December 2008		Moderate
5 – Public procurement			Moderate
6 – Company law			Well advanced
7 – Intellectual property rights	17 June 2008		Good
8 – Competition policy	17 June 2008		Moderate
9 – Financial services			Good
10 – Information society and media	19 December 2008		Moderate
11 – Agriculture and rural development			Some level
12 – Food safety, veterinary and phyto-sanitary policy	30 June 2010		Some level
13 – Fisheries			Early stage
14 – Transport policy			Moderate
15 – Energy			Moderate
16 – Taxation	30 June 2009		Moderate
17 – Economic and monetary policy	14 December 2015		Moderate
18 – Statistics	26 June 2007		Moderate
19 – Social policy and employment			Moderate
20 – Enterprise and industrial policy	29 March 2007		Good
21 – Trans-European networks	19 December 2007		Well advanced
22 – Regional policy and the coordination of structural instruments	5 November 2013		Moderate
23 – Judiciary and fundamental rights			Some level
24 – Justice, freedom and security			Moderate
25 – Science and research	12 June 2006	12 June 2006	Well advanced
26 – Education and culture			Moderate
27 – Environment and climate change	21 December 2009		Moderate
28 – Health and consumer protection	19 December 2007		Good
29 – Customs union			Good
30 – External relations			Good
31 – Foreign, security and defence policy			Moderate
32 – Financial control	26 June 2007		Good
33 – Financial and budgetary provisions			Early stage
34 – Institutions			-
35 – Other issues			-

Source: EC (2015), "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Turkey Progress Report 2015", European Commission, Brussels, 10 November 2015, SWD(2015) final, http://ec.europa.eu/enlargement/pdf/key_documents/2015/20151110_report_turkey.pdf.

Annex 3.A2

Principal environmental laws and regulations in Turkey

GENERAL
Law on Environment No. 2872
Law on Metropolitan Municipalities No. 5216
Law on the Use of Renewable Energy Resources for Electricity Production Purposes No. 5346
Law on Municipalities No. 5393
Penal Code
Law on Local Government Associations
Law on the Right Access to Information No. 4982
Regulation on the Basis and Procedures of the Implementation of the Law on the Right Access to Information No. 18132
Regulation on Environmental Inspection No. 24631/bis
Regulation on Environmental Impact Assessment No. 25318
Law on the Organisation and Responsibilities of the Ministry of Environment and Forestry No. 4856
Law on Mining
Law on the Procedure of Administrative Justice No. 2577
Law on the Organisation and Responsibilities of the State Hydraulic Works
Law on Sea Ports
AIR
Regulation on the Control of Air Pollution due to Warming No. 25699
Regulation on Petrol and Diesel Fuel Quality No. 25489
Regulation on Informing Consumers on Fuel Economy and CO_2 Emissions of New Passenger Cars No. 25530
Regulation on the Control of Exhaust Gas Emissions caused by Motor Vehicles
Regulation on Protection of Air Quality No. 19269
WASTE
Regulation on End-of-Life Tires
Regulation on Hazardous Waste Control No. 25755
Regulation on Medical Waste No. 25883
Regulation on Waste Vegetable Oil Control No. 25791
Regulation on Packaging and Packaging Waste Control No. 25538
Regulation on Waste Oil Control No. 25353
Regulation on Waste Batteries and Accumulators Control No. 25538
Regulation on the Recovery and Control of Ship Waste No. 25682
Regulation on the Control of Excavation soil, Construction Waste and Wreckages No. 25406
Regulation on Solid Waste Control No. 20814

Continued

WATER
Regulation on Bathing Water Quality No. 26048
Regulation on Urban Waste Water Treatment No. 26047
Regulation on the Control and Reduce Water Pollution Caused by Discharge of Certain Dangerous Substances No. 26005
Regulation on the Quality Required of Surface Water intended for the Abstraction of Drinking Water No. 25999
Regulation on Water Intended for Human Consumption No. 25730
Regulation on Water Pollution Control No. 25687
Law on Fisheries No. 1830
Regulation on Fisheries No. 22223
Regulation on the Protection of Waters against Pollution Caused by Nitrates from Agricultural Sources No. 25377
Law on Underground Waters No. 167
NATURE
Regulation on Keeping, Breeding, and Trade of Game and Wild Animals and the Products Obtained from them No. 25847
Regulation on the Conservation of Wetlands No. 25818
Regulation on Hunting and Wild Animals and Production Facilities and Stations and Rescuing Centres No. 25656
Law on Hunting No. 4915
Law on National Parks No. 2873
Law on Preservation of Cultural and Natural Entities No. 2863
INDUSTRIAL POLLUTION AND RISK MANAGEMENT
Regulation on Control of Air Pollution from Industrial Plants No. 26236
Law on Organised Industrial Regions
CHEMICALS
Regulation on the Working Principle and Procedures of Ethical Councils Concerning Animal Experiments No. 26220
Regulation on the Protection of Experiment Animals and on the Basic Principles of the Establishment, Operation and Inspection of Experiment Laboratories
Regulation on the Phase-Out of Ozone Depleting Substances No. 23766
Regulation on Dangerous Chemicals No. 21634
NOISE
Regulation on Environmental Noise Assessment and Management No. 25862

Source: OECD (2008), *OECD Environmental Performance Reviews: Turkey 2008*, http://dx.doi.org/10.1787/9789264049161-en.

Chapter 4

CAPACITY BUILDING AND SERVICES FOR THE FOOD AND AGRICULTURE SYSTEM IN TURKEY

This chapter outlines the role of infrastructure capacity, labour mobility, skills, and education in facilitating innovation in agriculture and food sectors. It describes the policies to improve rural infrastructure and outlines the main regional programmes. It then analyses how labour and education policies respond to demands for skills, and reports on trends in education expenditure and on the performance of the educational system. Finally, an overview is given on the level of education of those working in agriculture and on enrolment in agricultural programmes, notably by outlining the gap between supply and demand of skills.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

4.1. Infrastructure and regional development policies

Transport infrastructure connects the economic system so as to allow for the movement of factors of production, goods and information across agents and markets. Irrigation and electricity infrastructures are essential to the production process, while ICT infrastructure ensures information flows. As such, infrastructure as a whole provides the possibility of economic activity in principle, and determines its location and the kinds of activities or sectors that can develop within the economy. The availability and quality of infrastructure affect the decisions of firms and individuals to invest, including in innovation. This section looks at the general state of infrastructure in Turkey and government policy to develop it, while infrastructure issues within the rural development programmes are examined in Chapter 5.

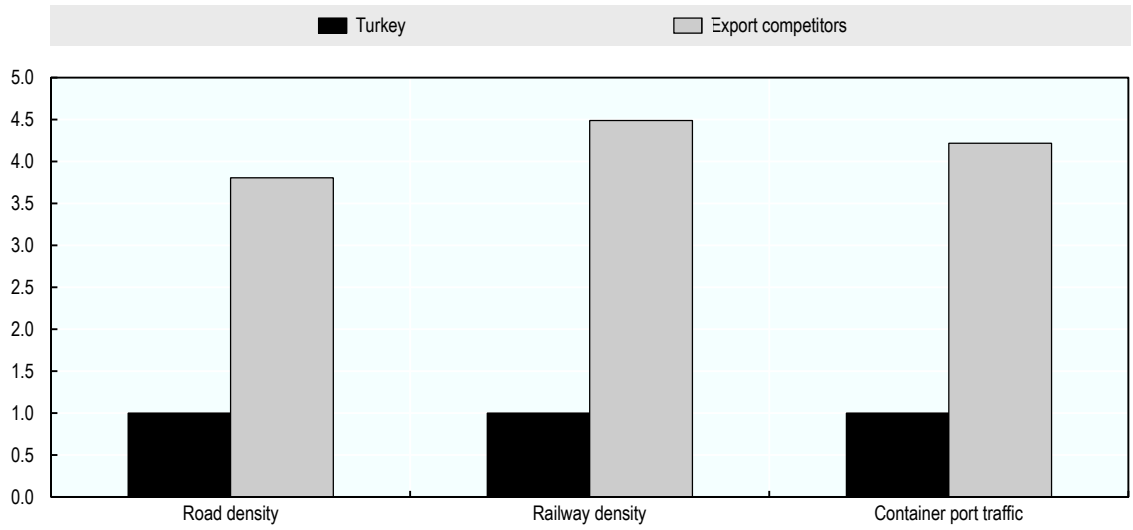
Availability and quality of infrastructure

Adequate transport and other physical infrastructure are essential for Turkey's economic and social development. Road and railway density, and container port traffic are around one quarter of that of its export competitors in OECD countries (Figure 4.1 and Annex 4.A1).[1]

The gap in terms of quality of transport infrastructure seems to be less pronounced than in its availability, as evidenced by the WEF's survey of business opinions. Overall, businesses in Turkey rated the quality of transport infrastructure close to OECD average levels, although the quality of railroads is perceived less favourably as compared to the average across OECD countries (Figure 4.2). In terms of ICT penetration and the quality of electricity and communications infrastructure, Turkey's ranking is also relatively modest (Figure 4.3). According to 2012 data, 53% of the population did not have access to internet in their neighbourhood. ICT deficiencies are particularly prevalent in rural regions (MOFAL, 2014).

Figure 4.1. Turkey's availability of transport infrastructure, international comparison, 2013

Normalised to 1 for the value of Turkey



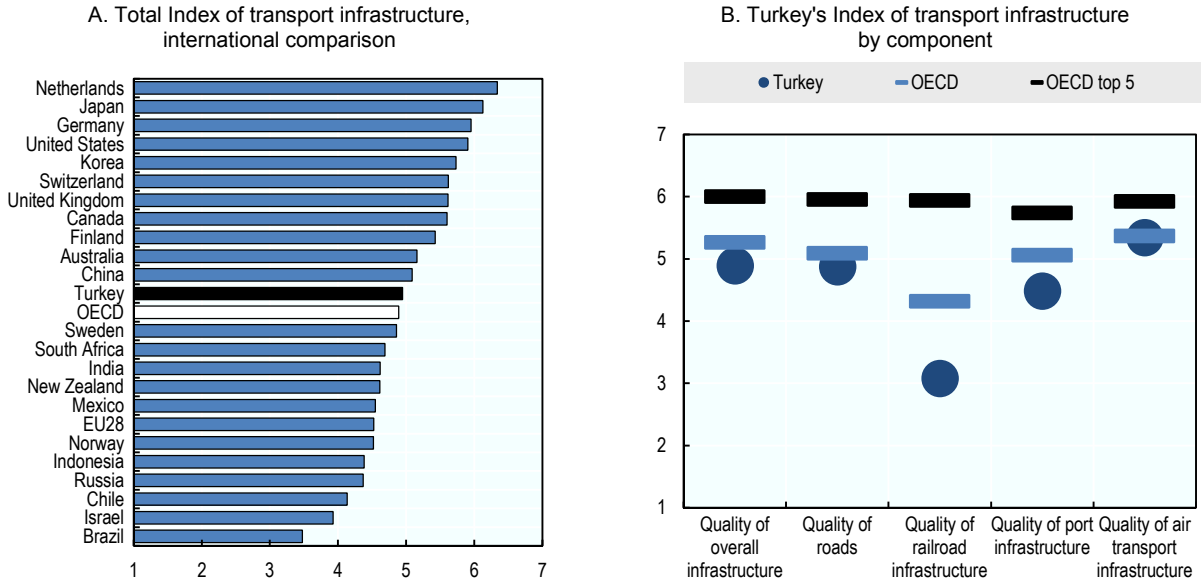
Note Export competitors are OECD countries representing top exporters relative to Turkey's agricultural export strength (Belgium, Canada, China, France, Germany, Italy, Netherlands, Spain, United Kingdom and the United States). Data for road density refer to 2011.

Source: WDI (2015), *World Development Indicators Database*, World Bank, http://data.worldbank.org/data-catalog/world-development-indicators.

StatLink http://dx.doi.org/10.1787/888933389749

Figure 4.2. Global Competiveness Index: Quality of Turkey's transport infrastructure 2015-16

Scale 1 to 7 (best)



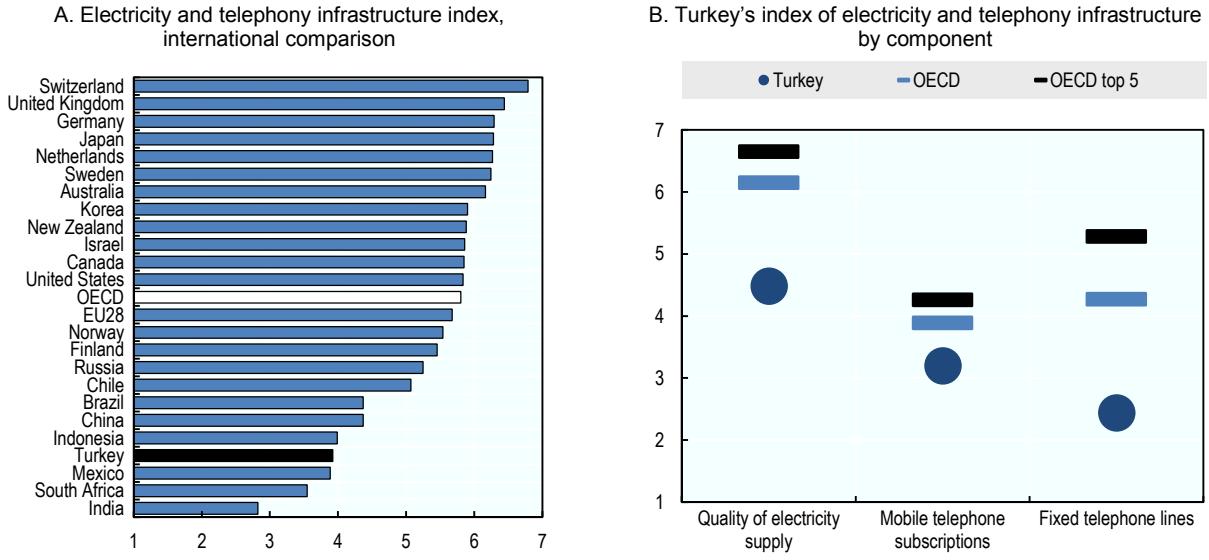
Note: OECD top 5 refers to the average of the scores for the top 5 performers among OECD countries (Netherlands, Japan, Spain, France and Germany). Indices for EU28 and OECD are the simple average of member-country indices.

Source: WEF (2015), *The Global Competitiveness Report 2015-2016: Full data Edition*, http://reports.weforum.org/global-competitiveness-report-2015-2016.

StatLink http://dx.doi.org/10.1787/888933389759

Figure 4.3. Global Competiveness Index: Quality of Turkey's electricity and telephony infrastructure 2015-16

Scale 1 to 7 (best)



Note: OECD top 5 refers to the average of the scores for the top 5 performers among OECD countries (Switzerland, Luxembourg, Austria, United Kingdom and Iceland). Indices for EU28 and OECD are the simple average of member-country indices.

Source: WEF (2015), *The Global Competitiveness Report 2015-2016: Full data Edition*, http://reports.weforum.org/global-competitiveness-report-2015-2016.

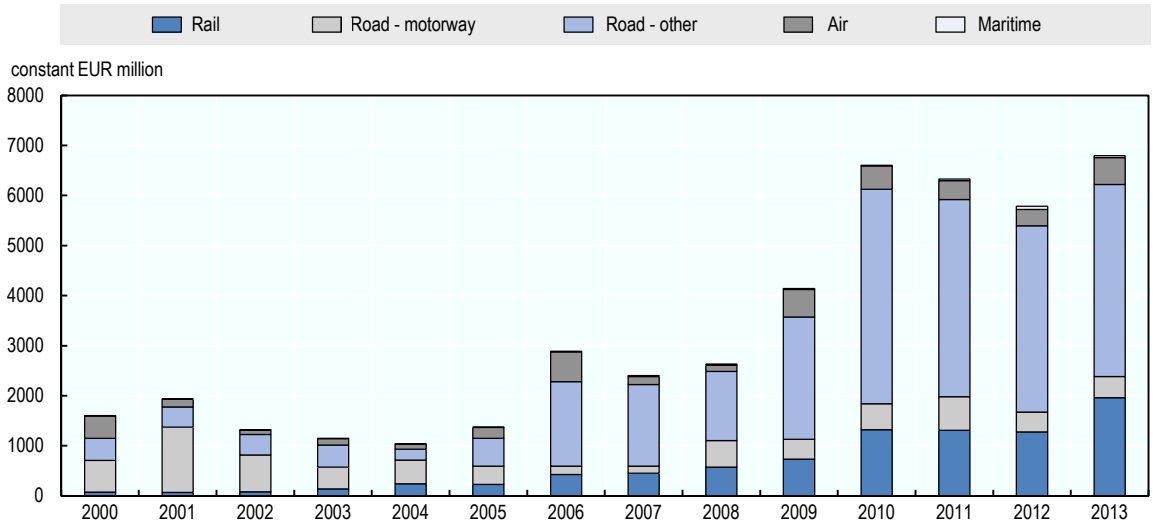
StatLink http://dx.doi.org/10.1787/888933389764

Infrastructure in the national and regional development strategies

The accelerated infrastructural development is viewed in Turkey as a national development priority. Since the mid-2000s, institutional and regulatory reforms in the infrastructure sectors have been implemented and investments made in large projects. The total amount of investment in transport infrastructure increased in real terms from EUR 1.6 billion per year in 2000-02 to EUR 6.3 billion per year in 2011-13, almost quadrupling (Figure 4.4). The GDP share of investments in inland transport infrastructure rose from 0.5% to 1.6% between these two periods. Road and rail transport has seen rapid growth, with the expansion of the road network and an increase in more modern roads and freight capacity (Figure 4.5).

Further ambitious targets to develop transport infrastructure are set for 2023, the centennial year of the Republic of Turkey. The government aspires to transform the country into a regional logistics hub and the targets, among others, include building 14 000 km of new railways, 5 300 km of new motorways, the largest airport in the world, and a 50 km waterway between the Black Sea and the Sea of Marmara (Thomas, 2015). The current Tenth Development Plan for 2014-18 is aligned with the orientations for the 2023 centennial. It sets accelerated growth targets for key transport sectors, far above those realised between 2006 and 2013 (Figure 4.5). Turkey is largely reliant on highway transport (90.5% of passenger transport, 87.4% of freight transport) and has included plans for a balanced distribution of modes of transport (MOD, 2014b). The rail and maritime transport sectors are to be given the most important boost. Turkey's rail transport is insufficiently developed and has a low share of domestic transportation, accounting for only 5% of freight. Maritime transport is of particular importance: with a coastline of 8 200 km and 220 seaports open to commercial traffic, over half of Turkey's foreign trade is shipped via maritime transport (Thomas, 2015). For road transport, the accelerated construction of motorways is foreseen.

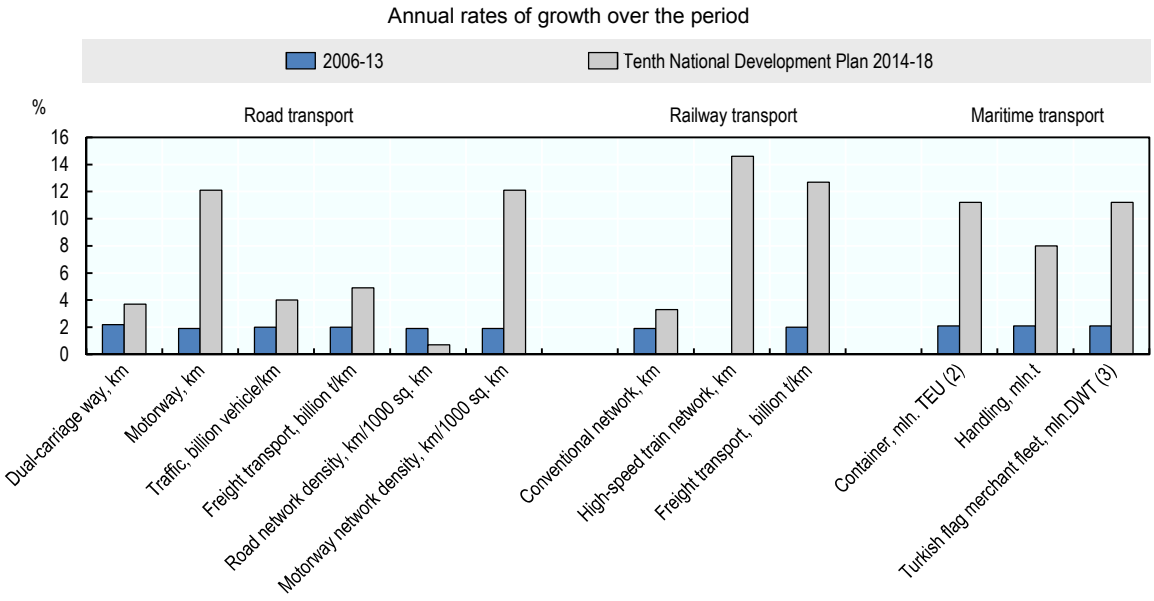
Figure 4.4. Investments in transport infrastructure in Turkey, 2000-13



Source: OECD (2015h), *Infrastructure Investment Indicators*, OECD Publishing, Paris, https://data.oecd.org/transport/infrastructure-investment.htm.

StatLink http://dx.doi.org/10.1787/888933389779

Figure 4.5. Development of transport infrastructure in Turkey: Selected indicators



1. Growth rate is not indicated as no high-speed train network existed in 2006; 888 km of high-speed network has been constructed by 2013.
2. TEU – twenty-foot equivalent units.
3. DWT – deadweight tonnage.

Source: MOD (2014b), *The Tenth Development Plan 2014-2018*, www.mod.gov.tr/Pages/DevelopmentPlans.aspx.

StatLink http://dx.doi.org/10.1787/888933389786

A special chapter of Turkish EU *acquis* relates to the integration of Turkish transport and energy sectors into the Trans-European networks. This includes the connections with the Trans-European Transport Network (TEN-T), and full integration and interoperability with the European Network of Transmission Systems Operators for Electricity (EC, 2015). The Instrument for Pre-Accession (IPA) allocated EUR 353 million of EU financial assistance in 2007-13 for the Turkish transport sector, and EUR 443 million are to be provided over the 2014-20 period, mainly to connect the TEN-T rail network and the greening of the transport system. Turkish transport plans also foresee developing connections to Asia, in particular towards China.

In the ICT area, Turkey has developed regulations and strategies, including the Electronic Communications Act and the R&D Law. The Information Society Strategy and Action Plan (2015-18) sets the objectives and actions to transform Turkey into an information society (MOD, 2015). The strategy is based on eight pillars: information technologies sector; quality of human resources and employment, information security and user trust, internet entrepreneurship and e-commerce; broadband infrastructure and competition; diffusion of ICT into society; ICT-supported innovative solutions; and user-centric and effective public services. Shaped by the Tenth Development Plan and the Digital Agenda for Europe, the Action Plan focuses on: growth and employment to effectively use ICT; integrating ICTs in other sectors and e-government; increasing job opportunities; and becoming more competitive in the global economy. Progress has been made towards attaining rates of national internet penetration and levels of network standards, but in the absence of measurement objectives, social inclusion of technology has yet to be addressed (Uçkan, 2009). Given urban-rural disparities, ICT strategies need to be targeted and embedded into social policies in order to address the challenges faced by the rural population.

Infrastructure development in Turkey has a strong regional development aspect. Turkey is one of the ten OECD countries with the highest regional disparities, as measured by the difference between the unemployment rates across regions of the country (OECD, 2014c). The greater wealth, urbanisation and

high profile infrastructure, including high speed rail, canals, and bridges, in the western regions contrast with the gaps in basic infrastructure and remote subsistence farming in the eastern regions. Infrastructure development projects are largely embedded into the regional development programmes, which address the important needs of the rural areas.

The National Strategy for Regional Development 2014-23 (NSRD) provides a framework for policy development and implementation at the regional level. There are 26 regional development agencies that implement national-level plans through territorial objectives that are broadly aimed at alleviating regional disparities. The regional development agencies also implement regional development plans in a decentralised manner in compliance with the European Union's regional and cohesion policies (Catir, 2015; Tiftikcigil, 2015). These projects address infrastructure and socio-economic issues specific to each region by offering technical support, planning, monitoring and evaluation activities, fostering research activities, and developing private sector co-operation (Montabone, 2010).

Among the various regional development projects of different scales and scope, four large projects concern the least developed areas of Turkey. They represent integrated, multi-sectoral undertakings with an emphasis on infrastructure improvements (Figure 4.6).

Figure 4.6. Turkey's large regional development projects

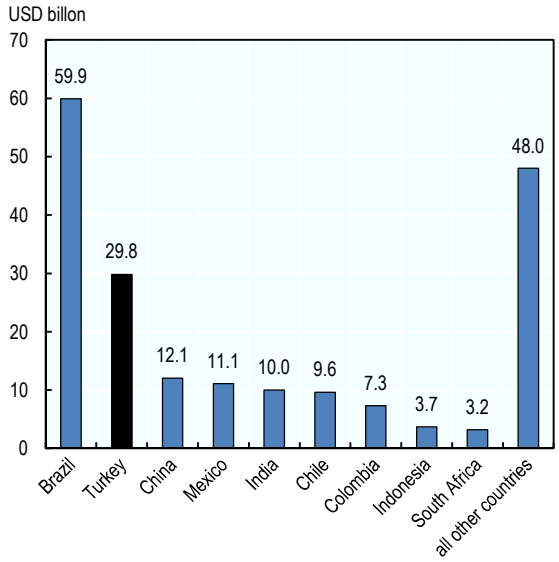
Source: MOD (2014a), *GAP Action Plan 2014-2018: South-Eastern Anatolia Project*, Republic of Turkey, Ministry of Development, Ankara.

The large South Eastern Anatolia Project (GAP) 2014-18 is currently on-going in nine provinces of the Euphrates and Tigris basins and in Upper Mesopotamia. The project aims to support the integrated sustainable development of the region, which covers approximately 10% of Turkey's total land area in terms of both population and surface (MOD, 2014a). GAP is an integrated project concerning agriculture,[2] hydroelectric power production, urban and rural infrastructure, forestry, and the education and health sectors. It includes the construction of 22 dams and 19 power plants, extensive irrigation schemes, and highway infrastructure (network extension and surface quality). GAP has also constructed seven airports, including Turkey's biggest cargo airport in Şırnak.

The Konya Plains Project (KOP) spans almost 50 000 km^2 within the Konya River basin and covers 73% of the total area that can be irrigated in this basin. The KOP includes 12 big projects for water management and water and energy supply, as well as a number of small-scale surface and ground water irrigation projects. The KOP includes the construction of dams, hydroelectric power plants, irrigation systems, and other agricultural infrastructure, as well as the development of transportation and water supply networks. In terms of irrigation, it is described as the second largest project after the South Eastern Project (Berktay et al., 2009). Improvements to Konya's agriculture-based industries are also meant to promote collaboration and to develop centres of agricultural innovation (KOP, 2013).

The Eastern Anatolia Project (DAP) was launched in 2000 and covers 14 provinces in the least developed eastern parts of Turkey. An increase in irrigation pipelines as well as the consolidation of farm land is foreseen in an effort to boost agricultural productivity (Burrell, 2005). The Eastern Black Sea Project (DOKAP) is being implemented in eight provinces. It aims to improve the livelihood of small-scale famers by way of improving, for example, the transportation and communication infrastructures so that mountainous regions are more accessible (Zhelezov, 2011).

Figure 4.7. Total private infrastructure investments in 2013 and 2014[1]

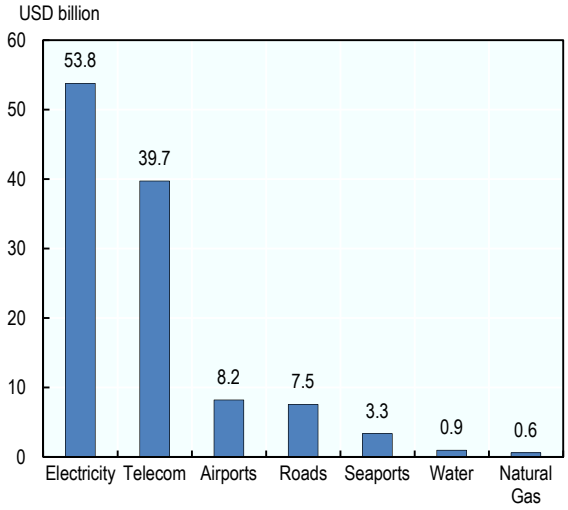


1. The investment amounts represent the total investment commitments by the project entity at the beginning of the project (at contract signature or financial closure).

Source: World Bank (2015), *World Bank Private Participation in Infrastructure Database*, http://ppi.worldbank.org.

StatLink http://dx.doi.org/10.1787/888933389796

Figure 4.8. Private infrastructure investments in Turkey by sector between 1994 and 2014[1]



1. See note to Figure 4.7.

Source: World Bank (2015), *World Bank Private Participation in Infrastructure Database*, http://ppi.worldbank.org.

StatLink http://dx.doi.org/10.1787/888933389803

Given the substantial funding that is needed to support infrastructure development plans, Turkey has encouraged private investment, including foreign direct investment. The investment incentive framework (Box 3.1 in Chapter 3) provides considerable concessions to private investors who engage in infrastructure projects. Within this framework, infrastructure projects may fall under various preferential schemes in taxation, credit and social contributions, all of which are further enhanced for investments in the least developed regions. Turkey promotes Public-Private-Partnerships for infrastructure projects in various forms: Build–Operate-Transfer (BOT), Build-Operate (BO), Build-Lease-Transfer (BLT) and Transfer of Operating Rights (ToR) arrangements. The recently enacted legislation (Law No. 6428 on Building and Renewal of Facilities and Procurement of Services through Public Private Model) consolidated financing regulations and opened a range of infrastructure sectors (electricity, transport, etc.) to private financing.[3] In an international comparison, Turkey ranked second in 2013-14 in receiving private funding for infrastructure (Figure 4.7). The telecom and electricity sectors have been by far the largest recipients of private funds (Figure 4.8).

Although national strategies are in place, the experience of infrastructure projects crossing through areas of responsibility of different government bodies has highlighted the need for clearer governance and coordination. Infrastructure development is associated with environmental and social impacts due to shifts in land ownership, land use structure, economic activity structure, and the demography of the regions. This creates the need for the adequate monitoring and management of natural resources,

appropriate land use planning and urbanisation, and management of industrial pollution (OECD, 2008). As highlighted in Chapter 2, there is also a need to consider infrastructure and regional development projects in terms of changes in the availability and quality of agricultural land and shifts of skilled labour across sectors, and how these changes affect agricultural productivity.

4.2. Labour policy

Labour market policy influences employment composition and can play an important role in facilitating structural adjustment. Flexibility in labour mobility and social security help provide the conditions for innovation and skills training. Labour regulations affect the cost and conditions of employing labour, and thus production choice by firms and their incentives to invest in new products and processes. Innovative enterprises engaged in changing technologies, processes, or business organisation are likely to be particularly sensitive to adequate conditions for hiring and dismissing people, complemented by a good unemployment insurance system and support for job placement, skills training and continuous learning. Labour market policies play an important role not only for the general economy, but for bringing innovation into the agricultural sector through improved opportunities for rural employment overall.

General features of labour market and regulations

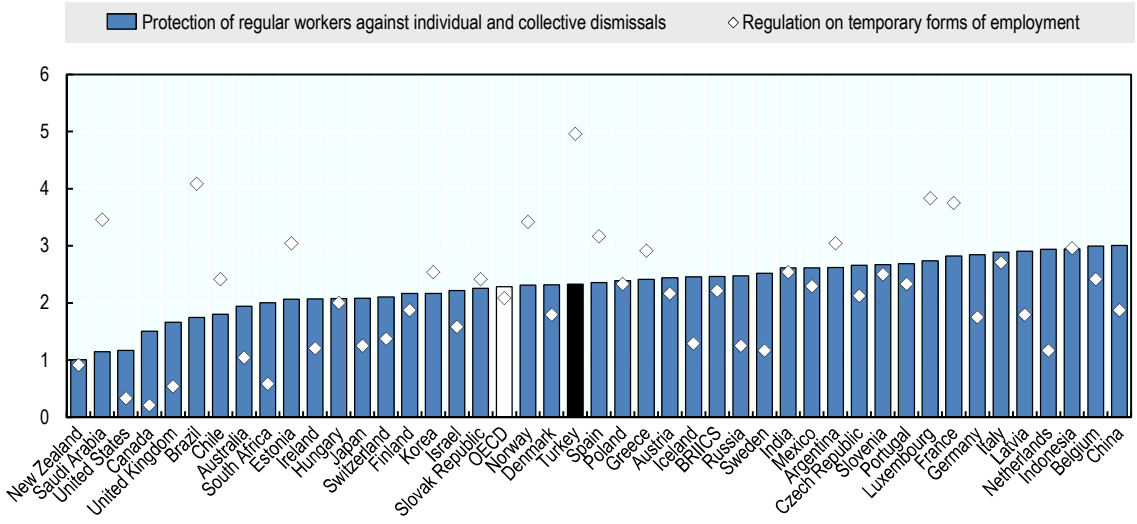
Turkey has a growing population, with a rising share of the working age. Wage earners account for 66% of total employment, with slightly less than 10% in agriculture. This means there is a significantly higher share of self-employed – employers, independent workers, and unpaid family members – in Turkey than in the majority of OECD countries (OECD, 2015a). Labour relations are characterised by a considerable degree of informality. The share of informal jobs, although declining since the early 2000s, is still around 33% for the whole economy and 22% in the non-agricultural sectors (OECD, 2015f). Around half of total employment and one-third of employees in the business sector are concentrated in small enterprises with less than 20 employees (OECD, 2015g). Small businesses are more likely to exploit informal labour arrangements and thus face an effectively reduced burden of labour regulations. This creates a trade-off between reduced labour costs and flexibility of smaller and semi-formal businesses, and scale economy and other productivity drivers of larger and formal businesses (OECD, 2014a). Placing all businesses into the formal framework of labour regulations would enable more efficient firms to develop and for growth opportunities across the entire economy to be realised. This transition, however, would require policies to support smaller informal and semi-formal businesses in such a transition, as well as a strengthening of the safety net system.

Employment protection regulations directly affect labour mobility. The OECD indicators of employment protection legislation measure the procedures and the costs involved in dismissing individuals or groups of workers, and labour market flexibility regarding procedures involved in hiring workers on fixed-term or temporary work agency contracts. Overall, Turkish employment legislation is stricter than the OECD average, with particular rigidity for temporary contracts, employment through work agencies, and severance costs (Figure 4.9).

The World Economic Forum's Global Competitive Index, based on a business survey, finds Turkey ranked lowest among OECD countries in overall labour market efficiency (Figure 4.10). In terms of the individual components evaluating the labour market, Turkey's low ranking in the ability to attract and retain talent suggests the challenges to develop its capacity to innovate. Additional difficulties to attracting workers to agriculture suggest the importance of life-long learning for women and men in rural regions.

Figure 4.9. OECD Indicators of Employment Protection Legislation, 2013

Index from 0 (least) to 6 (most) restrictive



Note: Data for Argentina, Brazil, China, India, Indonesia, Russian Federation, Saudi Arabia and South Africa represent 2012.

Source: OECD (2015i), *Indicators of Employment Protection Legislation database*, www.oecd.org/els/emp/oecdindicatorsofemploymentprotection.htm.

StatLink http://dx.doi.org/10.1787/888933389810

The rigidity of employment protection regulations increases the labour costs of firms, which has implications on their international competitiveness. It also encourages informality and traps business activities in smaller, lower-productive activities (OECD, 2014a). The lack of flexibility of temporary employment regulations, in particular, impedes formal labour arrangements in sectors which rely on seasonal labour, such as agriculture.

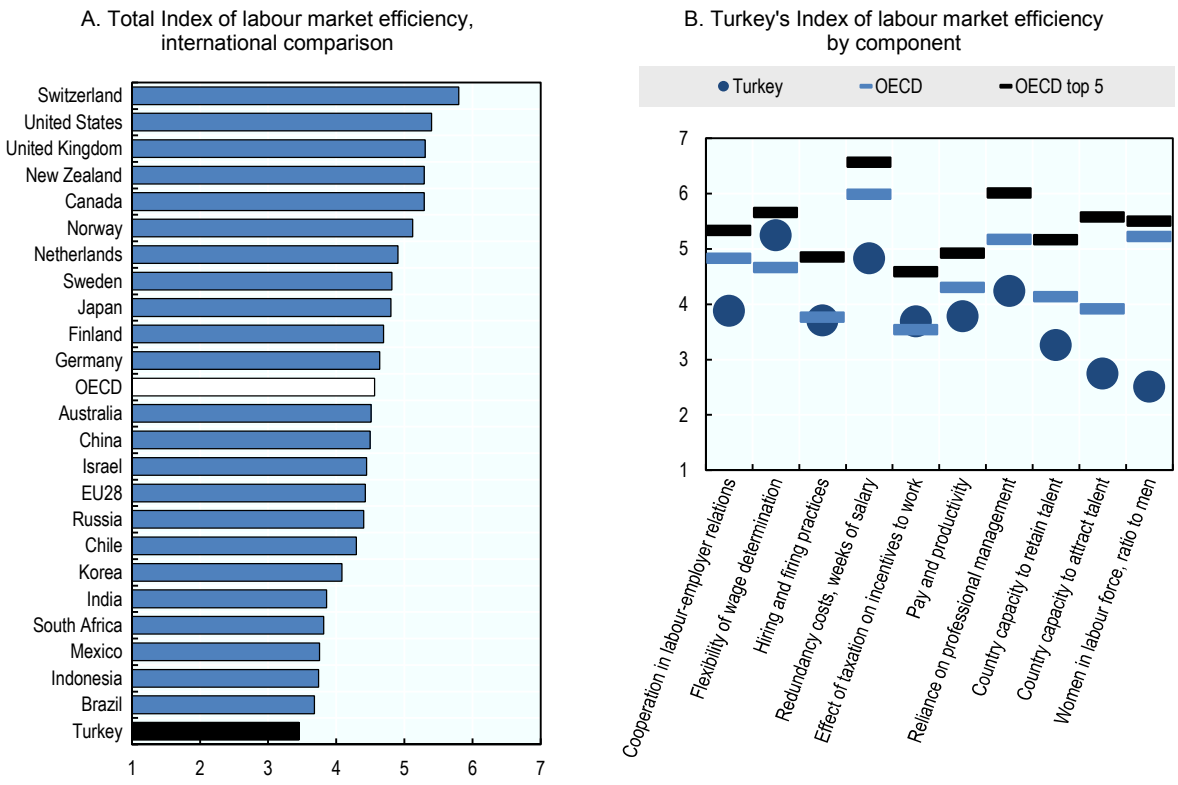
The modest performance of the labour market is shown by Tansel and Kan (2012) who studied non-agricultural labour market transitions in Turkey between 2006 and 2009. As resumed in OECD (2014a), their findings indicate that: most individuals remained at their entry-level; outflows from informal self-employment were very limited; transitions from informal to formal work were more frequent, but concerned only a minority of workers; few salaried workers exited; most women remained either inactive or informally self-employed; and transitions from unemployment to employment were twice as frequent towards jobs with informal rather than formal status.[4]

A far-reaching labour market reform – National Employment Strategy – was prepared in 2014 and included as a top priority in the Tenth Development Plan. This document, in line with OECD good practices, emphasises human capital and skills, vulnerable groups, dialogue with social partners, and enabling labour legislation. It seeks to reform the costly severance payment regime and facilitate modern employment methods through: permanent labour contracts with severance saving accounts (more secure for workers and potentially more affordable for enterprises), less restrictive fixed-term contracts, temporary employment, employment through work agencies, and employment on-call and home-based work. Many of these types of contracts had been prohibited or highly restricted in the formal sector, in contrast to their massive utilisation in the informal, small and low-productivity enterprises (OECD, 2014a).

The implementation of these reforms has, however, faltered amid a lack of stakeholder consensus on the principal aspects of the labour framework. Unions argued that in view of *de facto* restrictions of worker rights and protections, the reforms, with their greater employment flexibility and non-standard employment forms, would undermine social protection. Semi-formal and informal employers rejected

any change that would involve stricter labour rules and greater labour costs, while formal employers considered the reform of severance system would make it unaffordable unless contribution rates were reduced. Designing and implementing a consensual social safety net system could help support the necessary reforms. Collective social protections, including unemployment insurance, up-grading the skills of the unemployed, and Earned Income Tax Credit-type of transfers to the working poor, are still limited in scope. The schemes in place do not offer a credible alternative to enterprise-level job protections, neither for the minority of formal sector insiders nor for the majority of workers aspiring to the same levels of protection (OECD, 2014a). In the most recent development, the government's 2016 Action Plan has included the objective of improving the flexibility and security ("flexicurity") of labour market based on EU good practices. It also envisages an impact analysis of the on-going active labour market schemes (OECD, 2016).

Figure 4.10. Global Competitive Index: Labour market efficiency, 2015-16



Notes: OECD top 5 refers to the average of the scores for the top 5 performers among OECD countries (Switzerland, United States, United Kingdom, New Zealand and Canada). Indices for EU28 and OECD are the simple average of member-country indices.

Source: WEF (2015), *The Global Competitiveness Report 2015-2016: Full data Edition*, World Economic Forum Geneva 2015. http://reports.weforum.org/global-competitiveness-report-2015-2016.

StatLink http://dx.doi.org/10.1787/888933389827

Labour programmes with relevance to the agricultural sector

Agriculture employs nearly one-quarter of the total workforce and is the primary source of income in rural areas. It is largely composed of self-employed, unpaid family labourers with low levels of education. They are a vulnerable workforce, lacking the skills necessary to diversify rural activity or to make farm holdings more efficient. Nearly half of the employed in agriculture are women working as unpaid family labour and some are illiterate.

Turkey's general labour policy has prioritised investment in female employment for economic and social growth. The Ninth Development Plan (2007-13) included an action plan for gender equality but no substantive action was taken (OECD, 2014a). The current Tenth Development Plan (2014-18) includes an action on increasing the participation of women in the employment by offering vocational training when they enter the labour market. Activation policies included in the initiatives of the Life Long Learning Strategy Plan 2014-18 take into account the socio-economic variations in rural regions where vocational training may be insufficient to prepare women for the formal workforce. Socio-cultural factors on the role of women in the workforce will remain challenges for female education and labour market participation, particularly in rural areas (World Bank, 2009).

More and Better Jobs for Women: Women's Empowerment through Decent Work (2013-16) is a joint project by the Turkish Employment Agency (İŞKUR) and International Labour Organization (ILO). It was launched to promote women's employment and create better work opportunities. The project, among other outcomes, is intended to help prepare a new nation-wide policy framework, a National Action Plan on Women's Employment and Gender Equality. While the project targets women, it includes training for both men and women on gender equality and labour standards. This nation-wide project seeks to benefit unemployed women in urban areas with basic education, provide training, support and counselling to bring greater sensitivity to gender equality and employment practices, and to develop and implement active labour market policies for women (Eşitiz Beraberiz, 2016).

To address the issues of agricultural rural labour, several targeted job programmes which also focus on more vulnerable rural groups, such as rural women and young people, are being implemented.

The Project Supporting Women Entrepreneurship in Rural Areas aims to enhance knowledge and skills for entrepreneurship and thereby improve the employment prospects for women by helping them to develop business in agricultural products they produce. Women receive training and support in learning how to brand and market local products.

Through the Active Employment Market Programs Project, the Turkish Labour Agency and the Turkish Agricultural Chamber Association have signed a protocol "Cooperation for Active Employment Market Programs". Within this framework, a Younger Agricultural Population project aims at training young farmers with general production to be able to provide extension services in their communities and regions. A Herd Management Personnel Project with contributions from provincial governments and the Goat Breeders Association provides the needed training in 61 provinces. A Handcrafts Project will provide support for rural youths aged 14-24 to develop employment opportunities in rural regions and to support the transition of rural employment from agriculture to other sectors (Government of Turkey, 2015).

4.3. Education and skills policy

Education policy has strong and diverse links to innovation. A high level of general and scientific education across the population facilitates acceptance of innovations by society in general. Effective innovation systems require well-educated researchers, teachers, extension officers and business owners. Producers with a good general, technical and business education will generally be more willing and better skilled in fostering and adopting innovations.

Overall education status and education policy reforms

The education levels of the population have increased over the past two decades, helped by overall improvements in incomes and significant poverty alleviation. This progress has also been supported by the educational reforms of the late 1990s and in the 2000s to better align with EU standards. Primary and secondary enrolment rates have improved, with 95% of all 5 to 14-year olds enrolled in schools in 2012 (OECD 2014b). There has been a shift in the overall educational attainment structure, with the share of tertiary-level graduates increasing from 8% to 17% between 2000 and 2014, and those having below an upper secondary level education falling from 77% to 64% (OECD, 2015e).

Along with the increases in educational levels, student performance has also improved. In the OECD Programme for International Student Assessment (PISA) results for 2012, 15-year old students performed just below the OECD average in reading, mathematics and science, but have nevertheless shown some of the largest improvements in performance since 2006. These results are in part attributed to the improving economic and social status of the student population. Turkey is one of the few countries that has improved its performance in mathematics and its level of equity in education between the 2003 and 2012 PISA surveys. Nevertheless, compared to other countries performing at similar PISA levels, students in Turkey scored significantly worse in problem solving where students were asked to explore scenarios in unfamiliar settings, a key skill for innovation, (OECD, 2013).

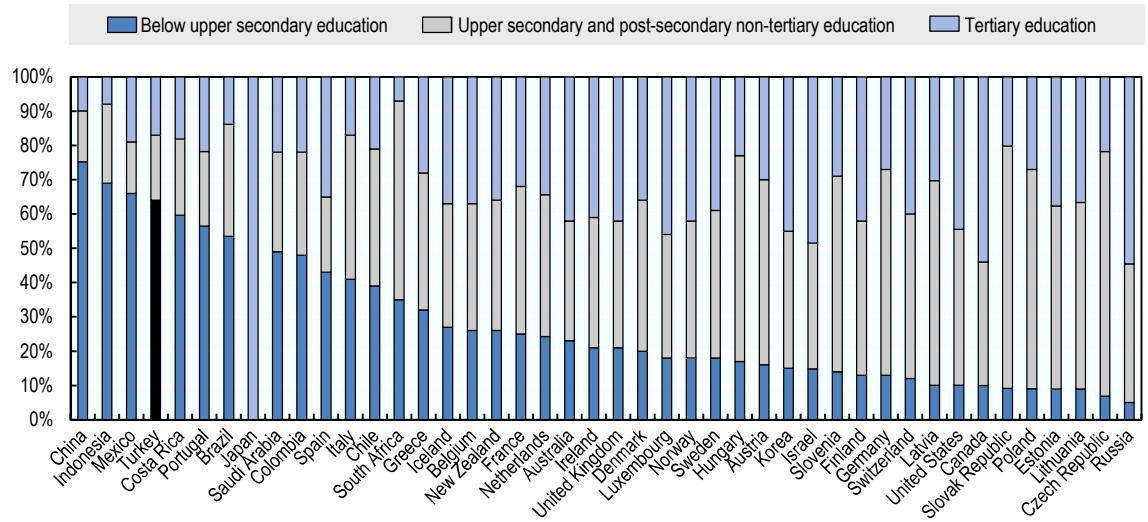
Despite the progress achieved in important dimensions of education, Turkey's overall education attainment status remains modest. Among OECD countries, it has the second-highest share of the population who have not obtained an upper-level secondary education and the lowest share of those having a higher education (Figure 4.11).

Turkey spends less per student than other OECD countries, particularly below the tertiary level of education, suggesting this may be a factor restraining advancement in education (Figure 4.12). Turkey ranks low among OECD countries by the share of time those aged 15-29 years spend on education: in 2014, it was 5.6% compared to the OECD average of 7.2%, and over 8% in countries such as Denmark, Slovenia, Norway, the Netherlands, Luxembourg and Finland (OECD, 2015c).

The WEFs Global Competitiveness Index provides an additional perspective on Turkey's educational performance as perceived by business (Figure 4.13). Whereas Turkish businesses evaluate the quantity of education relatively favourably, they have a low perception as to the quality of education and on-the-job-training. The Education Reform Initiative also puts the spotlight on the quality of education, noting that higher education targets were attained without sufficient increases in the quality and diversity of educational services (ERI, 2014).

Turkey's aspirations to become an information society, improve its economic competitiveness, and develop in a sustainable way, as well as its goal of EU membership, have made education reform an urgent necessity. Reforms are targeted to increase the participation rates at all levels, including the participation rates of disadvantaged populations such as females and the rural population in general (Box 4.1).

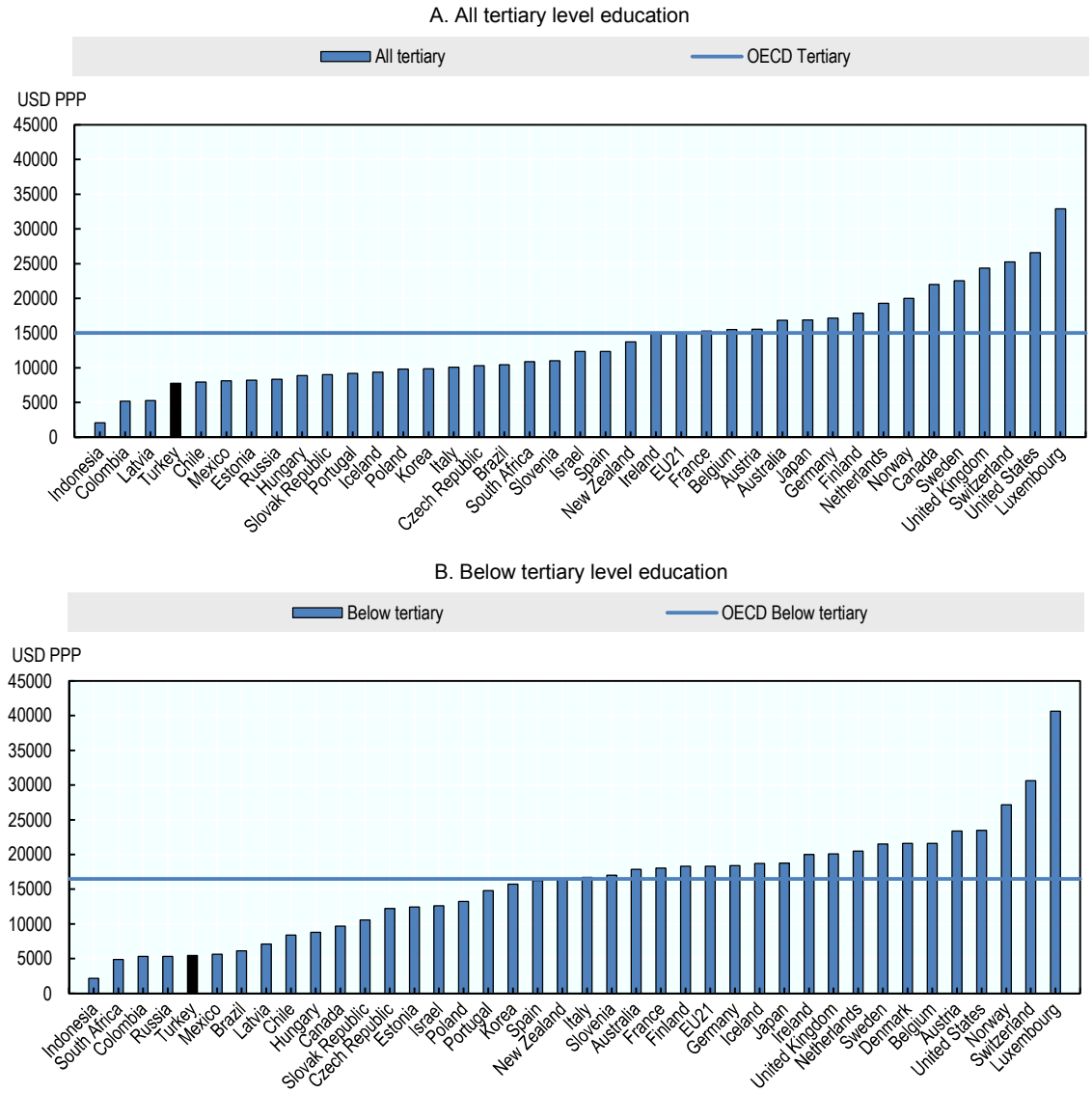
Figure 4.11. Educational attainment of the population aged 25-65 years, 2014



Source: OECD (2015e), *Education at a Glance* (database), http://stats.oecd.org/?lang=en#.

StatLink http://dx.doi.org/10.1787/888933389836

Figure 4.12. Annual expenditure per student by educational institution, 2014



Source: OECD (2015e), *Education at a Glance* (database), http://stats.oecd.org/?lang=en#.

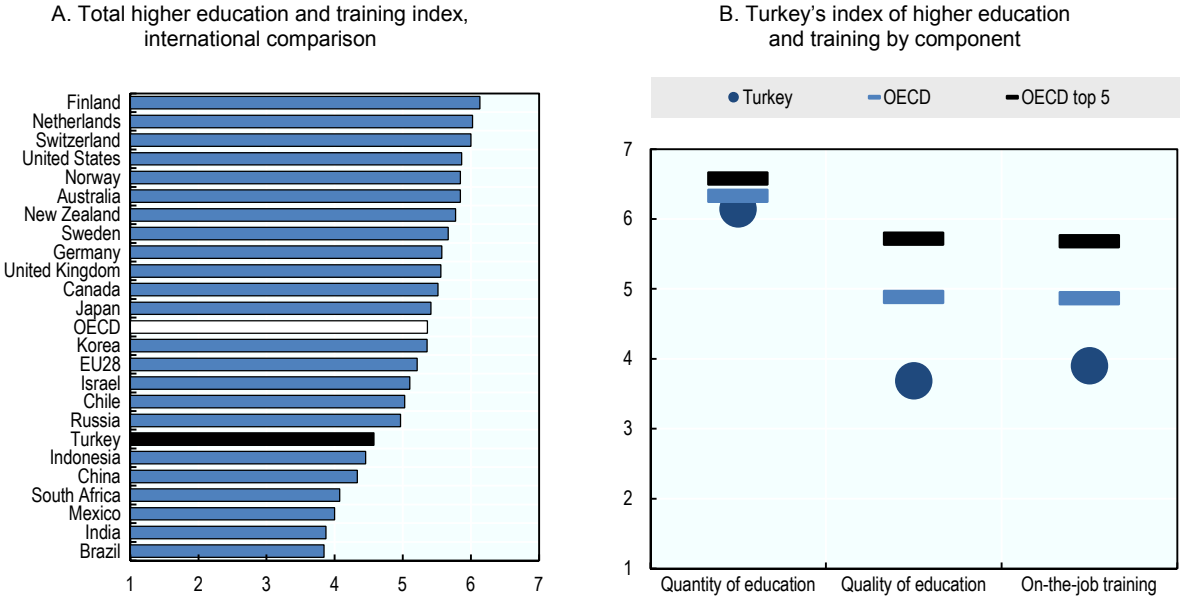
StatLink http://dx.doi.org/10.1787/888933389842

The Tenth Development Plan (2014-18), Strategic Plan for the Ministry of National Education (2014-18) and Skills Vision 2020 set multiple objectives for better education. They include further increases in the enrolment rates at all levels of education, with a focus on pre-schooling. Reducing the number of students per classroom in primary and secondary education and fewer students per academic teaching staff are other targets. The broader orientations include the establishment of adequate monitoring and evaluation of student performance, improvement of teacher education, and involvement of the private sector and professional organisations in the financing and administration of education. In the area of higher education, the objective is to transform it into a more autonomous, performance- and quality-oriented system. The creation of a National Qualification Framework and the updating of educational programmes are among the planned steps (MOD, 2014b). There is need to develop appropriate policy packages, such as on teacher policies to improve the quality of higher educational outcomes (ERI, 2014), particularly as concerns training and stimulating teachers to remain in

disadvantaged regions. Maintaining the momentum of these reforms in the long term, supported by adequate financial resources, is an imperative for national development, and rural and agricultural development in particular.

Figure 4.13. Global Competitiveness Index: Higher education and training, 2014-15

Scale 1 to 7 (best)



Notes: OECD top 5 refers to the average of the scores for the top 5 performers among OECD countries (Finland, Netherlands, Switzerland, Belgium and United States).

The quantity of education index is based on secondary and tertiary education enrolment rates from UNESCO Institute for Statistics. The quality of education index is based on responses from a WEF Executive Opinion Survey on "How well does the educational system meet the needs of a competitive economy; Executives' assessment of the quality of math and science education in schools and the quality of business schools; and on how widespread is Internet access in schools. The on-the-job-training index is based on survey responses on the availability of high-quality, specialized training services and the extent to which companies invest in training and employee development.

Indices for EU28 and OECD are the simple average of member-country indices.

Source: WEF (2015), *The Global Competitiveness Report 2015-2016: Full data Edition*, World Economic Forum Geneva 2015. http://reports.weforum.org/global-competitiveness-report-2015-2016/). Data for the Quantity of Education Index comes from UNESCO (2015), *Institute for Statistics*, http://www.uis.unesco.org/Pages/default.aspx.

StatLink http://dx.doi.org/10.1787/888933389859

Box 4.1. Recent education reforms and initiatives in Turkey

Many recent reforms in the education sector in Turkey have been supported by international organisations, in certain cases beginning as pilot projects. The Basic Education Programme (1997) and the Secondary Project (2006-11), both with the World Bank, aimed to improve quality of education at different levels of education. The Master Implementation Plan (2001-05) included multiple projects by UNICEF to improve both equity and quality of the education system. Initiatives in VET and tertiary education have been developed with the European Union to improve alignment with European standards. However, evaluations of certain projects indicate that not all targets or objectives were met and that it has been difficult to transform pilot projects into nationwide policy.

Box 4.1. Recent education reforms and initiatives in Turkey (*cont.*)

Various efforts have been directed to *increase the quantity and equity of education*. The latter goal in particular views women and socially disadvantaged youth and as such, has strong links to the improved educational status of rural population. A structural reform (2012) extended the length of compulsory education from 8 to 12 years and redefined the system into three levels (primary, lower and upper secondary) of four years each. This implies additional funding, personnel and restructuring of schools to provide separate primary and lower secondary institutions. An evaluation in Turkey found that enrolment rates for primary school increased in part as pre-primary education age students were enrolled in primary school instead of pre-primary school. New regulations were put in place for 2013-14 to properly enrol 5-year olds in primary school (ERI, 2014). Improving educational status of women is one of the most obvious imperatives for the education in Turkey. The Project for Increasing Enrolment Rates Especially for Girls (ISEG, 2011-13) was a pilot project in 16 provinces with the lowest enrolment rates to increase primary and secondary school participation and improve family educational awareness and links to the labour market. UNICEF also aimed to increase girls' educational participation as part of the Master Implementation Plan (2001-05), which included the Attendance of Girl Pupils to Schools project and the Girls to Schools Now campaign (2001-05).

Vocational and Education Training (VET) system has seen multiple reforms to strengthen completion rates and develop skills suitable for the labour market. Various projects and programmes were implemented in the 2000s targeting key problems, such as links with the labour market, teacher quality, and curriculum. The Specialised Vocational Training Centres Project (UMEM, 2010-15) aims to build capacity of youth and increase employment rates. The Ministry of National Education and the Scientific and Technological Research Council of Turkey (TÜBİTAK) are collaborating to support the vocational skills and entrepreneurship and leadership qualities of 15 000 VET school managers and teachers under the Teaching, Entrepreneurship and Leadership Training Cooperation Protocol for Managers and Teachers in Vocational and Technical Schools and Institutions. A number of initiatives aim to collect data and strengthen labour market outcomes.

To *improve teachers and quality of education*, the Teacher Training Programmes of Education Faculties (2008) aimed to increase the number of general knowledge and elective courses and credits. The New Teacher Programme (2011) was introduced to provide in-depth subject content and stricter requirements for certain subjects. The Transportable Schools and Mobile Teachers Programme aimed to improve quality of education in rural areas with pre-fabricated mobile schools and more teachers. Standards for Primary Education Institutions, were piloted in 2010 and expanded to all primary education schools from 2011-12. These standards, among other purposes, are intended to establish schools' self-assessment to determine the extent of its quality status and develop its own improvement plans.

To increase *private sector participation in education*, the Campaign of 100% Support for Education began to increase the financing from private and non-governmental organisations through tax exemptions on educational spending. Under the 193 Income Law (September 2003), a 100% tax deduction can be provided for contributions to education. Under the Private Teaching Institutions Law (January 2013, N°.5580), government funds have been provided to private vocational and technical schools in Organised Industrial Zones in addition to the funding available to private schools with students in special education.

Current reforms also include goals to be achieved by 2023 to improve educational opportunities through better *education technologies*. The Movement to Increase Opportunities and Technology project (FATIH) aims to equip each classroom with an interactive white board and each student with a tablet computer. The e-State Project (2009) was implemented to improve access to information for key stakeholders, such as teachers, administrators, students and parents. This project includes a number of initiatives: the e-Personnel Project to provide teachers and students with exam information and enable teacher requests; the e-Graduate Project to help vocational and technical secondary graduates locate employment and higher education opportunities; the e-Registration Project for parents to register their child in neighbourhood schools; and the e-School Information Management System to collect student information. The Ministry of National Education Information Systems (MEBBİS) (2002-03) was launched to collect and publish formal education statistics from school directors using the e-school module.

Source: OECD (2015d), *Education Policy Outlook 2015: Turkey*, www.oecd.org/edu/policyoutlook.htm.

Education status of agriculture

While the level of overall education has improved, a substantial part of the rural and poor populations continue to lack adequate education. Over three-quarters of employed in agriculture have only primary or secondary school education, while 15% are illiterate, due primarily to the extremely low level of education amongst women in agriculture (Table 4.1). One in four female agricultural workers is illiterate and lacks the essential skills to run productive farms, to use extension services, and to leverage technology.

Table 4.1. Educational status of the employed in Turkey, by economic sector, 2014

Percentage

	Illiterate	Primary and secondary school	High school and technical high school	University
Agriculture	14.6	77.2	6.5	1.6
Male	5.8	82.3	9.5	2.5
Female	24.9	71.3	3.1	0.7
Industry	1.6	66.1	21.3	11.1
Services	1.4	42.2	24.7	31.7

Source: TÜRKSTAT (2015b), *Labour Force Surveys* (database), http://www.turkstat.gov.tr.

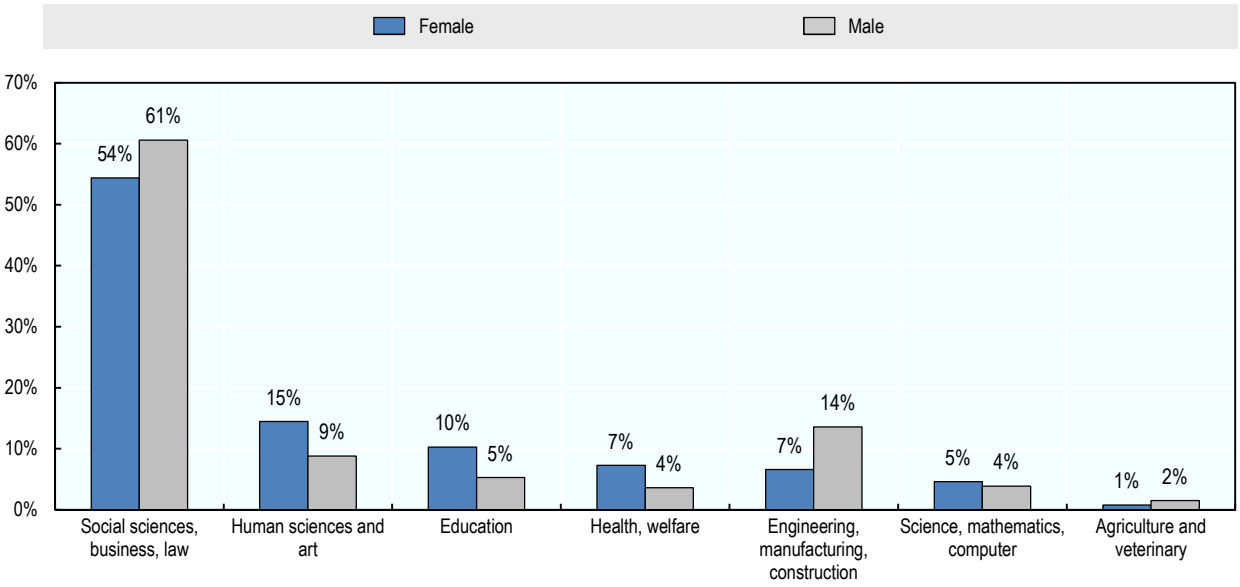
Education for rural people, beyond the issues of nation-wide relevance, faces specific challenges. An extension of compulsory education to 12 years may be hindered by the needs of rural families for farm labour. Oztürk (2012) found that the lack of a child benefit system in Turkey puts children of poor families at risk of being taken out of school and put in employment. The centralised governance by the Ministry of National Education for primary and secondary schools (the Council of Higher Education oversees tertiary level studies) provides limited autonomy to institutions to better respond to local needs in educating children in agricultural communities (ERI, 2014). Rural regions face additional transport challenges for students to have access to school. The Tenth Development Plan includes objectives to address transport in regionally disadvantaged areas as well as improving teacher quality and retention in these areas. The means to achieve this, however, have not been specified and in a centralised structure may remain difficult to address.

Turkey's agriculture education system includes agricultural vocational high schools, vocational schools and universities with specialised programmes in agriculture. Vocational schools provide training for agricultural machinery as well as training for modern agricultural technology disciplines at the level of EU agricultural colleges. At the 19 vocational agriculture high schools in Turkey, women represent only 25% of students (TÜRKSTAT, 2015a). Strengthening these programmes and improving the level of education for international accreditation will aid in developing a trained workforce.

With a low demand for education in the agricultural labour force, few students in Turkey pursue higher education in agricultural and veterinary sciences. In 2014/15, these disciplines attracted low enrolment shares across disciplines: 1% female and 2% male applicants (Figure 4.14). The number of university graduates in agriculture is likely below the sector's need for skilled labour, although no assessment is available of the skill demand and supply for agriculture. Slightly over 3% of all students completed their studies in agricultural programmes in 2013; this is a higher percentage than in many other countries, but substantially below Turkey's GDP share of agriculture (7%) (Figure 4.15). Furthermore, agricultural university graduation rates have been declining over the last ten years. Most innovations in the agricultural sector currently come from researchers and young people with higher education levels who start a farm as a business opportunity (Akkaya, 2011). Policies for education that foster agricultural innovation will need to be inclusive of rural populations and family farms to make gains in educational levels, basic skills and investment.

Figure 4.14. Higher education enrolment by field of study in Turkey, 2014-15 school year

Percentage in field of study

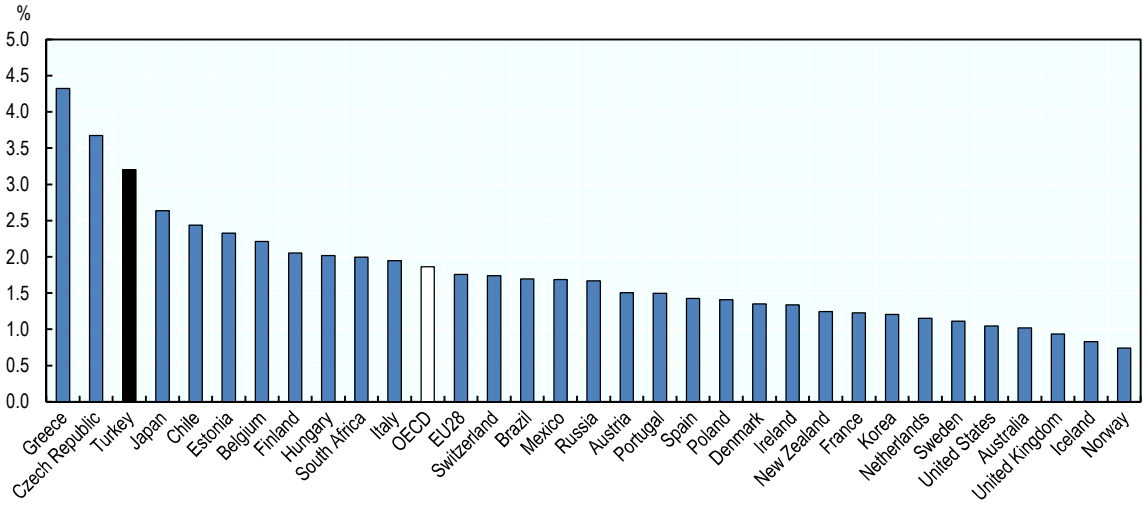


Source: TÜRKSTAT (2015a), *National Education Statistics, Formal Education* (database), www.turkstat.gov.tr .

StatLink http://dx.doi.org/10.1787/888933389866

Figure 4.15. Agriculture in tertiary education, 2013 or latest available year

Percentage of graduates from agriculture programmes



Source: UNESCO (2015), *Institute for Statistics*, www.uis.unesco.org/Pages/default.aspx .

StatLink http://dx.doi.org/10.1787/888933389873

Summary

- Turkey lags behind its international competitors in the agro-food area in the availability and quality of its infrastructure. Development of infrastructure is a national priority and large investments have been made; ambitious plans have been formulated up to 2032 to reduce this infrastructure gap further; integration with EU standards and trans-European transport and electricity networks are among the priorities.
- Another focus of infrastructure development is to contribute to reducing regional economic and social disparities by integrating infrastructure plans into regional development policy. As such, infrastructure plans address major needs of rural areas, such as farmland consolidation, irrigation networks, and rural transportation.
- With substantial funding needs to implement infrastructure plans, the policy has been to encourage private investment through important tax, credit and social contributions concessions; public-private partnerships in multiple forms have also been promoted.
- The labour market is characterised by a relatively high level of self-employment and small enterprises as principal employers, often relying on informal labour arrangements.
- Labour regulations are rigid leading to insufficient flexibility of the labour market. This increases labour costs and informality in labour relations and hinders structural adjustment. Placing all businesses into the formal framework of labour regulations would allow more efficient firms to develop and the growth opportunities across the entire economy to be realised. Policies would be required to support smaller informal and semi-formal businesses in such a transition, as well as a stronger safety net system. The government's Action Plan 2016 foresees to start labour reforms.
- Programmes are in place to address the difficulties of the most vulnerable labour groups, in particular women and youth, including in rural areas. However, the main improvement should come from a broad labour reform.
- Turkey's current level of education is modest, with a low share of people at higher levels of education and a significant illiteracy rate among the rural population, particularly women.
- Turkey has made gains in recent years in its level of education and performance, facilitated by the country's income growth and impressive progress in poverty alleviation. The improvements in education have also been supported by reforms which were largely driven by initiatives and pilot projects funded by international organisations, as well the goal of aligning with EU standards. Long-term efforts are required through sustained funding and national polices to build on these gains.
- While the overall education level has improved, substantial parts of the rural population lack essential skills. Education for rural people is hindered by the lack of a child benefit system as well as the needs of rural families for farm labour. Insufficient transport in some regions makes access to school more difficult, and primary and secondary education institutions have limited autonomy to better respond to local needs.
- The low demand for education amongst the agricultural labour force results in few students pursuing higher education in agriculture.
- Current objectives to improve education include increasing participation at all levels, in particular early childhood education. Improvements are also needed in the quality of education through the development of performance-based systems, curricula updates, national qualifications framework, increased autonomy in the system, and engagement of private investors and professional organisations in provision of education.
- Greater inclusion in education in rural regions, and women in particular, is a principal challenge if the agriculture is to develop into a more productive sector.

Notes

1. This comparison is conditional and requires care in view of the differences in countries' size, geographic conditions and development levels.
2. See Box 5.3 in Chapter 5 which describes the agricultural land consolidation component of the GAP.
3. Turkey has been an emerging market pioneer in public-private partnerships (PPPs) for infrastructure development since the mid-1980s. These projects were generally technically successful, but created fiscal risks. In particular, public purchase guarantees at pre-determined prices have been activated more often than expected. A Special Ad Hoc Committee on PPPs has been subsequently created to analyse the main governance issues encountered in PPP projects, and to formulate the best practice guidelines for implementation agencies. Establishing an accurate account for fiscal implications and risks was also a task. The work of this Commission contributed to the preparation of a new Framework Law on PPP (OECD, 2014a).
4. These results, however, may be also influenced by the 2008-09 global crisis.

References

Akkaya, F. (2011), "Agricultural Innovation System in Turkey", presentation to the Ministry of Agriculture and Rural Affairs General Directorate of Agricultural Research and Policies.

Berktay, A., B. Nas and A. Demirbas (2009), "Contribution of Konya Plain Projects to the National Development in Turkey's Water-Related Energy", Multi-Science Publishing, http://dx.doi.org/10.1260/014459806779388038.

Burrell, A. (2005). "Turkey's Rural Population and Agricultural Workforce", in: Burrell and A. Oskam (eds.), *Turkey in the European Union: Implications for Agriculture, Food and Structural Policy*, Wageningen University, CABI Publishing.

Catir, B. (2015*), IKF Brief: The National Strategy for Regional Development at a Glance*, Economic Development Foundation, www.ikv.org.tr.

EC (2015), "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Turkey Progress Report 2015", European Commission, Brussels, 10 November 2015, SWD(2015) final, http://ec.europa.eu/enlargement/pdf/key_documents/2015/20151110_report_turkey.pdf.

ERI (2014), "Education Monitoring Report 2013", *Education Reform Initiative*, Sabanci University. Istanbul.

Eşitiz Beraberiz (2016), "More and Better Jobs for Women: Women's Empowerment through Decent Work in Turkey", accessed on 24 March 2016, http://esitizberaberiz.org/home.

Government of Turkey (2015), "OECD Food and Agricultural Review: Innovation for Agricultural Productivity and Sustainability in Turkey: Questionnaire", Responses to the OECD received from the Turkish Government.

KOP (2013), Konya Plain Project Regional Development Administration KOP Action Plan, KOP Regional Development Administration accessed from www.kop.gov.tr/eylemplanyenieng.asp.

MOD (2015), *2015-2018 Information Society Strategy and Action Plan*, Republic of Turkey, Ministry of Development, Ankara.

MOD (2014a), *GAP Action Plan 2014-2018: South-Eastern Anatolia Project*, Republic of Turkey, Ministry of Development, Ankara.

MOD (2014b), *The Tenth Development Plan 2014-2018*, Republic of Turkey, Ministry of Development, Ankara. www.mod.gov.tr/Pages/DevelopmentPlans.aspx.

MOFAL (2014), *Instrument of Pre-Accession Assistance Rural Development (IPARD) Programme 2014-2020*, Ministry of Food Agriculture and Livestock, Ankara.

Montabone, B. (2010), "From Regionalisation to Territorial Management: the role of the "Regional" Development Agencies in Turkey"*, "Grand Ouest" days of Territorial Intelligence IT-GO, ENTI*, https://halshs.archives-ouvertes.fr/halshs-00781751.

OECD (2016), *OECD Economic Surveys: Turkey 2016*, OECD Publishing, Paris. http://dx.doi.org/10.1787/eco_surveys-tur-2016-en.

OECD (2015a), *Annual Labour Force Statistics* (database), http://stats.oecd.org/?lang=en#.

OECD (2015b), *Agricultural Policy Monitoring and Evaluation 2015*, OECD Publishing, Paris, http://dx.doi.org/10.1787/agr_pol-2015-en.

OECD (2015c), *Education Policy Outlook 2015: Making Reforms Happen*, OECD Publishing Paris, http://dx.doi.org/10.1787/9789264225442-en.

OECD (2015d), "Turkey", in *Education Policy Outlook 2015: Making Reforms Happen***,** OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264225442-32-en.

OECD (2015e), *Education at a Glance* (database), http://stats.oecd.org/?lang=en#.

OECD (2015f), "How does Turkey Compare?", in *Employment Outlook 2015*, www.oecd.org/turkey/Employment-Outlook-Turkey-EN.pdf.

OECD (2015g), *Structural and Demographic Business Statistics* (database), OECD, Paris. http://dx.doi.org/10.1787/sdbs-data-en.

OECD (2015h), Infrastructure Investment Indicators, OECD Publishing, Paris, https://data.oecd.org/transport/infrastructure-investment.htm.

OECD (2015i) *Indicators of Employment Protection Legislation* (database), OECD Publishing, Paris, www.oecd.org/els/emp/oecdindicatorsofemploymentprotection.htm.

OECD (2014a), *OECD Economic Surveys: Turkey 2014*, OECD Publishing, Paris. http://dx.doi.org/10.1787/eco_surveys-tur-2014-en.

OECD (2014b), "Turkey", in *Education at a Glance*, *2014: OECD Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eag-2014-75-en.

OECD (2014c), *OECD Regional Outlook 2014: Regions and Cities: Where Policies and People Meet*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264201415-en.

OECD (2013), *OECD Programme for International Student Assessment (PISA)* (database), 2013, http://www.oecd.org/pisa/.

OECD (2008), *OECD Environmental Performance Reviews: Turkey 2008*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264049161-en.

Oztürk, M. (2012), *Agriculture, Peasantry and Poverty in Turkey in the Neo-liberal Age*, Wageningen Academic Publishers, The Netherlands.

Tansel, A. and E. Kan (2012), "Labour Mobility across the Formal/Informal Divide in Turkey: Evidence from Individual Level Data", *IZA Discussion Papers*, No. 6271.

Thomas, M. (2015), "Transport in Turkey: Major Trends and Issues", European Parliament, Directorate-General for Internal Policies of the Union, Brussels, http:/dx.doi.org/10.2861/165427.

Tiftikcigil, B.C. (2015), "An Assessment on Activities of Regional Development Agencies in Turkey", *International Journal of Economics and Financial Issues*, Vol. 5/2, pp. 309-409.

TÜRKSTAT (2015a), *National Education Statistics, Formal Education* (database), http://www.turkstat.gov.tr

TÜRKSTAT (2015b), *Labour Force Surveys* (database), http://www.turkstat.gov.tr.

Uçkan, O. (2009), "Weakness of national ICT policy-making process in Turkey: the Governance Phobia", *International Conference on e-Government and e-Governance*, Ankara, Turkey.

UNESCO (2015), Institute for Statistics, UNESCO Publishing, Paris, www.uis.unesco.org/Pages/default.aspx.

WDI (2015), *World Development Indicators Database,* World Bank, http://data.worldbank.org/data-catalog/world-development-indicators.

WEF (2015), *The Global Competitiveness Report 2015-2016: Full data Edition*, World Economic Forum Geneva 2015. http://reports.weforum.org/global-competitiveness-report-2015-2016/.

World Bank (2015), *World Bank Private Participation in Infrastructure Database*, http://ppi.worldbank.org.

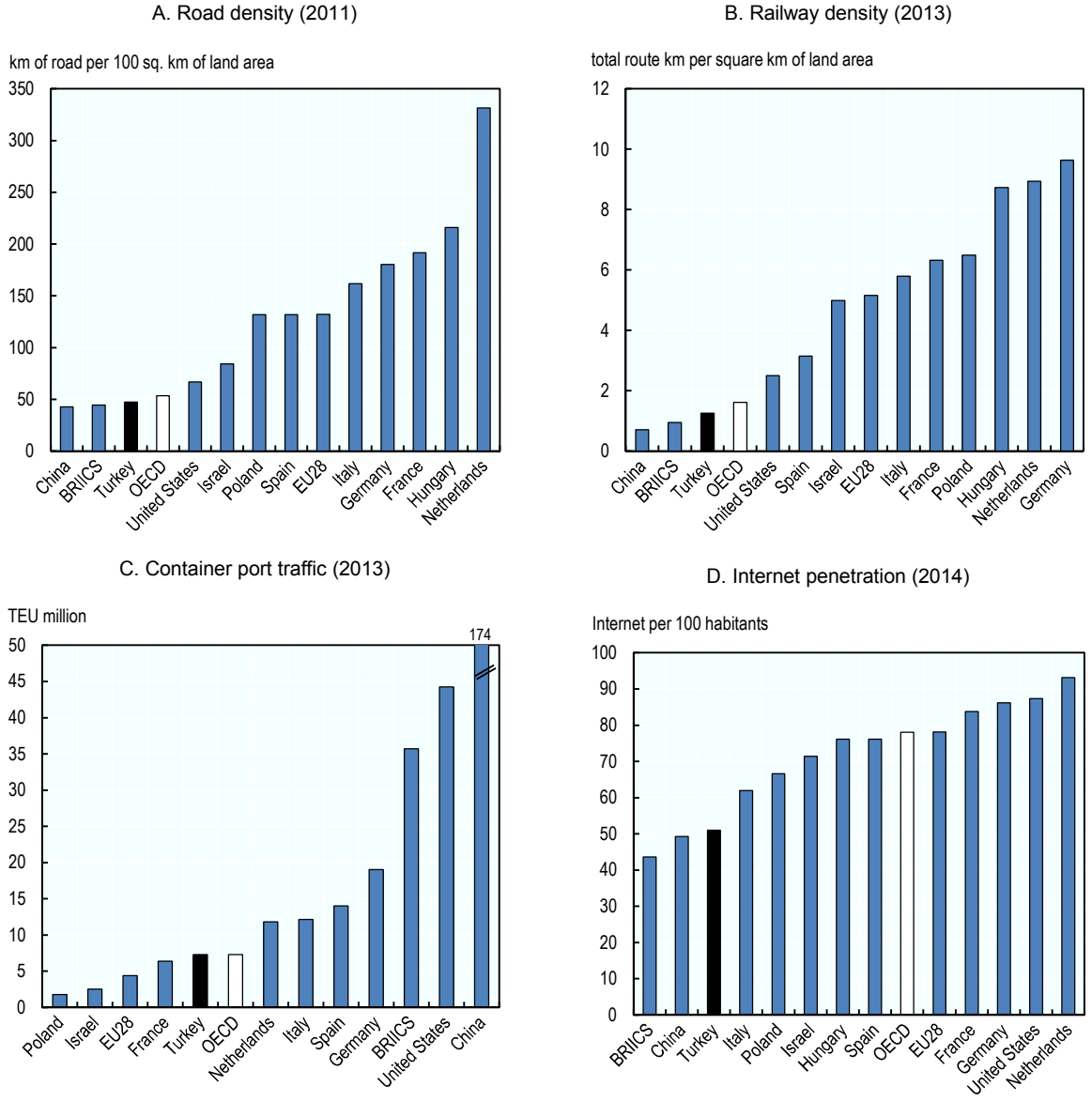
World Bank (2009), *Female Labor Force Participation in Turkey: Trends, Determinants and Policy Framework*, World Bank, Washington DC.

Zhelezov, G. (ed.) (2011), *Sustainable Development in Mountain Regions: Southeastern Europe*, Springer, London.

Annex 4.A1

Turkish infrastructure: An international comparison

Figure 4.A.1. Selected infrastructure availability indicators



TEU – twenty-foot equivalent units.

Source: WDI (2015), *World Development Indicators Database*, http://data.worldbank.org/data-catalog/world-development-indicators.

StatLink http://dx.doi.org/10.1787/888933389880

Chapter 5

AGRICULTURAL AND RURAL DEVELOPMENT POLICY IN TURKEY

This chapter provides an overview of domestic and trade agricultural policy measures that are specific to the agricultural sector. These differ from the general policies reviewed in previous chapters which concern agriculture and other sectors as parts of the overall economy. This chapter presents the objectives of Turkey's agricultural policy; it examines domestic price policies and payments based on various parameters of agricultural production, as well as based on environmental criteria. Trade policy measures associated with domestic agricultural policies are then examined, followed by an overview of land consolidation and rural development programmes. Finally, the extent to which Turkey's agricultural policy is oriented to the support of long-term agricultural productivity is evaluated based on OECD support indicators.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

5.1. Agricultural policy reforms of the 2000s

Agriculture was a sector targeted for structural reform to stabilise the Turkish economy in the early 2000s. The Agricultural Reform Implementation Project (ARIP) was developed and supported by the World Bank as a pre-condition for the macro-economic stabilisation assistance given to Turkey from the IMF. This project framed a multi-dimensional agricultural sector reform and was implemented between 2001 and 2008. ARIP sought to improve allocative efficiency in the agro-food sector by removing distortive types of support, and which would also contribute to fiscal consolidation (OECD, 2011a). ARIP prompted an overall move away from direct and indirect state involvement in pricing, marketing, and trade of agro-food products. As part of this move, the State Economic Enterprises and producer cooperatives were decontrolled to varying degrees and at different speeds, and became more exposed to market conditions. Another focus was on helping structural adjustment in agriculture through conversion to alternative production, transition support, land consolidation, and rural development.

ARIP also included as a key initiative a shift away from output and input subsidies towards direct income support payments. These new payments were introduced and applied during the life of ARIP, but had gradually given place to production-linked payments and were finally phased out. Some sources indicate a lack of familiarity with decoupled payments, payment delays, and other concerns which made the direct income support scheme unpopular among farmers (WTO, 2012), while others characterised this evolution as a "dilution of agricultural reform" (Akder, 2010). Furthermore, while the agricultural policy reform of the 2000s downsized domestic market interventions, it did not include a change in high border protection for agro-food products. Although partial or reversed in certain areas, this reform transformed agricultural policy in Turkey and has largely shaped the current policy framework.

5.2. Agricultural policy objectives and instruments

Turkish agricultural policy is governed by the national Development Plans, the 2006 Agricultural Law (No. 5488) which defines the main policy instruments, and Strategic Plans of the Ministry of Food, Agriculture and Livestock.

The present national Tenth Development Plan (2014-18) sets the strategic objective to provide the population with a sufficient and balanced nutritional diet. It aims for an agricultural production growth at 3.1% per year by emphasising advanced technologies, resolving infrastructure problems, promoting efficient organisation and high productivity, and developing a production structure that will increase the international competitiveness of Turkish agricultural products. This document mentions R&D, innovations, productivity improvement, strengthening the food safety infrastructure, and the sustainable use of resources in agriculture, in particular the more efficient use of water (MOD, 2014). Another key agricultural policy document, the 2013-17 Strategic Plan of the Ministry of Food, Agriculture and Livestock sets five strategic objectives: i) agricultural production and supply security; ii) food safety; iii) phytosanitary and animal health and welfare; iv) agricultural infrastructure and rural development; and v) institutional capacity building. For each of these areas, several strategic objectives are formulated, together with performance indicators and financing targets (MOFAL, 2015b).

Figure 5.1 presents the budget underpinning the 2013-20 Strategic Plan. The priorities are strongly shifted towards stimulating agricultural production through subsidies, as evidenced by the dominance of the "agricultural production and supply security" component which includes price, input, and credit subsidies. Infrastructure development is the second most important direction of the Strategic Plan, although it is given far less resources, while other components of the Plan are quite small in terms of allocated spending.

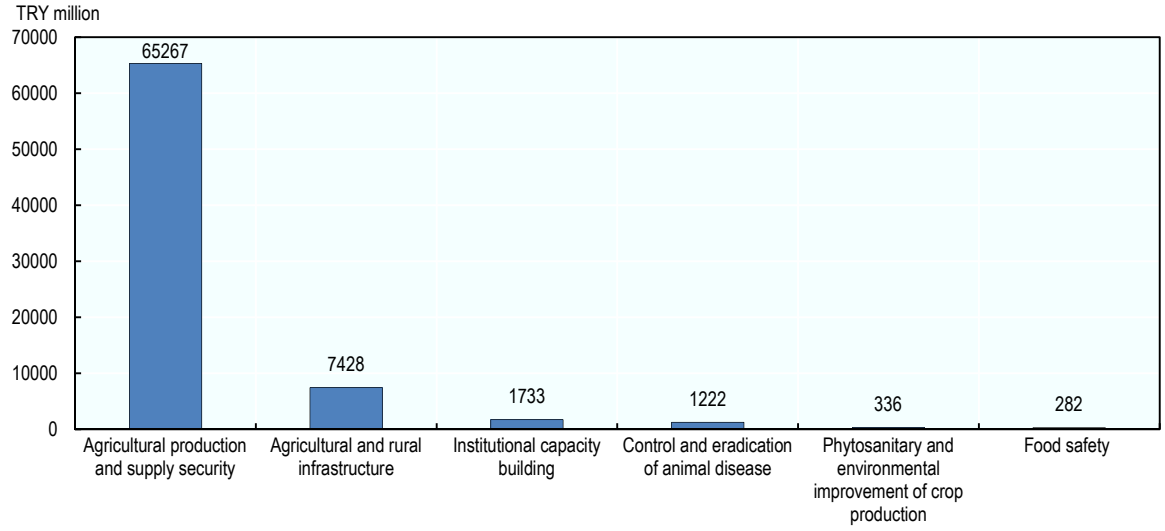
In addition to the activities of the 2013-17 Strategic Plan, the agricultural sector benefits from rural and regional development programmes which are broader in scope than just agriculture. These include the Rural Development Action Plan 2015-18 which underpins the EU-co-financed Instrument for Pre-Accession Assistance for Rural Development 2014-20 (IPARD-II). Large regional development projects, such as the South Eastern Anatolia Project (GAP), Eastern Black Sea Project (DOKAP), Eastern Anatolia Project (DAP), and Konya Plains Project (KOP), support investments in consolidating

agricultural land, production-related infrastructure, and investments in agricultural holdings, and their modernisation and diversification. These programmes also fund various activities related to rural development more broadly (Section 5.5). Rural and regional development frameworks vary in geographic scope: some are implemented in several provinces and financed through national-level and international sources, others are more local in scope and draw on local funds and sometimes on international donor assistance.

The principal policy instruments and activities underpinning these policy frameworks are discussed below, while support to knowledge and innovation in the agro-food sector is examined in Chapter 6.

Figure 5.1. Budgeted outlays for the implementation of the Strategic Plan 2013-17 by components

Aggregate spending for 2013-17



Source: MOFAL (2015b), *Strategic Plan for 2013-2017*, www.tarim.gov.tr/SGB/Belgeler/Stratejik%20Plan%202013-17-EN.pdf.

StatLink http://dx.doi.org/10.1787/888933389893

5.3. Domestic producer support instruments

Domestic price support and direct payments

Domestic price support measures include purchase prices and deficiency ("premium") payments. Most administered prices have been abolished since 2002, but State Economic Enterprises (SEEs) continue to set purchase prices for cereals, sugar beet, tobacco and tea. Sugar production is additionally controlled through a national production quota at the processing level which is fixed annually by the Sugar Board and allocated to sugar factories. SEEs systematically benefit from payments from the Treasury to cover the "duty loss" or profit forgone through their "duties", i.e. purchase-selling and export operations. SEEs have also received regular equity injections from the Treasury. In 2012-14, the aggregate "duty loss" transfers to these structures amounted to TRY 2.7 billion (USD 1.2 billion) over this period, while the equity injections amounted to TRY 1.7 billion (USD 718 million) (OECD, 2016b).

Deficiency payments are provided for a broad range of products estimated to be in short domestic supply, such as various cereals, oilseeds, olive oil, cotton, and tea. Since 2010, this support has been established according to "agricultural basins", with deficiency payments differentiated across the country's 30 agricultural basins. Each basin is determined by its agro-climatic and environmental conditions (climate, soil, topography, land class, and land use type). For each basin, the types of production are defined and the "strategic" supply deficits and competitive products are selected with the

corresponding deficiency payments schedules. Overall, such an approach represents a type of production planning based on agro-climatic modelling. The extent to which the subsidy stimulus from such agro-climatic programming leaves producers sufficient flexibility to respond to the changing market conditions is not certain.

Price interventions and deficiency payments are combined with tariff protection for imported products and export subsidies for the exported ones, altogether generating substantial and varying levels of price support across agricultural commodities (Section 5.6).

Subsidies for variable inputs, such as those for certified seeds, represent another type of direct payments to producers.

Direct payments also include area-based support. The most important are the so-called "diesel" and "fertiliser" payments that gradually replaced direct income support under ARIP applied in 2001-08. Despite the name, these payments are provided on the basis of land area, with rates significantly differentiated by group of crop (Table 5.1). "Diesel" and "fertiliser" payments accounted for 45% of total payments based on area and animal numbers in Turkey in 2013-15 (OECD, 2016b). Other important area payments are provided for fodder crops (as support for livestock production), and tea plantations as a compensation for the costs incurred in complying with strict pruning requirements. Land conservation payment is provided to protect environmentally fragile areas by setting aside the fragile cropland or replacing harmful cultivation practices with more environmentally friendly ones.

Table 5.1. Rates of diesel and fertiliser payments

TRY/hectare

Product group	Fertiliser	Fuel
Oilseeds and industrial plants	75	75
Grain, fodder, pulses, tuber plants, vegetables, fruits	60	46
Ornamental plants, meadows and pastures, forestry products	43	31

Source: Government of Turkey (2015), "OECD Food and Agricultural Review: Innovation for Agricultural Productivity and Sustainability in Turkey: Questionnaire", responses to the OECD received from the Turkish Government.

Aid for agricultural investment

Support to agricultural investment in Turkey is directed through various frameworks. Agricultural investment assistance within the current 2013-17 Strategic Plan of the MOFAL includes support for the purchase of livestock for herd improvement (beyond this aid, breeders who are members of cattle breeders unions receive per animal payment for the registration and management of cattle breeds).

Rural Development Investments Support Programme (RDISP) between 2006 and 2015 had two components: machinery and equipment grants for farmers and grants for 'economic investments', which were directed mainly for development of processing. Within the economic investments' component, up to TRY 800 000 (USD 296 000) for legal entities and TRY 100 000 (USD 37 000) for natural persons were granted for the 50% of the investments.

Important support to agricultural investment comes through the large rural and regional development projects. Thus, approximately 75% of the funds allocated in the national rural development programme IPARD-I (2007-13) went for the investments in milk and milk farms, as well as agricultural processing. The new IPARD-II (2014-20) maintains virtually the same funding priorities. The South Eastern Anatolia Project (GAP) provided grants for animal farming – as of 2014, TRY 87 million (USD 32 million) have been allocated for projects which included the purchase of livestock and equipment and construction of production facilities. Beyond that, the GAP disbursed TRY 219.3 million (USD 81 million) as credit to 93 cooperatives for the purchase of agricultural animals and establishment

of greenhouses. GAP also supports organic farming. Eastern Anatolia Development Project (DAP) since its start in 2010 and up to 2014, has funded TRY 44.7 million (USD 16 million) for development of animal farming (MOFAL, 2014).

Regional Development Agencies provide financial support to investments in their regions. Although agriculture is not a high priority, these agencies financed 599 projects related to agriculture and rural development for investments in the construction of facilities and equipment (MOFAL, 2014).

Credit support

Credit support is a long-standing agricultural support policy. Concession takes the form of interest subsidies on short-term and long-term agricultural loans, varying from 25% to 100% depending on the type of loan (OECD, 2011). Concessional loans are available from Ziraat Bank and agricultural credit cooperatives. Ziraat Bank, for example, disburses investment loans to individual producers and producer groups for organic agriculture, application of Good Agricultural Practices, cattle farming, aquaculture, irrigation, and mechanisation. Investment loans are also offered for acquisition of a broad range of existing agricultural businesses. "Contract production loans" of the Ziraat Bank provide working capital to individual producers who have contracted their output or to the companies-contractors. The amount of interest subsidies provided by the government has been rapidly increasing in the past years and rose from TRY 372 million (USD 138 million) in 2008 to TRY 1.3 billion (USD 481 million) in 2015, which in real terms corresponds to more than a doubling.

Agricultural insurance

Agricultural Insurance Pool (TARSİM) operates as the government-supported agricultural insurance. The amount of support is established by decision of the Cabinet of Ministers which, on the basis of a proposal by MOFAL, determines the products, regions, risks and size of businesses to be supported. The government provides 50% of the premiums for all risks determined by the Cabinet. The risks covered by TARSİM are transferred to local and foreign reassurance companies through contracts, while the rest is covered through excess of loss reassurance by the Treasury (MOFAL, direct communication).

Since its inception in 2005, TARSİM has progressively developed new products and lines of risks insurance and expanded the scale of operation (Box 5.1). Total premiums produced in the TARSİM rose from TRY 69 million (USD 49 million) to TRY 966 million (USD 355 million) between 2007 and 2015 – an almost six-fold increase if these amounts are expressed in real terms. Nearly 72% of total premiums were for crop insurance and nearly 21% for cattle, with the remaining 7% coming from sheep and goats, greenhouses, aquaculture, apiculture and poultry policies. Crop and cattle also account for major shares of total insured assets (83%) and indemnities paid (97%) in 2015. The loss-to-premium ratio, which is defined as including government support, has evolved in the last decade and varies a great deal among lines of risks: in 2015, it ranged from 72% for crop insurance (this insurance having the largest share in total TARSİM's premium collections) to 0.18% for poultry (the smallest share in total premiums) (MOFAL, direct communication).

With the expansion of subsidised insurance, overall government allocations for subsidising premiums have increased from TRY 32 million (USD 25 million) in 2007 to TRY 524 million (USD 192 million) in 2015 (MOFAL, direct communication), a more than a six-fold growth in real terms.

The establishment of TARSİM has broadened the risk management instruments available to agricultural producers. TARSİM is also an instructive example of public-private action for agricultural risk management. The future development of this rapidly expanding insurance system warrants an assessment. OECD work on agricultural risk shows that subsidised insurance encourages excessive risk-taking by farmers, which in turn can cause deficits in the insurance system in the long-run and undermine its financial soundness. This is enhanced by the uncertainties related to climate change, and the fact that subsidised insurance can be associated with negative environmental impacts. The

magnitude of negative effects of insurance subsidies generally depends on the specific parameters of support built into the system, the type of agricultural systems, and the risk profiles of each country. These effects can be evaluated only through country-specific analysis (OECD, 2011b; Antón and Kimura, 2011).

Box 5.1. TARSİM: Agricultural insurance in Turkey

TARSİM is a public-private partnership governed by the Board of Directors represented by the Minister of Food, Agriculture and Livestock, the Undersecretary of Treasury, the Insurance Association of Turkey, the Union of the Agricultural Chambers of Turkey and the Management Company unifying 24 insurance companies with equal shares. The Management Company is responsible for the operations of the Agricultural Insurance Pool. Insurance companies participating in TARSİM sell standardised contracts to farmers and collect insurance premiums with a total risk transferred to the Pool. TARSİM can obtain reinsurance from the reinsurance market.

Subsidised insurance is offered for the crop losses from natural disasters (including greenhouse production) with a broad range of disasters insured. Beyond the standard support rate, one-third of additional support is provided for frost risks, except for those relating to flowering period of fruits grown in open-air. Insurance is also available for livestock in the events of disease, natural disaster, or accident. Livestock policies cover cattle, sheep and goats, poultry, apiculture and aquaculture.

Only 0.6% of agricultural land had some insurance cover up to the mid-2000s, with only 9 out of 62 insurance companies offering policies for agriculture (OECD, 2011a with reference to Karaca et al., 2010). Following the launch of TARSİM, agricultural insurance has expanded and is currently offered for crop growing, greenhouse production, aquaculture, apiculture, cattle, poultry and sheep and goats. For the 2015 agricultural season, TARSİM insurance covered 14% of the total agricultural area registered in Farmer Registry System (MOFAL, direct communication). Although the new system remains relatively limited, it is growing at a rapid pace. The further expansion of the agricultural insurance programme faces challenges of increased transaction and implementation costs to cover small-scale farms and ensuring the actuarial soundness of the system in the long run in view of uncertainties related to climate change.

Tax regime for agriculture

Income from agricultural activity is taxable. However, small farmers are exempt from tax if the farmer's gross revenue or the size of his farming enterprise is less than the amount specified by the Income Tax Law. Most farmers are exempt from income tax since the average farm size is small and average farm income is low. Workers employed by the farmers who are not subject to income tax are exempt from income tax on their wages. Agricultural taxpayers who are liable for income tax (legal entities of specified legal forms) can benefit from an investment allowance exemption. This represents a discount on taxable income amounting to 40% of the cost of capital goods purchased or manufactured for business purposes.

The VAT regime incorporates a number of concessions related to agro-food activities. While a standard VAT rate is 18%, agricultural goods sold by farmers exempt from income tax do not also pay VAT, while for other agricultural producers the rate is set at 1%. A reduced VAT rate of 8% applies to foodstuffs. Some agricultural inputs pay a reduced VAT rate: it is set at 8% for plant protection and veterinary products licensed by the MOFAL, while the water delivered for agricultural production and land improvement services performed by public and cooperative providers are free from VAT (Deloitte, 2016).

Water and irrigation policies

Irrigated agriculture is an important and growing part of the Turkish agriculture sector. Irrigation covers about 6 million hectares, which represents about 15.6% of total agricultural land (MOD, direct communication) and about 70-80% of total freshwater withdrawals in Turkey. The main irrigated crops include maize, cotton, cereals, fodder crops and sugar beet. Irrigation continues to be developed and is considered by the government as a key element for productivity growth and competitiveness in agriculture. The government's objective is to expand the irrigated area to 8.5 million ha. This objective is integrated in the regional development projects, the biggest being the South Eastern Anatolia project.

Irrigation systems are being modernised, but there is significant room for more efficient water conveyance and application systems. Drip and sprinkler irrigation, the most efficient water application techniques, represent only 10% and 16% of irrigated lands respectively, against 74% for (less efficient) surface irrigation.[1] But adoption of efficient techniques is rising: areas under drip and sprinkler techniques have increased from 17% of total irrigated areas in 2009 to 26% in 2015 (Fayrap, 2015). In terms of water conveyance, the majority of irrigation systems are still open canals and gravity systems with low efficiency, but efforts since the early 2000s have sought to develop pipeline distribution networks and pressurised systems (Çakmak, 2010).

Government provides financial support for the adoption of more efficient water application systems. Since 2005, the government subsidises water-saving irrigation methods, such as drip and sprinkle irrigation (Özerol and Bressers, 2015). Half of the expenditures (excluding VAT payments) on the purchase of individual irrigation machinery and equipment are subsidised. There is an upper-limit for the expenditures: TRY 100 000 (USD 37 000) for individuals and TRY 200 000 (USD 74 000) for legal entities. The types of investments considered are, among others, installation of on-farm drip, sprinkler or micro-sprinkler irrigation, and of irrigation schemes based on solar power (Official Gazette of the Turkish Government, 2015). By 2012, these aids subsidised 6 196 projects, with 61 000 farmers benefitting, for a total amount of TRY 165 million (USD 61 million) (MOD, 2014).

Management of irrigation schemes has been decentralised in the last 20 years. Starting in 1993, the operation and maintenance of irrigation systems have been progressively transferred from the General Directorate of State Hydraulic Works (DSI) to water users, including local authorities, Water User Associations (WUAs), and groundwater cooperatives. DSI retains ownership of infrastructures and is in charge of the irrigation development policy. By 2010, 719 irrigation schemes were transferred to the Water User Associations (Table 5.2).[2]

Decentralisation has improved the performance of irrigation schemes in certain cases, but the margin for progress remains significant. Comparing the Menemen irrigation scheme between the pre-transfer (1984-1994) and post-transfer (1995-2004) periods, Kukul et al. (2008) show substantial increases in water productivity, water fee collection rates, and financial sustainability. Similar positive findings were shown by Çakmak et al. (2010)[3] regarding irrigation water fee collection rates and financial cost reduction, and more recently by (Sener, 2012) in the case of the Meric-Ergene Basin. However, there is recent evidence that water efficiency, economic and environmental performance varies a great deal across irrigated schemes, and remains unsufficient in several cases (Özmen and Kaman, 2015).

Table 5.2. Irrigation systems and irrigated areas by management type in Turkey

Management type	Number of irrigation systems	Net area (ha)	Gross area (ha)
Operated by DSI	59	76 420	90 000
Transferred to Water User Associations	719	2 181 738	2 572 240
Constructed for other institutions	31	17 510	20 644
Groundwater cooperatives	1 368	452 238	533 174
TOTAL	2 177	2 727 906	3 216 154

Source: DSI (2012), *Water and DSI 1954-2012*, www2.dsi.gov.tr/english/pdf_files/dsi_in_brief2009.pdf.

Incentive mechanisms to save water in irrigated areas are still not sufficient. There is evidence that the decentralisation of operations and maintenance has improved water management by empowering water users through higher water charges and improved collection rates (Çakmak, 2010).[4] However, water charges only cover operation, maintenance, and administrative costs; they exclude capital costs, opportunity costs of water scarcity and environmental externalities. Water pricing is charged on a per hectare basis and differentiated by type of crop, and thus does not directly depend on the volumes effectively consumed by farmers (Çakmak, 2010).[5]

The Tenth Development Plan 2014-18 introduced a new initiative on irrigation water – a Programme for Efficient Use of Water Resources in Agriculture. This programme aims at increasing water use efficiency and water productivity by modernising irrigation equipment, developing economic incentives to save water, and investing in extension and education on agricultural water use (Box 5.2).

MOFAL's General Directorate of Agricultural Research and Policies (TAGEM-MOFAL) undertakes applied research to support the improvement of water management practices in agriculture. This work is focussed on: drought management or mitigating the effects of drought and water consumption rates, irrigation programs and criteria for water deficit irrigation practices. Studies on deficit irrigation practices are on-going to enable the irrigation of larger areas of land while consuming the same amount of water by allowing a certain level of yield loss from a given crop with higher returns gained from the diversion of water for irrigation of other crops.

Box 5.2. Turkey's Programme for the Efficient Use of Water Resources in Agriculture

The objectives of the *Programme for the Efficient Use of Water Resources in Agriculture* related to the irrigation infrastructure developed by DSI include:

- Increasing the share of the land irrigated by modern on-farm water-saving technologies (drip and sprinkler irrigation) in total irrigated land from 20% to 25%
- Increasing the irrigation ratio from 62% to 68%, and the irrigation productivity from 42% to 50%
- Increasing the number of modern irrigation systems by 10% annually
- Decreasing by 5% the use of groundwater resources

The Programme includes five broad components: i) modernisation and enhancement of existing irrigation infrastructure; ii) extension of education and information on the rational use of water to farmers; iii) design of agricultural subsidies which take into account water stress problems; iv) water budgeting at the water basin level; and v) improvement of institutional setting for irrigation.

Modernisation and enhancement of existing irrigation infrastructure: identification and replacement of the old irrigation schemes with closed irrigation systems; expansion of the existing closed irrigation systems and modern irrigation technology (drip and sprinkler irrigation); R&D on new irrigation technology (including the use of wastewater in irrigation); acceleration of land consolidation in irrigation areas.

Increased education and information on the rational use of water to farmers: provision of the information on the rational use of irrigation water to individual farmers; technical advice and education to WUAs and irrigation. cooperatives.

Design of agricultural subsidies which take into account water stress: agricultural subsidies accounting for regional water stress and irrigation-induced water pollution at the hydraulic basin level; monitoring of the water pollution caused by agricultural activities, identification of the regions most affected by water pollution, and actions will be undertaken to control the pollution; provision of R&D support for development of drought-resistance crops.

Water budgeting at the water basin level: implementation of water pricing policies taking into account regional water stress; volumetric water pricing in closed irrigation systems; master plans prepared for water budgets at the basin level; groundwater use control based on the monitoring and registration of use.

Improvement of institutional setting of irrigation: enhancing the synergies and cooperation between the institutions in charge of agricultural policy-making and delivery of agricultural subsidies; monitoring of the activity of water use associations and irrigation cooperatives.

Source: MOD (2014), *The Tenth Development Plan 2014-2018*, www.mod.gov.tr/Lists/RecentPublications/Attachments/75/The%20Tenth%20Development%20Plan%20(2014-2018).pdf.

In the framework of Turkey's accession process to the European Union, negotiations on chapter "Environment and Climate Change". Progress has been made on water issues with the adoption of the Harmonisation of the Water Law and the River Basin Management Plans (RBMP) (MOD, 2014). This represents important steps towards the establishment of integrated river basin management and sustainable use of water resources. Turkey is divided into 25 hydraulic basins,[6] each differing significantly in water potential. The Euphrates-Tigris basin alone represents 28% of the total potential for all basins (DSI, 2012). River Basin Protection Plans are now being prepared in order to increase the efficiency of water management and use, with the aim to complete this work for all basins by 2020. This is carried out in view of the objective in the Tenth Development Plan to adopt irrigation policies based on agricultural basins and on agricultural parcels (MOD, 2014).

Turkey also aims to develop a drought and climate change monitoring system using remote sensing within its Integrated Management Information System (TARSEY) (see Annex 2.A3).

Agri-environmental and climate change policies

Well-designed agri-environmental policies can contribute to the sustainable productivity growth of agriculture by encouraging more environmentally-friendly practices, reducing pressures from agriculture on natural asset base, and providing a bundle of ecosystem services to the whole economy.

Agri-environmental issues are becoming an increasing focus in Turkey, as is the case for environmental issues in general. This development is linked to the approximation process with EU regulations, which includes agri-environmental measures as part of Common Agricultural Policy. Beyond agri-environmental measures, Turkey has developed other environmental regulations as part of the approximation process, such as Nitrate Directive, Water Framework Directive (Chapter 3).

Various pilot agri-environmental initiatives have been undertaken since the early 2000s: i) the programme for Protection of Agricultural Fields for the Environment (ÇATAK); ii) the project "Supporting the Development of a National Agri-environment Programme for Turkey" (2006-08), that led to the Handbook for the development of a national Agri-environmental programme for Turkey. Several activities to combat soil erosion, such as soil erosion control, afforestation, land rehabilitation, establishment of energy forests, and artificial regeneration are included in the 2013-17 Action Plan "Combating soil erosion" (MOFWA, 2012).

The programme Protection of Agricultural Fields for the Environment (CATAK) provides per hectare support to farmers for environmentally-friendly activities that target erosion control, sustainability of natural resources, and protection of soil and water quality. This programme is implemented in 30 provinces, and has grown with time, with a budget of TRY 35 million (USD 18.4 million) for 9 195 farmers for a total field area of 33 172 ha in 2013. There are three categories of payments: i) category 1 for minimum tillage; ii) category 2 for soil and water conservation and erosion prevention; and category 3 for adoption of agri-environmentally friendly practices regarding water, input use, and organic agriculture (Official Gazette of the Turkish Government, 2014).

The IPARD-II (2014-20) includes a measure "Agri-environment, climate and organic farming", but receives a limited budget share. The objective of this measure is to improve the sustainable management of natural resources and climate change mitigation in agriculture beyond regulatory requirements. The measure especially targets soil conservation, water resource, biodiversity and organic farming (Table 5.3). The payments are to be made to compensate income foregone and extra-costs, including working hours to implement the programme (compulsory training, additional labour costs, and administrative tasks). The programme is fully financed by public funds, including EU contribution of up to 85% of total expenditures. The measure is projected to amount EUR 18.8 million for the period 2014-20.

Table 5.3. Agri-environment, climate and organic farming measure of IPARD-II (2014-20)

Area	Activities
Soil conservation	Maintain soil quality in terms of fertility, organic matter content, soil structure and biodiversity
	Decrease soil erosion
Water resources	Decrease the amount of water used for irrigation
	Improve groundwater quality and quantity
Biodiversity	Protect the local species with a specific emphasis on establishing stability and sustainability of Great Bustard population by improving their habitat
	Raise awareness on the value of biodiversity and particularly the Great Bustard population
Organic farming	Extend organic farming practices
General	Raise awareness about environmentally-friendly farming practices
	Decrease the damage given to the environment during the agricultural activities to the minimum level

Source: MOFAL (2014), *Instrument for Pre-Accession Assistance Rural Development (2014 -2020)*, http://ipard.tarim.gov.tr/admin/app_upload/Turkey_IPARD_Programme.pdf.

Support is provided for the adoption of Good Agricultural Practices (GAPs). Good agricultural practices started to develop on a voluntary basis in the early 2000s and are now regulated by a specific legislation adopted in 2010. Financial supports include: i) per hectare payment for fruits and vegetables and for greenhouse cultivation; ii) a 50% interest rate subsidy for business and investment loans for farms implementing GAPs (Official Gazette of the Turkish Government, 2014); iii) 50% subsidy on the expenditures for certification and/or laboratory tests up to USD 50 000, conditional on positive results and that exporters belong to an Export Association (Ataseven and Sumelius, 2014).

Organic farming has also been encouraged since the mid-2000s, notably through per hectare payments for fruits and vegetables, and arable crops, as well as payments for livestock (per head) and for beekeeping (per beehive) (Ataseven and Sumelius (2014). MOFAL set the objective to increase the area under organic farming, which has reached 60 797 ha in 2013, beyond the initial target. In addition, the "Organic Agriculture National Action Plan" (2013-16) prepared by MOFAL, universities, government offices, non-governmental organisations and trade associations aims at promoting organic farming through dedicated actions in various areas including control and inspection services, traceability, education and institutional capacity (Ataseven and Sumelius, 2014).

The Ministry of Environment and Urbanization offers grants up to 50-100% for projects on environmental infrastructure and environmental protection. The purpose is to prevent pollution in rural areas and protect natural resources. Projects themes are tourism infrastructure, hard waste storage, recycling infrastructure, wastewater treatment and potable water infrastructure. The applicants are local administrations and unions.

Turkish policy on fertiliser use aims at improving farmer awareness to use fertilisers based on soil analysis and to increase productivity of soils. Provincial Directorates provide constant training support to farmers. Since 2009, soil analysis is compulsory for land parcels of 5 ha and above. In 2009, the areas covered by soil analysis were 2.9 million ha. This requirement increased such areas to 3.8 million ha in 2014. As of 2005, the amount of support provided for soil analysis has been TRY 550 million, and in 2016 TRY 2.5 million will be provided for soil analysis. The laboratories functioning within the research institutes subordinated to MOFAL provide extensive soil, fertiliser and water analyses, and consult farmers regarding the results of these analyses.

Table 5.4. The National Climate Change Adaptation Plan for the Agriculture Sector (2011-23)

Purposes	Objectives	Action areas
Increase the sink capacity of the agriculture sector	Determine and increase the quantity of carbon stock captured in the soil	Disseminate sustainable agriculture techniques that also take into consideration adaptation to climate change
		Increase the effectiveness of soil management
		Increase the effectiveness of pasture management
	Identify and increase topsoil and subsoil biomass	Complete the irrigation infrastructure
		Improve agricultural infrastructure
		Enable management of crop production
Limit greenhouse gas emissions from the agriculture sector	Identify the potential GHG emissions limitations in the agriculture sector	
	Decrease the rate of GHG emissions originating from crop and animal production	Limit GHG emissions originating from crop production
		Limit GHG emissions originating from animal production
		Limit GHG emissions originating from energy consumption in agriculture
Develop information infrastructure and capacity in the agriculture sector	Build the information structure to meet the needs of the agriculture sector to adapt and combat climate change	

Source: MOEU (2011), *National Climate Action Plan (2011-2023)*, Republic of Turkey, Ministry of Environment and Urbanisation, Ankara.

Efforts to establish the infrastructure of a "fertiliser tracking system" are ongoing, with the objective to follow the process from production to final consumption of fertilisers.

Policies on climate change adaptation and mitigation are gradually emerging in recent years. The National Climate Change Action Plan of Turkey (2011-23), foresees the analysis of mitigation and adaptation challenges for Turkey for all economic sectors, including agriculture, and sets a structured set of purposes, objectives and concrete actions (MOEU, 2011). Mitigation targets have, however, not been determined yet. The Climate Change and Air Management Coordination Board was established on 7 October 2013 for taking the necessary measures to minimise the adverse effects of climate change and to enable the efforts for being more efficient. Relevant ministries, institutions and NGOs are the members of this board.

The National Climate Change Adaptation Plan of Turkey (2011-23) sets three directions for the agricultural sector: i) increase the sink capacity of the agriculture sector; ii) limit greenhouse gas emissions from the agriculture sector; and iii) develop information infrastructure and capacity in the agriculture sector (MOEU, 2011). These general purposes are specified into objectives, action areas and actions, and performance indicators, such as outputs, time of implementation, and responsible organisations, including relevant Ministries, farmer unions, research institutes, and NGOs (Table 5.4).

Some of the existing agri-environmental policies are also likely to contribute to the adaptation and mitigation to climate change in the agriculture sector, as identified in the National Climate Change Adaptation Plan. Such policies include, for example, land consolidation, good agricultural practices, ÇATAK, support programs for modern irrigation and food processing methods for water saving, supports for minimum tillage, activities to increase carbon sink, legislation on soil protection and land use, support for certified saplings and orchards to increase the number of enterprises, and grassland rehabilitation activities.

The institutes under MOFAL's General Directorate for Agricultural Research and Policies conduct various research activities on identification and monitoring of agricultural drought and its impacts on soil and water resources, and understanding the impacts of climate change. The main research subjects include: conducting research on hydrological drought, assessment of proper drought monitoring and forecast methodologies, identification and monitoring of soil water regimes on basins, appropriate water harvesting methods and revealing its impacts on crop development, the impacts of climate change on soil quality parameters, and identification of carbon flows resulting from land use and crop production (Box 5.6).

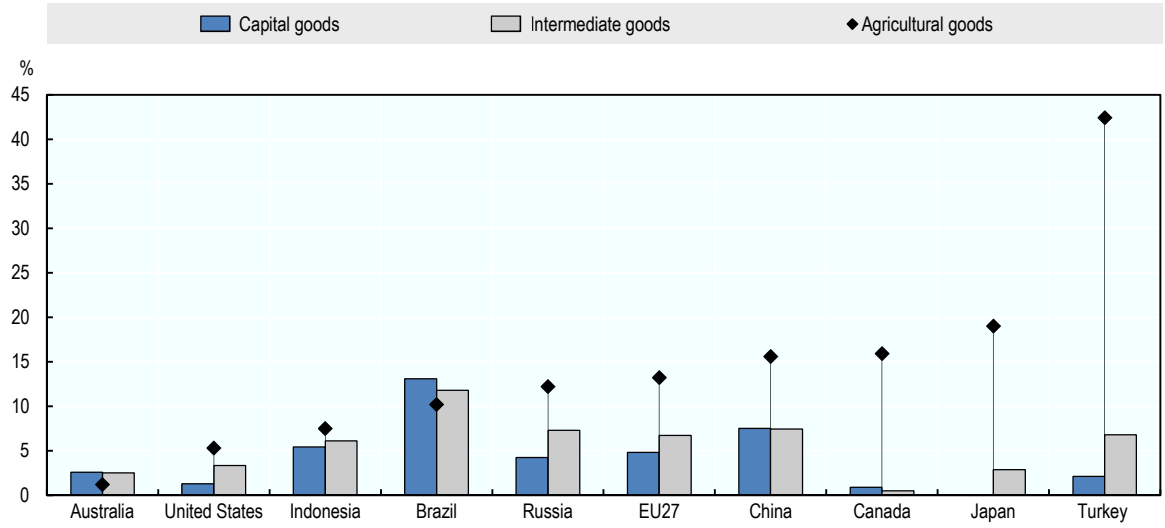
5.4. Agricultural trade policy

Turkey substantially regulates trade in agricultural products. High protection is applied against imports of principal livestock product groups and some crop products. Agro-food exports are regulated through stimulating and restricting measures, including export subsidies and export credit supports for some products, while export duties and export prohibitions for others.

Import measures

Turkey's import tariff profile reveals distinct agricultural bias (Figure 5.2). A simple average applied MFN tariff on agricultural products (WTO definition) is at 42.2% (2014), compared to an average non-agricultural tariff at 5.4% (WTO, 2016a). The rates exceeding 15% account for 63% of agricultural tariff lines, of which 12% are the lines with tariffs above 100%. Dairy products command a prohibitive MFN tariff (over 100%) and no duty-free imports. Average MFN applied tariff for animal products is also above 100%, but in 2014, for example, over one-third of these imports entered duty free. Sugar is another product with a highly protective regime (average MFN duty at 88%). Import tariffs are moderate on raw materials for food processing such as oilseeds, while cotton imports are duty-free. Capital goods, industrial inputs, breeding animals or seeds, face relatively low border protection (WTO, 2016a).

Figure 5.2. Import tariffs for industrial and agricultural goods,[1] 2014



1. Simple average MFN tariffs, specific duties in *ad valorem* equivalents included. Tariff rates for non-agricultural products do not include *ad valorem* duties.

Source: UNCTAD (2014), *Trade Analysis Information System (TRAINS) and World Tariff Profiles*, United Nations Conference on Trade and Development (UNCTAD).

StatLink http://dx.doi.org/10.1787/888933389909

Turkey has no WTO tariff-quota commitments but maintains a number of autonomous TRQs for agro-food products (for cereals and sugar) and under a large number of trade agreements with non-EU countries of Southern Europe and Middle East. The government also uses unilateral tariff quotas as a trade policy instrument to facilitate imports.

Export measures

Turkey's WTO commitments allow the export subsidies with the stated aim of developing the export potential in value-added agricultural products. Sixteen product groups are covered, including items such as processed fruit and vegetables, honey, olive oil, poultry meat, eggs, and derived food products. Export subsidies are granted in the form of reductions of the exporters' debts *vis-à-vis* public corporations (for example, for taxes, and telecommunications or energy bills). All destinations are eligible, including to the European Union. Exporters of agricultural products also benefit from generally available export credits. Export taxes are levied on hazelnuts and animal skins, while a number of agricultural products are prohibited for exports (specified agricultural plants, tobacco seeds and seedlings, and angora goats) (WTO, 2012).

5.5. Farm structure and rural development policy

Structural adjustment as a re-allocation of land, labour, and capital resources within and outside agriculture is one of the productivity drivers. Farm structure and rural development policies work to activate this process and, as such, have particular importance in the context of Turkey. As developed in Chapter 2, the re-allocation of labour resources towards more productive uses within and outside agriculture is fundamental to agricultural productivity growth in Turkey.

Farm structure policies

The small farm size is commonly viewed as a handicap for agricultural development in Turkey. This is typically evoked with respect to field-cropping where the size of parcels is believed to constrain the operation at an optimal-scale. Small farms seem to be perceived as less of a problem in horticulture (Akder, 2015). The analysis on relative productivity and efficiency on farms of different sizes is scarce and in general is limited by the availability of up to date farm-level data.

Current government policy related to farm structure is focussed on preventing further fragmentation of farms based on certain operational criteria of minimum farm sizes. Land consolidation and regulations on land transfer imposing minimal size constraints are used as the main instruments to achieve these objectives.

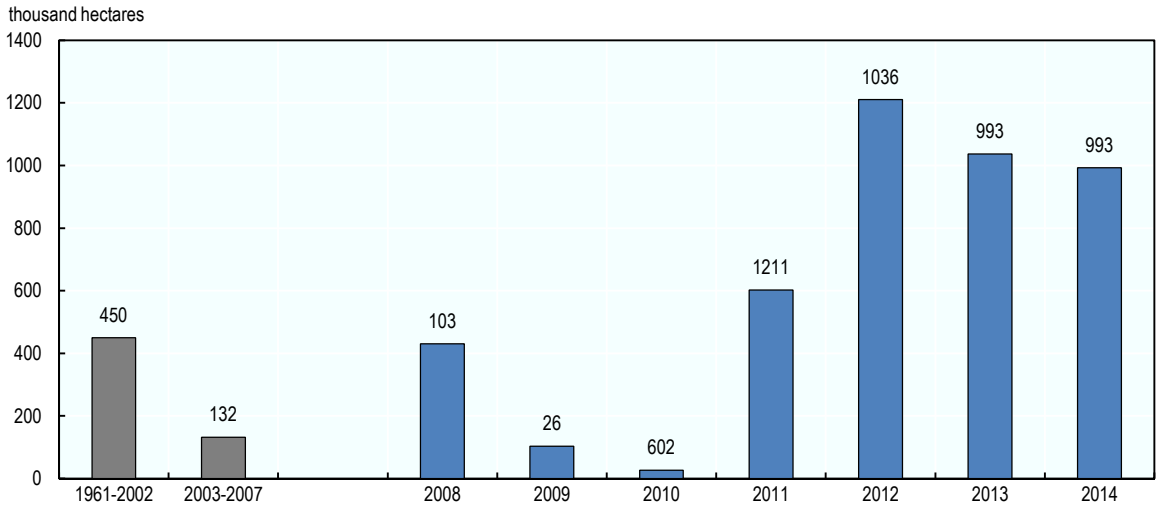
Land consolidation

Land consolidation is at present a major agricultural policy. The first consolidations began in 1961 in Konya province of Turkey, but it was not until 2011 when this activity became large scale (Figure 5.3). Between 1961 and 2014, almost 5 million ha was consolidated. The target for 2015 was to increase this total to 6 million ha. It is planned to consolidate an additional 8 million ha between 2016 and 2023. This will make a total of 14 million ha which is considered the area of land to technically meet the land consolidation needs of Turkey (Akder, 2015).

The early programmes included only simple consolidations of fragmented parcels, but this activity has become more integrated recently to include irrigation schemes, drainage, land and water conservation programmes, road systems, and various services for rural development. Land consolidation in certain locations is combined with on-farm development activities, for example, within the South East Anatolian Project (GAP), Eastern Black Sea Project (DOKAP), Eastern Anatolia Project (DAP), and Konya Plains Project (KOP). Transport infrastructure development also requires land consolidation, thus in certain cases Treasury land is exchanged for lands going into the road construction and for other

public investments. Box 5.3 illustrates the activities involved and estimated gains from the land consolidation work using the example of the South Eastern Anatolian Project (GAP).

Figure 5.3. Agricultural land consolidation in Turkey



Source: MOFAL (2015a), *Arazi Toplulaştırma ve Tarla İçi Geliştirme Geliştirme Hizmetleri Daire Bakanlığı Faaliyet Yayını* (Activity publication), Tarim Reformu Genel Müdürlüğü (General Directorate of Land Reform), Republic of Turkey, Ministry of Food, Agriculture and Livestock, Ankara.

StatLink http://dx.doi.org/10.1787/888933389918

Box 5.3. Land consolidation within the South Eastern Anatolian Project (GAP)

Land consolidation in the framework of GAP covers 2.5 million ha, with works on 98% of this area completed to date. A total of 107 projects have been carried out in 2 035 villages. The estimated 950 000 people are the beneficiaries. The outcomes of the GAP include 20 391 km of new roads, 1 346 km of waste water system, 1 346 cesspools and 15.5 million cubic meters of stone removed from the fields. In the course of works, 2.5 million aerial photographs and 2 million soil analyses have been taken.

According to thet General Directorate of Land Reform of the MOFAL which is responsible for land consolidation, land consolidation within the GAP yields TRY 2.3 billion (USD 838 million) of recurrent annual gains (largely from the reduced labour costs) and TRY 4.6 billion (USD 1.7 billion) of one-off gains (Table 5.5).

Table 5.5. Estimated gains from land consolidation in the South-East Anatolia Project

	TRY million	USD million
Recurrent annual gains, total	2 282.9	838.4
Reduction of labour and machinery costs within the parcel	1 981.6	727.7
Labour and machinery cost reduction among the parcels	262.4	96.4
Increase in irrigation efficiency	34.7	12.7
Increase in output due to cleaning fields from stone	5 2	1.9
Non-recurrent gains, total	4 590.9	1 686.0
Reduction in the cost of land expropriation for water channels and roads[1]	2 130.9	782.5
Gains from irrigation investments	2 460.0	903.4

1. Due to land consolidation, the required length of water channels and roads is reduced, bringing down the amount of compensation in the case of the expropriation of land for construction of these infrastructures.

Source: MOFAL (2015a), *Arazi Toplulaştırma ve Tarla İçi Geliştirme Geliştirme Hizmetleri Daire Bakanlığı Faaliyet Yayını* (Activity publication), Tarim Reformu Genel Müdürlüğü (General Directorate of Land Reform), Republic of Turkey, Ministry of Food, Agriculture and Livestock, Ankara.

Farm-size regulations

Turkey has recently introduced major changes to its regulations related to inheritance and the sale of agricultural land. In May 2014, Turkish Parliament approved amendments to the Law on Protection of Soil and Use of Land (Law No. 5403) and to the Turkish Civil Code (Law No. 4721). These changes seek to prevent further fragmentation of farms and concern land transfers, land conservation, and related provisions.

Agricultural land may now be transferred (sold) as long as the minimum farm size requirements are observed. With respect to the transfer of land through inheritance, the previous legislation stipulated that 25% of a deceased landowner's property be inherited by the spouse and the rest distributed in equal shares among the surviving children. Now heirs have several options to allocate the inherited land; each of these options aim to prevent the physical split of the land below the minimum size requirements and to encourage the transfer of land to a "qualified" farmer heir or a third party while maintaining its agricultural use (see Annex 5.A1 for detail).

The regulation also introduces minimal size requirements if a farm or a parcel is transferred (sold or inherited): one relates to an individual parcel size, and another one to the size of a farm (which may integrate several parcels).

The minimal size of a farm is based on a concept of a minimal "income-generating capacity" of a farm. These sizes are established for each district in Turkey. Four categories of land are distinguished: irrigated, rain-fed, orchards and greenhouse land. Sufficient income generating size for greenhouse production is fixed for all Turkey at 0.3 ha, and at 1 hectare for orchards; but varies across the country for irrigated land between 5 and 10 ha, and for rain-fed land between 12 and 20 ha.

The definition of the minimum parcel size employs an input-yield criterion, i.e. it corresponds to an area which if further reduced would prevent the attainment of yields at the economically rational use of inputs. Parcels at or below the minimal size may not be allotted, and may not be shared by additional owners. The minimum parcel size is uniform across Turkey: it may not be less than 2 ha for "absolute" cultivated agricultural lands, special product lands, and marginal agricultural lands; 0.5 ha for orchards; and 0.3 ha for lands under greenhouse production. The MOFAL may allow the exceptions related to olive, hazelnut and similar orchards which need special climate and soil conditions.

Other policies affecting farm structure: early retirement, entry in and exit from farming

No specific retirement schemes for farmers, including early retirement schemes, exist in Turkey, but farmers may voluntarily opt for the private insurance schemes, so called Tarım-Bağkur.

Entry in and exit from farming are free. Purchase of agricultural land is not tied to any specific conditions. Persons who wish to acquire or rent an agricultural holding do not need to provide proof of qualification. To become eligible for certain subsidy programmes and to benefit from investments under the rural development programmes, a farmer has to be a member of local Agricultural Chamber and be registered in MOFAL's Farmer Registry System. To obtain such membership, producer needs to submit an application and a declaration of the land-deed and to pay a membership fee. Farms in Turkey are not legal entities and it is the deed, or land ownership certificate, that defines the farm. The minimum size requirements regulating the sale of land affect the exit from farming.

Rural development policy

Rural development has traditionally been integrated into the overall development policy focussed on large infrastructure projects under the National Development Plans. In various provinces and regions where rural development projects were implemented, they also aimed at infrastructure improvements, and were supported by foreign finance, especially from the World Bank and International Fund for Agricultural Development (IFAD).

The current large national infrastructure projects maintain the rural area components. However, since the mid-2000s, specific rural development policy frameworks have emerged in the context of Turkey's movement towards the EU acquis. The first national Rural Development Strategy for 2007-13 was adopted in 2006 as the basis of the EU Instrument for Pre-Accession Assistance Rural Development (IPARD-I) and Turkey launched its first Rural Development Plan (OECD, 2011a). IPARD is intended to address the country needs in the pre-accession period in the area of rural development.

These developments have broadened the objectives and the scope of Turkish rural development policy to align it with the EU framework. The priorities formulated in the current (second) Rural Development Strategy for the period of 2014-20, along with investments in productive activities and infrastructure, also view environmental sustainability, rural diversification, as well as social advancement of rural areas in critical dimensions, such as education, health, fight against poverty, and local institutional capacities (Annex 5.A2). The principal activities of the current programmes related to rural development are presented below.

EU Instrument for Pre-Accession Assistance Rural Development (IPARD)

Turkey has recently launched its IPARD-II for 2014-20 to succeed IPARD-I for 2007-13. In both periods, 42 out of 81 Turkish provinces are covered, however it has been stated that an expansion of regional coverage will be considered for the second phase.

A total of TRY 6.9 billion (EUR 2.3 billion) has been invested through IPARD-I, of which 58% were public grants (Table 5.6). Nearly 11 000 projects were implemented and some are still ongoing. Axis 1 activities received 80% of total funds, with the majority of funds invested in improvements in the economic performance of farms and processing capacities to upgrade them to Community Standards. Milk, meat, horticulture, and fisheries operations received support, with milk and meat farms accounting for the major share. IPARD-I did not finance the preparation for the environmental actions under Axis 2. Farm and off-farm diversification under Axis 3 received relatively modest shares of total investments – 9% and 11% respectively, while there seem to be varied opportunities for such activities in Turkey (Box 5.4).

Box 5.4. Experience and opportunities for rural diversification in Turkey

The idea of rural diversification is not new to Turkey. During the early period of the Republic, the establishment of "industrial villages" was viewed as a synthesis of village and city from a spatial perspective, and a synthesis of agriculture and industry from an economic perspective (Çetin, 1999). This pioneering idea of Kemal Nusret Köymen was revived several times in contemporary Turkey as "Village-Town", "Centre Village", and "Agricultural Town" approaches (Jorgerden, 2004). The last (Village-Town) application was implemented after a long break in Ordu-Mesudiye-Çavdar Köyü in 2000. However, these programmes had limited success, probably due to the relatively low development level of rural areas in Turkey in terms of infrastructure, governance, and service provision and also due to the over-emphasis on supply.

Rural economy diversification is a stated priority in the new Rural Development Strategy 2014-20. It explicitly highlights such activities as tourism, fishery, organic agriculture, forestry products and handicrafts. The previous documents also mentioned honey production and the growing of medicinal, aromatic and ornamental plants. One may distinguish a specialisation among regions around these off-farm activities. For example, specialisation in manufacturing is found in Samsun, Tokat, Çorum, Amasya, for fishery in Trabzon, Ordu, and Giresun; for forestry in Bursa, Eskisehir and Bilecik and for trade, in Manisa, Afyon, Kütahya and Uşak. Diversification of activities depends greatly on co-existing activities in the area and the more developed the area the more diversified the range of activities in which farmers are engaged (MARA, 2007).

Ornamental plants are also mentioned in the previous National Rural Development Strategy as one potential alternative economic activity in rural areas. Turkish has favourable prospects for this production, as the country has different types of soil and climatic conditions. Specifically, Anatolia is the main source of many ornamental plants. The total land under the cultivation of ornamental plants in the country was 4 901 ha in 2014, according to Turkish Statistical Institute. Ornamental plant production is located mainly in Marmara, Aegean and Mediterranean regions, as well as on inland tablelands, under favourable micro-climatic conditions.

Turkey has a good potential for the production of medicinal and aromatic plants and is competitive in some of these products, especially in cumin, savoury, carob and bay. More specifically, cumin, savory, fennel, caraway seed, coriander and mint are presently cropped and the areas are steadily expanding, however, statistics on this type of production are few.

Box 5.4. Experience and opportunities for rural diversification in Turkey (*cont.*)

Organic farming is among the measures of the Rural Development Strategy 2014-20. It started in Turkey in 1994, but expanded quite rapidly. It is also interesting to note that organic agriculture is practiced most in the eastern provinces of Turkey where rural development is mostly needed. At present, organic agriculture includes mainly animal production and organic bee keeping. The targets are to broaden the product range, the value added through processing of organic products, increase exports, as well as domestic consumption.

Traditional Turkish handicrafts have combined original and genuine values with the cultural heritage of the different civilizations in the region of Anatolia. They are very varied and include carpet-making, rug-making, sumac, cloth-weaving, writing, tile-making, ceramics and pottery, embroidery, leather manufacture, musical instrument-making, masonry, copper work, basket-making, saddle-making, felt-making, weaving, woodwork, cart-making.

Tourism has not yet catered for other potential emerging segments and new destinations of tourist market, such as eco-sports, nature observation, rural leisure, mountain climbing and trekking, to mention just a few alternatives of the industry. These alternative forms of tourism could provide additional sustainable incomes and employment for the rural population, raising the quality of life and integrating the rural areas into the wider economy, as desirable places to live and work. As a consequence, eco and agro tourism, would act as counter-incentive towards out-migration to urban centres.

Source: Akder, H.A. (2015), "Farm Structure of Turkish Agriculture, Structural Adjustment and Rural Development Policy", Consultant report prepared for the OECD.

Table 5.6. Aggregate IPARD-I investments in 2007-15

Measures		No. of supported projects	Total investment			Public grant co-financing, %
			TRY million	EUR million[1]	%	
Axis 1	Improving market efficiency and implementing Community Standards	2 685	5 560	1 841	80%	58%
	1.1. Investments in agricultural holdings:	2 238	4 228	1 400	61%	62%
	Milk production	1 130	2 620	867	38%	62%
	Meat production	1 108	1 608	532	23%	62%
	1.2. Investments in processing and marketing	447	1 332	441	19%	50%
	Milk and milk products	169	427	141	6%	50%
	Meat and meat products	114	444	147	6%	50%
	Fruits and vegetables	144	401	133	6%	50%
	Fisheries	20	59	20	1%	50%
Axis 2	Preparatory actions for agri-environmental measures	0	0	0	0%	0%
Axis 3	Development of the rural economy	8 023	1 354	448	20%	50%
	3.1. Diversification and development of rural economic activities	8 023	1 354	448	20%	50%
	Farm activity diversification and development	7 296	604	200	9%	50%
	Local products and micro enterprise development	332	308	102	4%	50%
	Rural tourism	372	425	141	6%	50%
	Aquaculture	23	17	5	0.2%	50%
Technical Support		21	1	0.49	0.02%	100%
Total		10 708	6 914	2 289	100%	56%

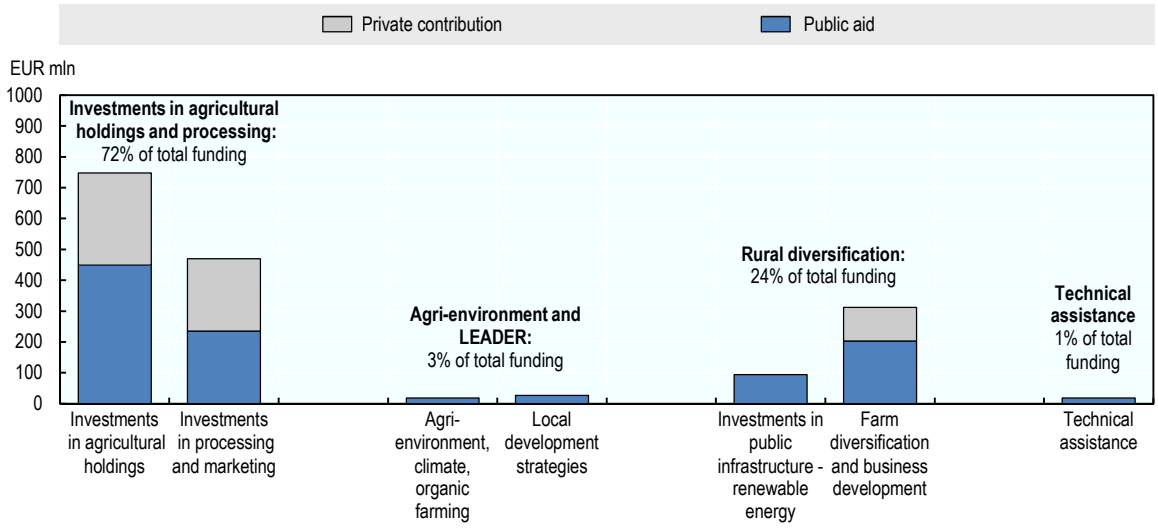
1. Converted at an annual average TRY/EUR exchange rate in 2015.
Source: MOFAL, direct communication.

IPARD-II began in February 2016, with the planned budget of EUR 1.688 billion for the entire programming period. Of this total, EUR 801 million are to be funded by the European Union and EUR 244 million by the government of Turkey as public aid, with the rest complemented by private contributions. Figure 5.4 depicts the distribution of IPARD-II budget across the individual measures. For the current phase, the previous focus on investments in agricultural holdings and processing is maintained. This is to concentrate 72% of total IPARD-II funding. Development of the rural economy will receive 24% of total resources as in the first phase, but it is foreseen to include a new measure on developing renewable energy supplies for rural settlements. A slight shift in the distribution of IPARD funding is also expected due to the start of projects on farm agri-environmental measures and local development (LEADER). However, only 3% of total IPARD-II is intended for these measures. With nearly the same distribution of spending between the key areas (investments in farms and processing – agri-environment – rural diversification), IPARD-II is expected to make a slightly higher level of total investment compared to IPARD-I.

A range of programmes exist under the responsibility of the Ministry of Development concern rural development. As highlighted previously, the South Eastern Anatolia Project (GAP), Konya Plain Regional Development Project (KOP), Eastern Anatolia Regional Development Project (DAP), and Eastern Black Sea Regional Development Project (DOKAP), all have rural development components. Project for Supporting the Infrastructure of Villages (KÖYDES) aims to eliminate continuing problems in the rural areas associated with drinking water and road construction and is implemented in 51 provinces.

The Small and Medium Enterprises Development Organisation (KOSGEB) supports the establishment of new enterprises and competitiveness improvement of the existing ones. Food processing industry is among the supported sectors. In 2015, KOSGEB provided TRY 37 million (USD 14 million) through its supports to SMEs engaged in food processing, wholesaling and retailing,[7] no information is available, however, on the share received by SMEs in rural areas.

Figure 5.4. IPARD-II financial plan: Aggregate allocations over the 2014-20 period



Source: MOFAL (2014), *Instrument for Pre-Accession Assistance Rural Development (2014 -2020)*, http://ipard.tarim.gov.tr/admin/app_upload/Turkey_IPARD_Programme.pdf.

StatLink http://dx.doi.org/10.1787/888933389927

Support to rural development is also provided as part of the poverty alleviation policy. The Ministry of Forestry and Water offers subsidised credits for the so called "forest-villages" which depend on traditional animal husbandry, low-productivity agriculture, and forestry work and where live around 10% of Turkey's population. The aim is to enable additional income generating activities in these villages where poverty is a serious problem. The Ministry of Family and Social Policies also offers microcredits for income-generating activities to individuals with low incomes (MOD, 2014).

Regional development projects with international assistance

IFAD and UNDP support rural development projects in several provinces of Turkey. These projects on smallholder and non-farm enterprise investments, village infrastructure investments, and capacity building for employment. The examples are the Diyarbakır – Batman – Siirt Development Project (2007-14), with a total budget of USD 37 million and Ardahan – Kars – Artvin Development Project (2010-15) with a total budget of USD 26 million. IFAD also finances the Sivas – Erzincan project which aims to increase agricultural productivity and income levels and expand rural employment opportunities in these two Turkish provinces.

Employment outcomes of rural development projects

IPARD-I projects are estimated to have created 30 000 jobs (EC, direct communication). An assessment of IPARD-I based on a sample of projects showed that 58 new enterprises and 875 new workplaces were created through these projects in addition to 87 previously existing businesses which employed 340 persons. This corresponds to an increase of an average employment per enterprise by 4.5 persons, or more than a doubling. For all IPARD-I projects, the increase in the average employment was estimated at 5.5 persons. These estimates, however, do not consider employment generated indirectly in activities such as purchasing and selling, transportation, and others. The largest increase in employment has been observed in red meat production and processing, followed by broiler production. The increase in labour demand for medicinal and aromatic plant growers concerned both own family labour and seasonal workers (ARDSI, 2015).

Another evaluation of employment effects of rural development projects was made for projects supported through MOFAL's Rural Development Investments Support Programme (RDISP). Its component 'economic investments' provided grants for development of processing and storage and irrigation infrastructure, and alternative energy and greenhouses. Between 2006 and 2010, these projects have created 29 978 workplaces in 3 070 enterprises, or 9.8 workplaces on average.

The employment generation and diversification impacts of rural development programmes are directly linked to agricultural productivity, as developed in Chapter 2. From the perspective of productivity, it would be important to evaluate these programmes not only in terms of additional employment created, but also in terms of how they change the balance between labour and capital in agriculture and thus the efficiency and productivity of the enterprises involved.

5.6. Level and composition of agricultural support from the perspective of innovation

Domestic agricultural and associated trade measures affect farm investments and practices through a variety of instruments, with different impacts on innovation and sustainability. Several dimensions of agricultural policies are important in this context: (i) the extent to which market-distorting instruments are used to support producers; (ii) the extent to which policies provide targeted support to innovation and producer actions towards the environmental sustainability; and (iii) the extent to which policies provide support to general services for the sector as opposed to support to individual producers.

Support to agricultural producers: Use of most distorting support

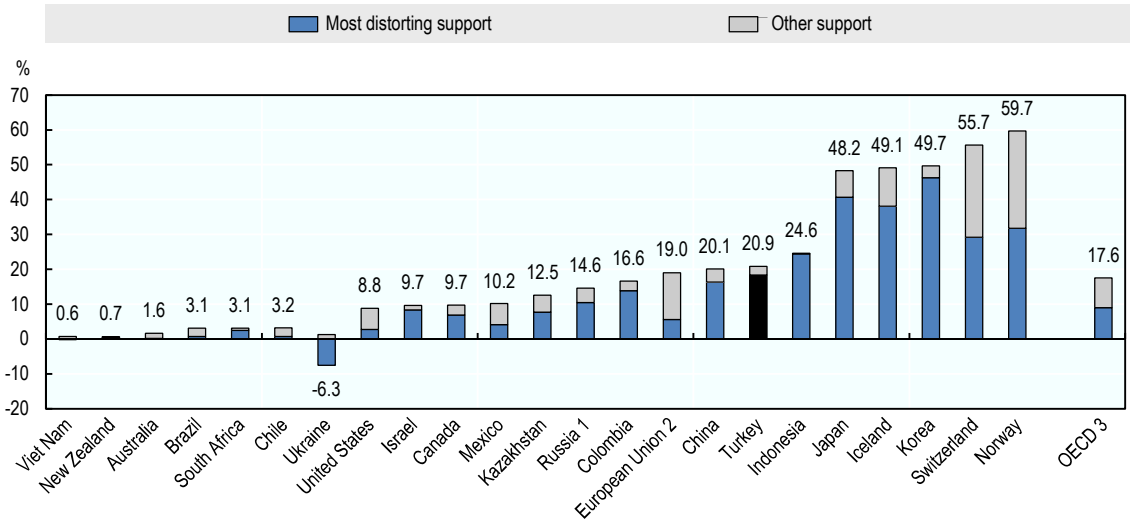
A key characteristic of agricultural policy from the perspective of innovation is the extent to which producer support relies on measures that distort agricultural output and input markets. OECD analysis

on production, trade and income effects of agricultural support has shown that border protection, supply controls, output-based payments and variable input subsidies are potentially the most distorting. As such, these policies strongly diminish producer incentives to employ production factors more efficiently and to innovate so as to become more competitive. Distorting policies dampen the incentives to innovate not only because they shield producers from competition, but also because they perform weakly in terms of transferring income to intended beneficiaries of support. It has been shown that most of the support provided through price interventions and variable input subsidies is captured in land rents, by input suppliers and is lost as deadweight (Martini, 2011). Distorting support measures are not likely to be advantageous also because they encourage riskier behaviour by producers, making them more exposed to market and natural risks (OECD, 2011b). On the other hand, broad-based income support decoupled from commodity production is more effective in transferring income to producers. It leaves more flexibility to producers to undertake new activities and switch to new products. If conditional on the adoption of environmentally-friendly practices, this support may help more sustainable resource use. Yet, even if decoupled from production choices, income support still slows structural adjustment that is needed to facilitate economies of scale, attract new entrants, and thus foster innovation and productivity growth.

Turkey's support to agricultural producers (as measured by the Producer Support Estimate, PSE) amounted to 21% of gross farm receipts in 2013-15. This implies that agricultural policies place the country in the middle range by the level of support among the monitored countries, but far above those with open agricultural sectors, such as New Zealand, Australia, South Africa, Chile, and Brazil (Figure 5.5).

Figure 5.5. Composition of Producer Support Estimate (PSE) by country, 2013-15 average

As a percentage of gross farm receipts



Notes:

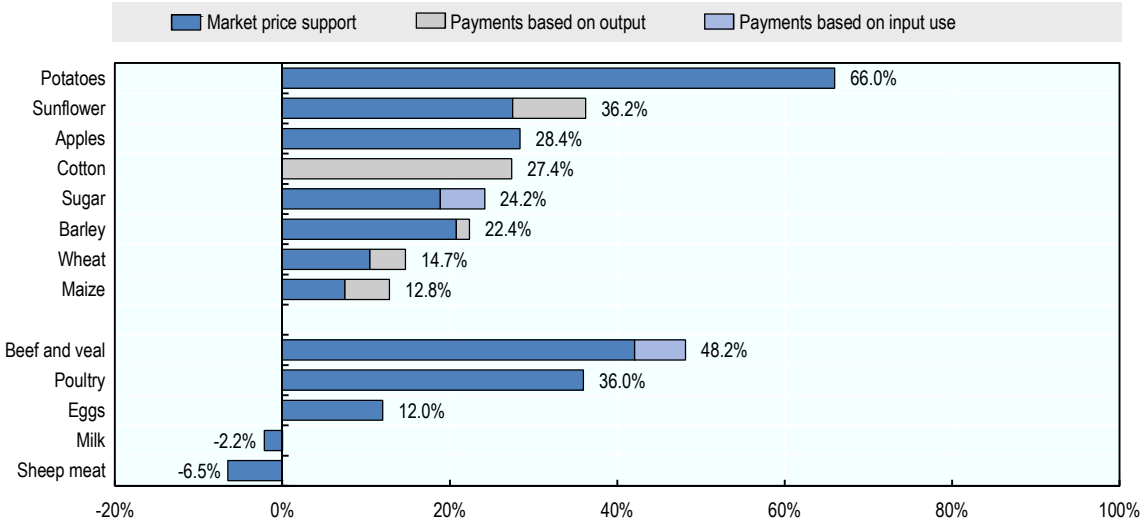
1. For Russia, 2013-15 is replaced by 2012-14.
2. EU27 for 2012-2013; and EU28 from 2014 when available.
3. The OECD total does not include the non-OECD EU member states.

Source: OECD (2016b), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics* (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

StatLink http://dx.doi.org/10.1787/888933389934

Figure 5.6. Support to specific commodities in Turkey: Single Commodity Transfers, 2012-15 average

In percentage of gross farm receipts for each commodity



Source: OECD (2016b), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics* (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

StatLink http://dx.doi.org/10.1787/888933389948

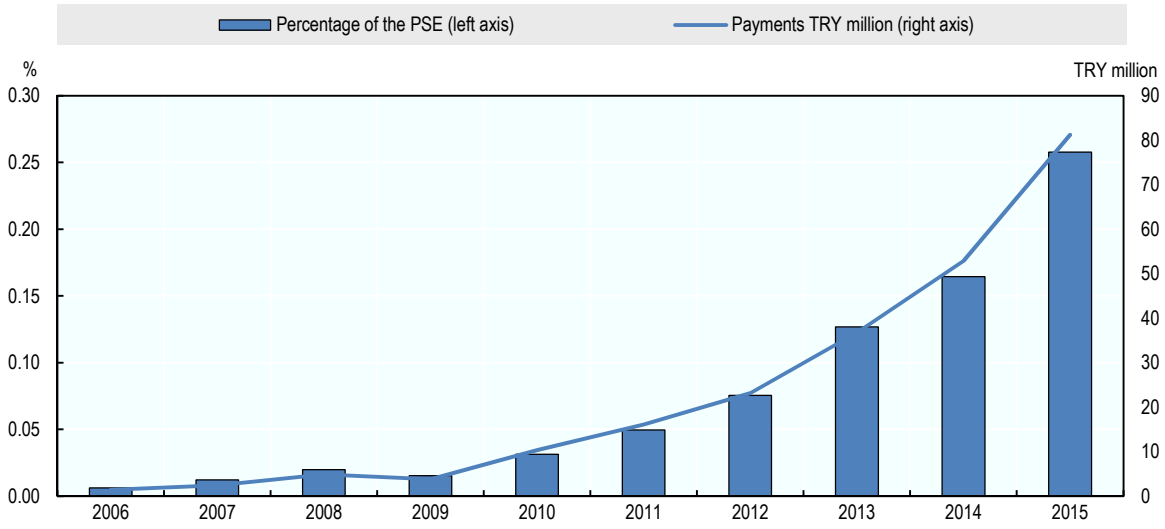
Producer support in Turkey (the PSE) is generated predominantly through the most distorting measures. These measures include market price support, payments based on output, and payments based on unconstrained use of inputs, which accounted for 88% of Turkish PSE in 2013-15. Commodity-specific transfers constitute 88% of Turkish PSE and cross-commodity distortions are substantial. The principal crop products receive high support, while beef receives the most supported among livestock products (Figure 5.6). For the majority of products, support is generated predominantly through border and domestic price interventions: as measured by the Nominal Protection Coefficient (NPC), domestic agricultural prices in Turkey are on aggregate 20% above those observed in world markets. Cotton faces no tariff protection, but cotton producers are supported through price premiums. The price premiums also complement tariff protection for cereals, sunflower, and beef.

Support to producers targeted at environmental sustainability

Turkey's payments targeted at specific environmental actions by producers have been steadily increasing since mid-2000s, as has the share of this spending in total support to producers (the PSE) (Figure 5.7). This support remains marginal in the total transfers to producers, reaching only 0.18% in 2013-15. However, this percentage is underestimated due to the lack of comprehensive data. For example, it does not include support generated through reduced-interest loans offered for the adoption of environmentally beneficial practices, or through investment grants for environmental improvements under the rural and regional development programmes. The extent to which the aggregate share of payments for environmentally-beneficial practices is underestimated is not known, but it is most likely minor.

Comparing the importance of agri-environmental payments in the overall support to producers at an international level, Turkey is among those countries where such support is practiced to a marginal extent only (Figure 5.8).

Figure 5.7. Support for environmentally friendly production practices in agriculture in Turkey, 2006-15

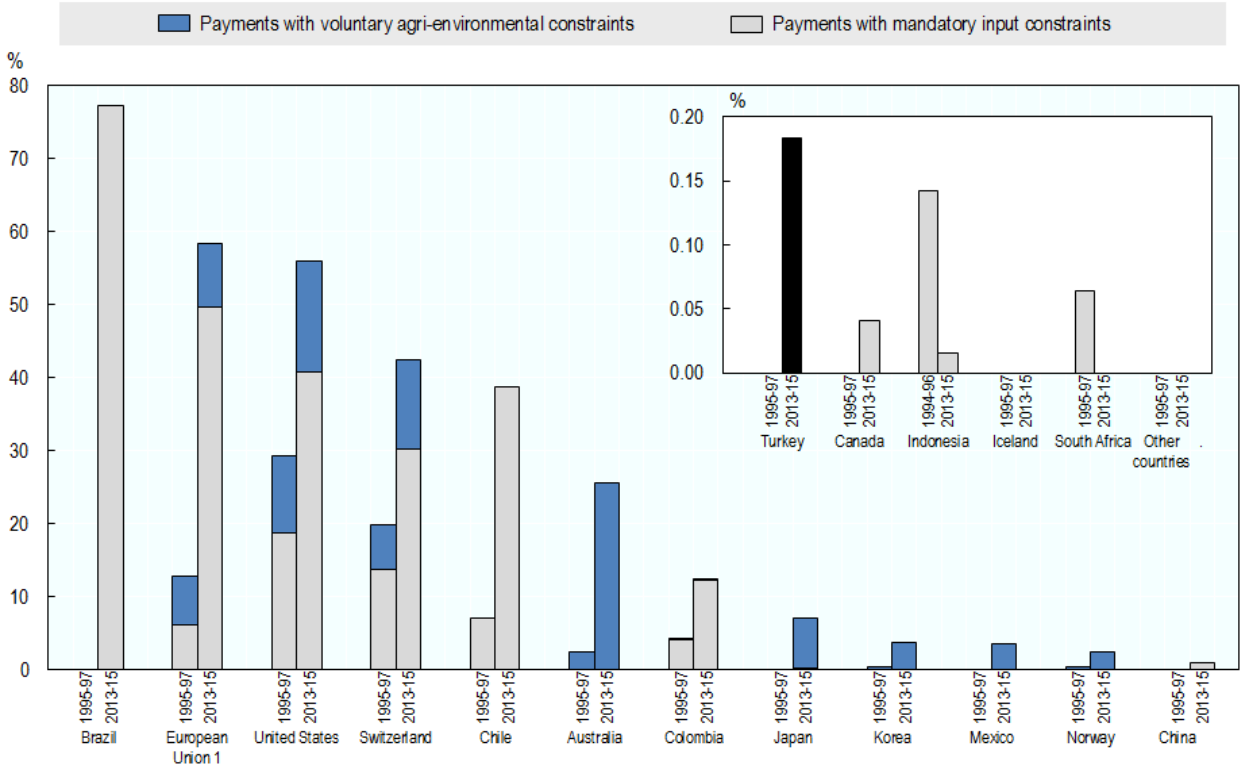


Source: OECD (2016b), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics* (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

StatLink http://dx.doi.org/10.1787/888933389957

Figure 5.8. Support for environmentally friendly production practices in agriculture: International comparison, 1995-97 and 2012-15

As a percentage of gross farm receipts



1. EU15 for 1995-97; EU27 for 2012-13 and EU28 from 2014 when available. 2. For Mexico, 1995-97 is replaced by 1991-93.
Source: OECD (2016b), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics* (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

StatLink http://dx.doi.org/10.1787/888933389966

Total support to the agricultural sector: Focus on innovation and productivity enhancement

Another key feature of agricultural policy from the perspective of innovation is the extent to which it is oriented towards supporting long-term productivity improvements. Such policy orientation can be revealed by the importance in the overall support of investments in development of knowledge systems, infrastructure and systems for livestock and plant health and food safety (inspection and control systems). These investments differ from assistance to individual producers (as measured by the PSE) in that they support functions with broadly spread benefits that are essential for the efficient operation of the entire agro-food system.

Total support to agriculture in Turkey (as measured by the Total Support Estimate, TSE) is dominated by transfers to individual producers. These transfers accounted for 82% of total support to agriculture in Turkey in 20132-15 as measured by the Producer Support Estimate (PSE) (Figure 5.9). Financing of general services to agriculture (the General Services Support Estimate, GSSE) constituted only 18% of total support to the agricultural sector during that same period.

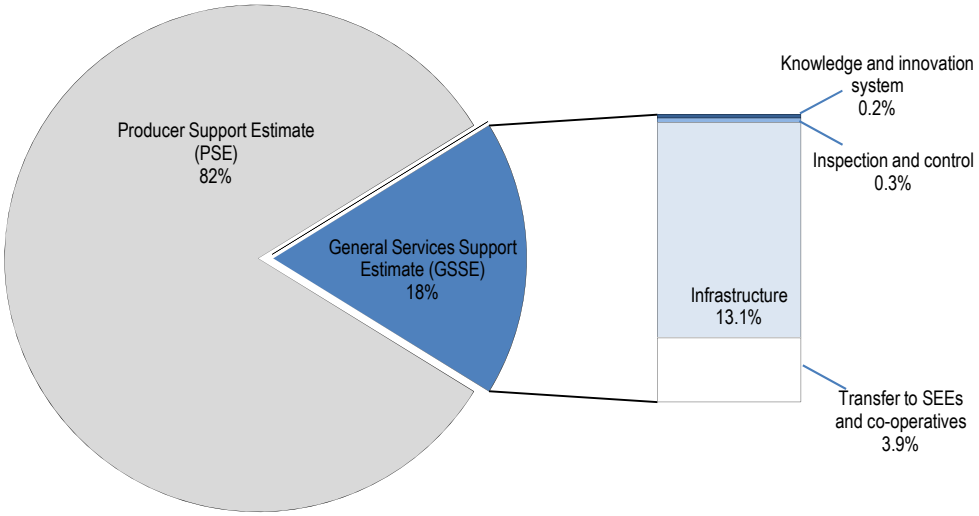
The GSSE indicator includes the financing of knowledge-related activities, such as agricultural research and education, as well as investments in infrastructure, inspection and control systems, activities on promotion and marketing of agricultural products, and the costs of maintenance of public stockholding systems. Within this broad range, activities supporting knowledge systems, infrastructure development and inspection and control systems contribute directly to foster innovation and productivity in the agricultural sector. These activities account for 78% of overall support to general services in Turkey, of which the infrastructure spending accounts for the overwhelming part, while the share of resources directed to knowledge system and inspection and control system is very small and far below the share of transfers to State Economic Enterprises and agricultural cooperatives (Figure 5.9).

Over the longer term, the share of support directed to general services in the overall agricultural support did not experience significant change (Figure 5.10) Although the reforms of the 2000s in Turkey have significantly reduced the transfers to SEEs and agricultural cooperatives and the share of infrastructure spending has somewhat increased due to the expansion of land consolidation, total support to the agricultural sector continues to be predominantly based on subsidising producers, with expenditures for innovation and productivity-enhancing services retaining a very small weight in total support.

The dominance of support to individual producers over support to general services in Turkey is, nevertheless, similar to the situation in the majority of countries covered by OECD agricultural policy monitoring. With the exception of a few countries, such as New Zealand and Australia where the low shares of producer support in total support reflect explicit policy orientation towards the provision of public goods, this share reaches from over 60% to over 90% in other countries (Figure 5.11A). The degree to which countries prioritise innovation and productivity-enhancing areas in their support to general services varies widely. Form this standpoint, Turkey is among those monitored countries where this share is around 80% but, as highlighted, these transfers are strongly concentrated on infrastructure area with a small emphasis on other productivity-enhancing services (Figure 5.11B).

Figure 5.9. Composition of Total Support Estimate (TSE) in Turkey, 2012-15 average

As a percentage of gross farm receipts

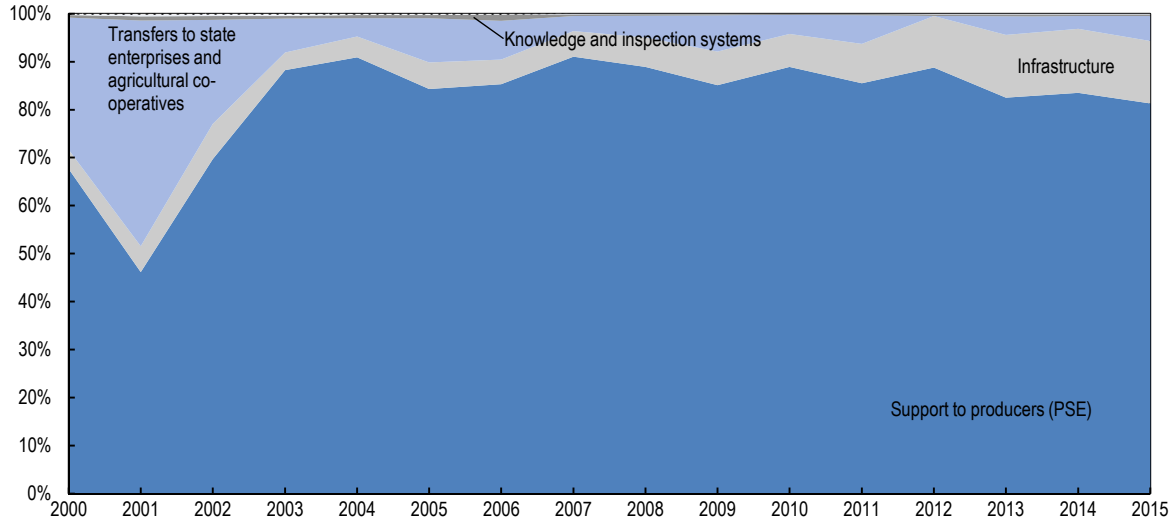


Source: OECD (2016b), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics* (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

StatLink http://dx.doi.org/10.1787/888933389979

Figure 5.10. Evolution of Total Support Estimate (TSE) in Turkey, 2000-15

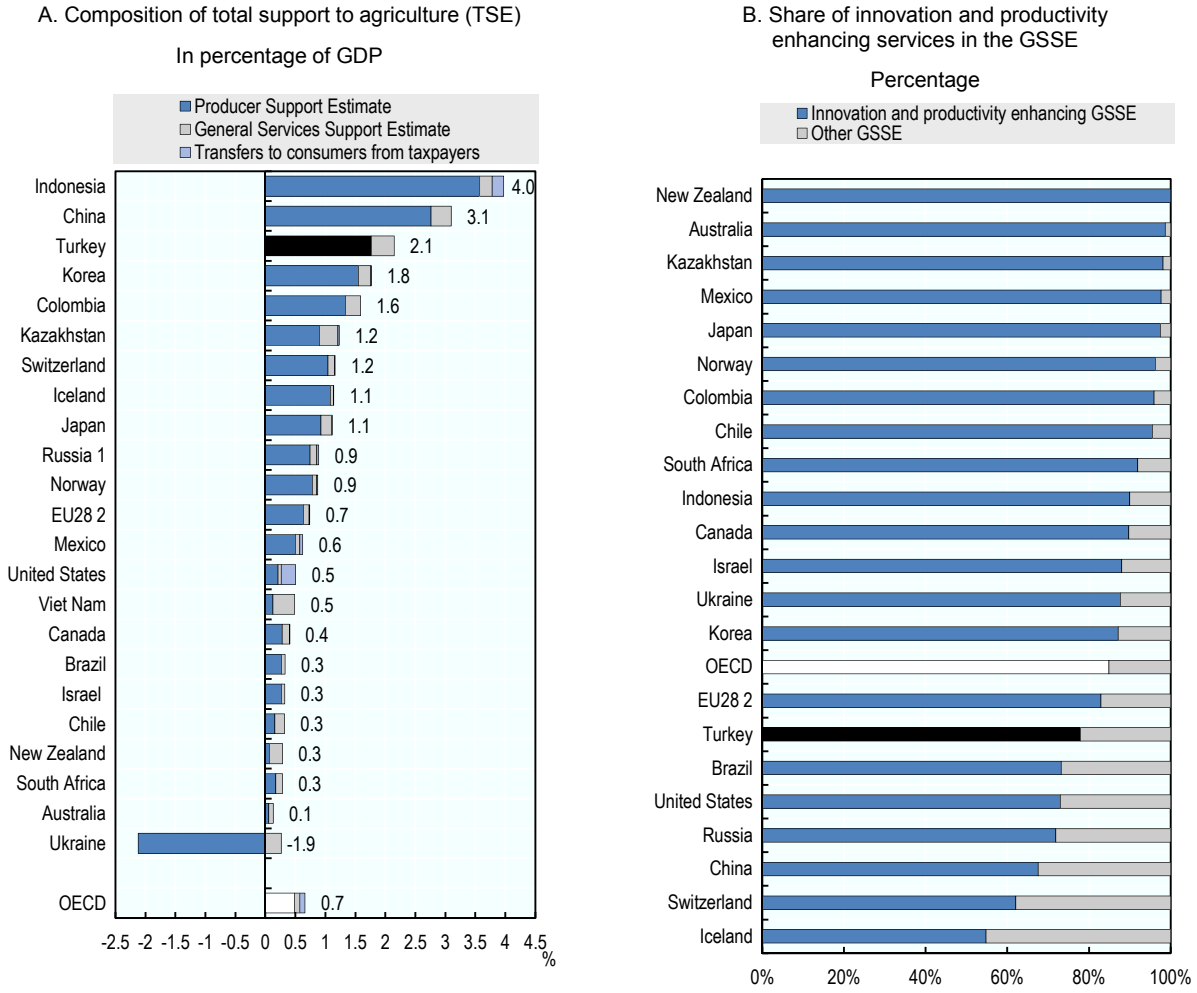
Percentage



Source: OECD (2016b), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics* (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

StatLink http://dx.doi.org/10.1787/888933389987

Figure 5.11. Total support to agriculture (TSE) and general services (GSSE), international comparison, 2013-15 average



Note: Innovation and productivity enhancing GSSE includes financing of knowledge and innovation systems, infrastructure and inspection and control systems. Other general services include financing of "duty loss" and equity injections to State Economic Enterprises.

Source: OECD (2016b), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics* (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

StatLink http://dx.doi.org/10.1787/888933389996

Summary

- Turkey's agricultural policy is focussed on increasing agricultural output to attain higher supplies for domestic and external markets. Associated with this broad policy orientation are objectives of the enhancement of phyto-sanitary and veterinary and food safety systems and development of higher value added agro-food segments.
- The OECD indicators of agricultural support show that to attain the stated objectives, the government largely relies on altering the prices farmers face on output and input markets. This is evidenced by the high prevalence of transfers to individual producers in the total support to

agriculture (82%) and that 88% of these transfers originate from protection at the border, price premiums, and variable input subsidies.

- Such a support structure may have short-term effects on production levels of targeted commodities. However, it creates considerable distortions of market conditions in which the sector operates and is unlikely to increase producer incentives to employ production factors more efficiently. In the longer term, this results in a less productive agricultural sector.
- Policy transfers for general services to the agricultural sector constitute a relatively small share of total support to agriculture (18%) and are strongly concentrated on infrastructure, with major effort on land consolidation. Other productivity-enhancing areas, such as knowledge and inspection and control systems, constitute a small share of support to general services. Compared to these areas, transfers to State Economic Enterprises and agricultural cooperatives to cover their operational deficits and to replenish their capital, attract by far larger share of public resources.
- Some environmental concerns in agriculture are long-standing, e.g. soil erosion, and enhancing environmental sustainability has progressively been integrated into agricultural policy with the introduction of specific support measures to producers to facilitate the adoption of environmentally friendly practices.
- The objectives related to the environmental sustainability of agriculture derive from broad national environmental objectives. Among these, the efficient use and preservation of water and land are particularly relevant for agriculture. There is room for further development of water pricing to stimulate more efficient water use in agriculture. Policies on adaptation and mitigation of climate change have been gradually developed in recent years.
- The amount of agricultural policy transfers towards environmental sustainability actions by farmers have increased significantly in absolute terms. This reflects the introduction of payments for soil conservation, concessional loans for adoption of good agricultural practices, and organic farming. However, today this support constitutes only a marginal share of total support to producers.
- Along with environmental sustainability, rural development is becoming a more prominent policy focus of Turkish policy. Specific regional and rural development programmes have been introduced to increase investments in rural economy.
- A stronger focus on rural development has also been driven by the EU *acquis* which foresees alignment of Turkey's rural development policy with that of the European Union's. Investments under the EU Instrument for Pre-Accession Assistance Rural Development (IPARD) are concentrated on agricultural production and processing, with the largest part of this investment directed to the milk and meat sectors. A smaller share of funding is allocated to the diversification of rural activities and to technical assistance to potential private co-investors to help them take up the IPARD's investment aid. With minor changes related to the launch of the environmental component, the IPARD is to maintain these orientations up to 2020.
- Despite the emergence of policy objectives and underlying measures which extend beyond the objective of increased production, the structure of support has remained largely unchanged since the early 2000s. Public resources oriented at long-term productivity improvements, environmental sustainability and rural diversification yet attract a small share of government spending.

Notes

1. Drip irrigation methods are considered to be the most efficient ones (90% or higher water use efficiency–WUE), followed by sprinkler systems (75-80% WUE), and surface irrigation (60% WUE).
2. Other irrigated area is served by small schemes managed by farmers. Groundwater irrigation is under the management of farmer irrigation cooperatives, with their largest number being in the Central Anatolia and the largest-size cooperatives operating in the Aegean region.
3. In the case of the Kalecik, Akinci, Asartepe, Gokceoren, Koprukoy right bank and left bank, Bolu, Kizilirmak and Kumbaba irrigation associations.
4. Analysing the evolution of water charges to the Water User Associations between 2001 and 2006, Çakmak (2010) reports that the pumping irrigation charge per hectare is two and half times higher than the gravity irrigation charge. These charges are differentiated per crop and by region. For the gravity irrigation, charges are the highest for the Marmara region on average for all crops, namely USD 147 per hectare. In terms of the type of crop, water charge for greenhouses is the highest, with USD 172 per hectare for the whole of Turkey. The gravity charges vary considerably between the regions reflecting the differences in crop patterns and in the timing of development of the irrigation scheme, with recently developed schemes applying lower charges.
5. A volumetric pricing, nevertheless, is difficult to apply as the majority of the existing irrigation systems are open canals.
6. DSI (2014) splits the Euphrates-Tigris Basin (Dicle-Firat in Turkish) into two distinct basins: Euphrates Basin and Tigris Basin. In this case, the number of total hydraulic basins comes to 26.
7. This sum does not include KOSGEB's support schemes for which the sectoral allocation of the assistance is not reported.

References

Akder, H.A. (2015), 'Farm Structure of Turkish Agriculture, Structural Adjustment and Rural Development Policy', Consultant report prepared for the OECD.

Akder, A.H. (2010), "How to Dilute and Agricultural Policy Reform: Direct Income Subsidy Experience in Turkey (2001-2008)" in Karapinar, B., F. Adaman and G. Ozertan (eds.), *Rethinking Structural Reform in Turkish Agriculture: Beyond the World bank's Strategy*, Nova Science Publishers, New York, 2010.

Akder, A. H. (2009), "New Approaches to Rural Development and the FAO Experience", paper presented at the Conference on Comparative Rural Development Perspectives: Current Policy Framework in Turkey, 20 February 2009, Ankara.

Antón, J. and S. Kimura (2011), "Risk Management in Agriculture in Spain", *OECD Food, Agriculture and Fisheries Papers*, No.43, OECD Publishing, Paris, http://dx.doi.org/10.1787/5kgj0d57w0wd-en.

ARDSI (2015), *Agriculture and Rural Development Support Institution's Projects, Study of Impact Assessment,* Ankara, Agriculture and Rural Development Support Institution www.tkdk.gov.tr.

Ataseven, Y. and J. Sumelius (2014), "The evaluation of agri-environmental policies in Turkey and the European Union", *Fresenius Environmental Bulletin*, Vol. 23 No. 8 A, pp. 2045–2053.

Bora, B. (2010), "Subsidised Agricultural Insurance in Turkey (TARSIM)", www.mapfre.com/mapfrere/docs/html/revistas/trebol/n54/docs/Articulo2en.pdf

Çakmak, E. H. (2010), "Agricultural Water Pricing: Turkey", in OECD *Sustainable Management of* Water *Resources in Agriculture*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264083578-14-en.

Çetin, T. (1999), Cumhuriyet Döneminde Köycülük politikaları:Köye Doğru Hareketi [Peasantry Policy, to the Village Movement during the Republic], içinde: *75 Yılda köylerden Şehirlere* , Tarih Vakfı, İstanbul.

Deloitte (2016), *VAT in Turkey*, Corporate Series, May 2016. www.verginet.net/UserFiles/File/pusula_serisi/VAT.pdf

DSI (2014), *2013 Statistical Bulletin of the General Directorate of State Hydraulic Works*, The Ministry of Forestry and Hydraulic Works of the Republic of Turkey, General Directorate of State Hydraulic Works, Ankara (in Turkish).

DSI (2012), *Water and DSI* 1954-2012, Republic of Turkey, General Directorate of State Hydraulic Works, Ministry of Environment and Forestry, Ankara, www2.dsi.gov.tr/english/pdf_files/dsi_in_brief2009.pdf

Fayrap, A. (2015), "The experiments of modern irrigation techniques and methods in Turkey agricultural groundwater management in Turkey", 2015 Conference of the International Commission on Irrigation an Drainage (ICID)-6th IEC and 26th ERC meetings, Montpellier, France.

Government of Turkey (2015), "OECD Food and Agricultural Review: Innovation for Agricultural Productivity and Sustainability in Turkey: Questionnaire", Responses to the OECD received from the Turkish Government.

Jorgerden, J. (2004), *Rural Constitution of Turkish Popular Identity, Peasants, Modernization, and the Nation in the Work of Nusret Kemal Köymen*, paper presented at the conference, Nationalism, Society and Culture in post-Ottoman South East Europe, St Peter's College, Oxford, 29 May 2004.

Karaca, A., A. Gültek, A. İntişah, B. Engürülü and A. Karioğlu (2010), "Ímplementation of Agricultural Insurance in Turkey", paper presented to the 7th Technical Congress of Agriculture Engineers, 11-15 January, Ankara.

Kukul, Y.S., S. Akçay, S. Anaç and E. Yeşilirmak, E. (2008), "Temporal irrigation performance assessment in Turkey: Menemen case study", *Agricultural Water Management*, Vol. 95 No. 9, pp. 1090–1098.

Larson, D. F., W. Martin, S. Sahin and M. Tsigas (2014), *Agricultural Policies and Trade Paths in Turkey*, Policy Research Working Paper 7059, World Bank, October 2014, Washington D.C.

Mahul, O. and J. C. Stutley (2010), "Government Support to Agricultural Insurance: Challenges and Options for Developing Countries", World Bank.

MARA (2007), *Instrument for Pre-Accession Assistance, Rural Development (IPARD) Programme (2007-2013)*, Republic of Turkey, Ministry of Agriculture and Rural Affairs, Ankara, www.tkdk.gov.tr/Ipard/IpardProgrami.

Martini, R. (2011), "Long Term Trends in Agricultural Policy Impacts", *OECD Food, Agriculture and Fisheries Papers*, No.45, OECD Publishing, Paris. http://dx.doi.org/10.1787/5kgdp5zw179q-en.

MOD (2014), *The Tenth Development Plan 2014-2018*, Republic of Turkey, Ministry of Development, Ankara. www.mod.gov.tr/Lists/RecentPublications/Attachments/75/The%20Tenth%20Development%20Plan%20(2014-2018).pdf.

MOEU (2011), *National Climate Action Plan (2011-2023)*, Republic of Turkey, Ministry of Environment and Urbanisation, Ankara.

MOFAL (2015a), Arazi Toplulaştırma ve Tarla İçi Geliştirme Geliştirme Hizmetleri Daire Bakanlığı Faaliyet Yayını (Avtivity Publication), Tarim Reformu Genel Müdürlüğü (General Directorate of Land Reform), Republic of Turkey, Ministry of Food, Agriculture and Livestock, Ankara.

MOFAL (2015b), *Strategic Plan for 2013-2017*, Republic of Turkey, Ministry of Food, Agriculture and Livestock, Ankara. www.tarim.gov.tr/SGB/Belgeler/Stratejik%20Plan%202013-17-EN.pdf

MOFAL (2014), *Instrument for Pre-Accession Assistance Rural Development (2014 -2020)*, Republic of Turkey, Ministry of Food, Agriculture and Livestock, Ankara. http://ipard.tarim.gov.tr/admin/app_upload/Turkey_IPARD_Programme.pdf.

MOFWA (2012), *Action Plan of Combating Erosion: 2013-2017*, Republic of Turkey, Ministry of Forestry and Water Affairs, Ankara.

OECD (2016a), *Agricultural Policy Monitoring and Evaluation 2016*, OECD Publishing, Paris. http://dx.doi.org/10.1787/agr_pol-2016-en.

OECD (2016b), "Producer and Consumer Support Estimates", *OECD Agriculture Statistics* (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

OECD (2011a), *Evaluation of Agricultural Policy Reforms in Turkey*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264113220-en.

OECD (2011b), *Managing Risk in Agriculture: Policy Assessment and Design*, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264116146-en.

Official Gazette of the Turkish Government (2015), Notification on subsidies to the purchase of individual irrigation machinery and equipment, under the Support program of rural development investments, Ankara, Turkey, available at: www.resmigazete.gov.tr/default.aspx.

Official Gazette of the Turkish Government (2014), Ankara, Turkey, www.resmigazete.gov.tr/default.aspx.

Özerol, G. and Bressers (2015), "Scalar Alignment and Sustainable Water Governance: The Case of Iirrigated Agriculture in Turkey", *Environmental Science & Policy*, Vol. 45, pp. 1–10.

Sener, M. (2012), "Assessment of Irrigation Management Transfer: A Case Study of Meric-Ergene Basin in Turkey", *Journal of Food, Agriculture and Environment*, Vol. 10 No. 2, pp. 1060–1064.

TARSİM (2014), *TARSİM Agricultural Insurance Pool: Annual Report 2014*.

UNCTAD (2014), Trade Analysis Information System (TRAINS) and World Tariff Profiles, United Nations Conference on Trade and Development (UNCTAD).

WTO (2016a), *Statistics Database: Tariff profiles*, http://stat.wto.org/Home/WSDBHome.aspx?Language=E.

WTO (2016b), *Trade Policy Review: Turkey. Report by the Secretariat*, 9 February 2016, WT/TPR/S/331, Geneva.

WTO (2012), *Trade Policy Review: Turkey. Report by the Secretariat,* Revision, 7 February 2012, WT/TPR/S/259/Rev.1, Geneva.

Annex 5.A1

New agricultural land inheritance provisions in Turkey

The amended legislation offers the following options for the inheritance of farmland which have to be completed within a year:

- transfer of the entire land to several or one heir as long as the shares of each heir is not below the minimum size requirement
- registration of the plots as a family partnership by a notarial deed
- establishment of a limited liability company for the management of land, each heir holding a share in the company proportional to the share in the inherited land
- transfer of the entire property to a third party and sharing the proceeds from the sale.

If the heirs cannot decide on one of the above options within a year and do not apply to court for settling the dispute, the Ministry of Food, Agriculture and Livestock (MOFAL) take the case to court itself. The court will then take control of the property. The court may determine the qualified heir and transfer the land to that heir at its "agricultural revenue value". If there is more than one qualified farmer, the land will be transferred to the one who is dependent for his living primarily on this land. If this is cannot be established, the court may transfer the land to the heir who offers the highest bid. If there are several qualified heirs and if they own already some land, the court may decide for a transfer such that those owning land under minimum size requirement will be upgraded to the required size. The courts may sell the land if no heir asks for the transfer of that land and provide each inheritor with an equal share of the proceeds.

The law defines "agricultural revenue value" of land as twenty times the average revenue earned from agricultural land in that locality.

The criteria for choosing the qualified (farmer) heir is based on the assigning points each heir according certain characteristics which include professional aspects, social security status, capital equipment, length of registration in MOFAL's farm registry, gender, and others:

- dependent on the inherited land for living: 20 points
- have no other income as agricultural income: 10 points
- have qualification, skills, and knowledge to cultivate this land: 10 points
- resident in the locality (district) where the inherited land is situated for less than six years: 5 points
- resident in the locality (district) where the inherited land is situated for more than six years years: 10 points
- have no social insurance: 10 points
- have agricultural social security insurance: 5 points
- registered in MOFAL's (farmer) registration systems for less than six years: 5 points
- registered in MOFAL's (farmer) registration systems to receive for more than six years: 10 points
- members of agricultural organisations for less than six years: 2 points
- members of agricultural organisations for more than six years: 5 points
- owning agricultural machinery and equipment: 5 points.
- female heir: 5 points.

Annex 5.A2

Strategic objectives and measures for rural development in 2014-2020 in Turkey

Objective-1: Development of rural economy and increase in employment opportunities		
Priority 1.1 Development of competitiveness in agriculture and rural economy		
Measure	1.1.1	Development of producer organization's capacity
Measure	1.1.2	Processing and marketing of food and agricultural products
Measure	1.1.3	Improvement of education and advisory systems for the producer
Measure	1.1.4	Modernization of food and agricultural firms
Measure	1.1.5	Increase in food safety
Priority 1.2 Diversification of rural economy		
Measure	1.2.1	Development of rural tourism
Measure	1.2.2	Achieving value added increase in agricultural and non-agricultural local products
Measure	1.2.3	Modernization of commercial business in non-agricultural sector
Measure	1.2.4	Encouragement of entrepreneurship in micro business
Measure	1.2.5	Development of fishery products
Objective-2: Improvement of rural environment and sustaining natural resources		
Priority 2.1 Sustainability of soil and water resources		
Measure	2.1.1	Extension of environment friendly agricultural practices
Measure	2.1.2	Development of organic agriculture
Measure	2.1.3	Prevention of pollution caused by agricultural activities
Measure	2.1.4	Improvement of meadows
Priority 2.2 Achieving efficiency increases in agricultural land use		
Measure	2.2.1	Improvement of irrigation infrastructure
Measure	2.2.2	Extending land consolidation
Priority 2.3 Achieving the sustainability of forestry resources		
Measure	2.3.1	Development of income generating activities for forest products
Measure	2.3.2	Extension of forest rehabilitation and forestation
Measure	2.3.3	Development of income generating activities in protected areas
Objective-3: Improvement of social and physical infrastructure of rural settlements		
Priority 3.1 Development of physical infrastructure		
Measure	3.1.1	Improvement of transportation network
Measure	3.1.2	Improvement of potable water infrastructure
Measure	3.1.3	Improvement of waste management
Measure	3.1.4	ICT technology use will be extended
Measure	3.1.5	Extension of renewable energy resources
Measure	3.1.6	Encouragement of local (traditional) architecture in construction
Measure	3.1.7	Establishment of secure settlements against natural famines
Priority 3.2 Development of social infrastructure		
Measure	3.2.1	Development of infrastructure for the conservation of the local heritage
Measure	3.2.2	Development of the infrastructure for sports and art
Measure	3.2.3	Not in use public buildings should be rearranged for development activities

Objective-4: Development of social capital and reduction of poverty of the rural society		
Priority 4.1 Development of social capital		
Measure	4.1.1	Facilitation of access to formal and informal education
Measure	4.1.2	Facilitation of access to preventive health care services
Priority 4.2 Strengthening the fight against poverty		
Measure	4.2.1	Activate services to the wandering seasonal workers
Measure	4.2.2	Activate social services and aid
Measure	4.2.3	Strengthening the social inclusion of disadvantaged people
Objective-5: Development of institutional capacity for local development		
Priority 5.1 Improvement of public service capacity		
Measure	5.1.1	Improvement of small town and village administration service capacity
Measure	5.1.2	Improvement of the service capacity of district municipalities
Measure	5.1.3	Development of innovative models for public service offers
Priority 5.2 Strengthening local development initiatives		
Measure	5.2.1	Public and non-public stakeholder cooperation for local development strategy development and application
Measure	5.2.2	Improvement of the technical capacity of civil initiatives
Measure	5.2.3	Formation of a national rural development cooperation network

Chapter 6

AGRICULTURAL INNOVATION SYSTEM IN TURKEY

This chapter examines how the Turkish agricultural innovation system functions. It looks at the role of the different actors, the governance mechanisms to define priorities and evaluate performance, trends in agricultural R&D expenditure and sources of funding, and how intellectual property protection fosters knowledge markets. It also outlines the institutional arrangements to facilitate knowledge transfer and outlines the efforts undertaken to strengthen international R&D co-operation. Finally, this chapter provides evidence on the performance of the agricultural innovation system, including R&D outputs.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

6.1. General innovation profile

Agro-food innovation is increasingly dependent on general innovation through developments in ICT, biotechnology and nanotechnology, and other fields with broad-ranging application. A well-performing innovation profile ensures that knowledge is available in other fields necessary to innovate in agro-food areas, and that economic actors and society share a culture of innovation (OECD, 2014a).

Turkey has made important efforts since the early 2000s to invest in R&D and develop its STI capacities. Gross Domestic Expenditure on R&D (GERD) rose from 0.51% of GDP in 2000-03 to 0.96% in 2012-14, with a 3% target set for 2023. The number of full-time researchers almost tripled (OECD, 2015; TÜBİTAK, 2013b) Private business participation in R&D has also increased, both in terms of financing and performing R&D. Turkey's current STI framework, the National Science, Technology and Innovation Strategy for 2011-16 and the underlying action plans have contributed to this progress. Various national STI institutions implement a range of financial support programmes and tax incentives are provided to businesses which engage in R&D. These instruments aim to increase the number of researchers, their performance and international mobility; to promote entrepreneurial and innovative activities in universities and university-industry co-operation; to increase private R&D investments; and to develop, promote and market technological products.

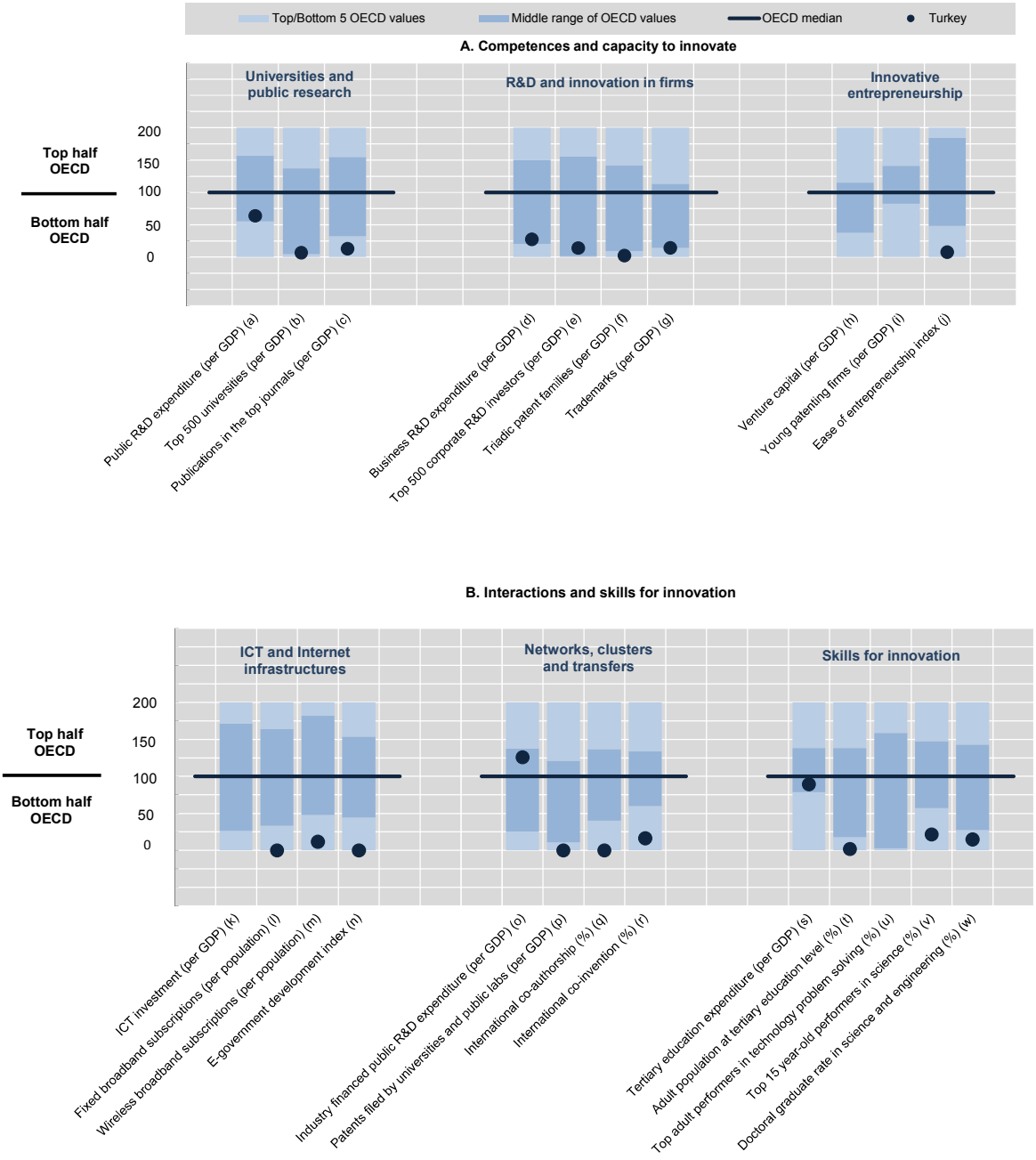
STI development in Turkey, however, started from a low base and considerable progress is needed if the country is to catch up to other OECD countries. Despite the increase in financial and human resources and the rapid increase in R&D outputs, public and private R&D systems are small and produce few outputs in view of the size of the Turkish economy (Figure 6.1.A). STI is constrained by insufficient ICT and internet infrastructures, limited scientific networks and international cooperation, as well as a low human resource base (Figure 6.1.B).

Turkey's STI strategy has emphasised increases in the number of researchers and R&D funding and less the quality of education and research, skills development and academic excellence. The Innovation Union Progress Report by the European Commission highlighted that improvements in these areas were not as dynamic in Turkey as in most European countries (EC, 2014a). Of the 33 countries covered in this report, Turkey was ranked amongst the lowest performers in excellence in science and technology, innovation outputs, and knowledge intensity of the economy.

The Turkish government recognises "quality" and "impact" weaknesses of STI performance and has identified these as cross-cutting issues for improvement in the National STI Strategy for 2011-16; some previous STI support programmes have been revised and new ones introduced to address these issues, as discussed in the following sections.

Figure 6.1. Comparative performance of Turkey's science and innovation system, 2014

Normalised index of performance relative to the median values in the OECD area (Index median = 100)

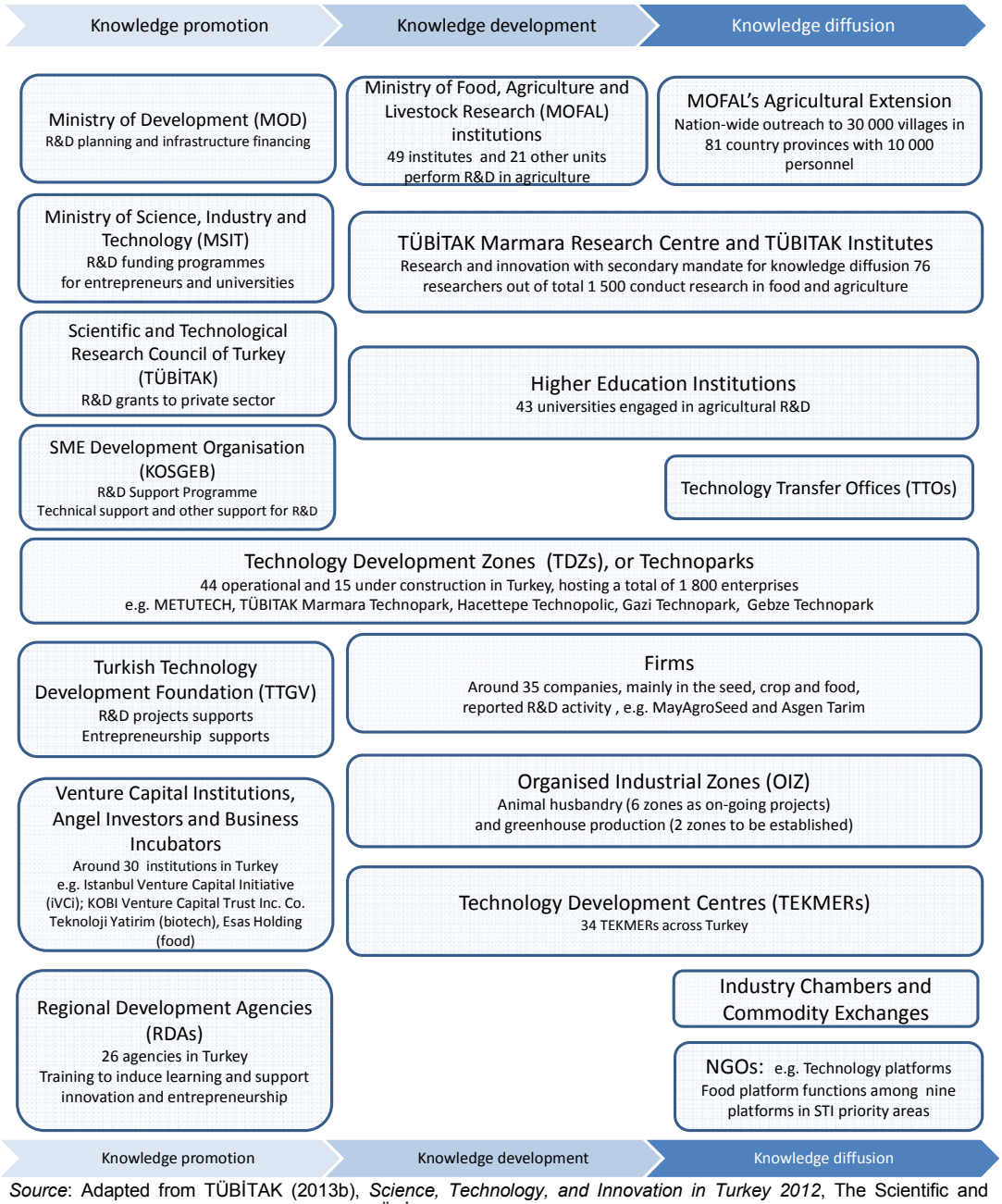


Source: OECD (2014b), *OECD Science, Technology and Industry Outlook 2014*, http://dx.doi.org/10.1787/sti_outlook-2014-en.

6.2. Key actors of the agricultural innovation system: An overview

The Turkish agricultural innovation system (AIS) functions as part of the overall national STI system. The AIS includes a broad range of actors, differing by their origin in private or public sectors, roles in the system, and organisational forms which range from rigid and often formal structures to more flexible and less formal groups and networks. Figure 6.2 shows the key AIS actors in Turkey across the continuum of knowledge promotion, development and dissemination, with no attempt, however, to depict the complex linkages and interactions between these actors.

Figure 6.2. Key actors of the Turkish AIS and their roles



Source: Adapted from TÜBİTAK (2013b), *Science, Technology, and Innovation in Turkey 2012*, The Scientific and Technological Research Council of Turkey (TÜBİTAK), Ankara.

Various types of institutions act as *promoters of knowledge-driven development* in Turkey. They perform functions spanning from advice, networking, organisation of learning and training for R&D, to R&D funding. These institutions serve all sectors of the national economy and are tied to the Turkish AIS. Government agencies have a prominent role as promoters of R&D and innovation. They include the Ministry of Development (MOD), Ministry of Science, Industry and Technology (MOSIT) and the Scientific and Technological Research Council of Turkey (TÜBİTAK). The SME Development Organisation (KOSGEB), a public agency affiliated with MOSIT, promotes innovative entrepreneurship. The Turkish Technology Development Foundation (TTGV) is a public-private non-profit institution combining international (World Bank), public and own funds to support research and innovation. Venture capital institutions, angel investors and business incubators also operate in Turkey. Regional development agencies (RDA) function across 26 Turkish regions, typically as joint undertakings of provincial and municipal authorities, local businesses and their organisations. The primary role of RDAs is to mobilise funding for regional and local development projects and, as such, they can create subsidiaries operating as business angels for small local companies that promote technology transfers.

More than 120 public and private sector institutions *conduct agricultural research*. They operate within the public system of the Ministry of Food, Agriculture, and Livestock (MOFAL) and TÜBİTAK, and as part of the universities and private companies (Box 6.1).

R&D institutes and universities are the principal *knowledge diffusers*. Turkish universities establish Technology Transfer Offices (TTOs), some as part of the university-based Technoparks (TDZs) (Chapter 3). Other knowledge diffusers are Technology Development Centres (TEKMERs) established as partnerships with technical universities to support technology-based start-ups. Thirty four TEKMERs function throughout the country. The KOSGEB and, in some cases, industry chambers provide finance and staff for the establishment and operation of TEKMERs, while universities provide the infrastructure. TÜBİTAK's R&D institutions are involved in knowledge diffusion, and MOFAL's research institutes closely interact with public agricultural extension services for the dissemination of agricultural knowledge.

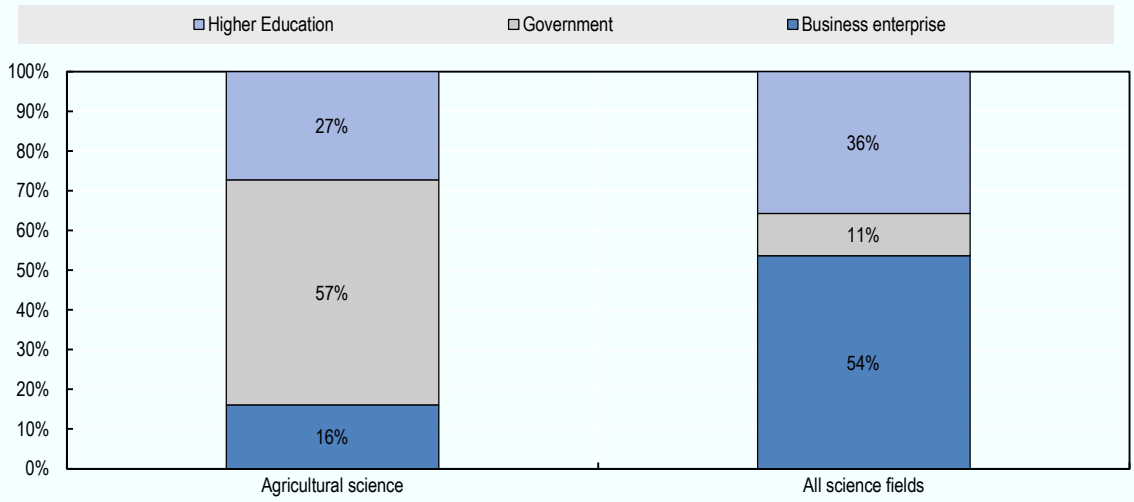
Technology Development Zones (TDZ) cross the entire knowledge continuum. Since the early 2000s, the government has provided substantial tax concessions and infrastructure finance to businesses and R&D providers located in these zones (Chapter 3, Box 3.2). At present, 44 TDZs are operational and 15 are under construction. The extent to which businesses in TDZs are engaged in agro-food innovation and technology development requires further investigation. Organized Industrial Zones (OIZs) also promote technologically-advanced business within an investor-friendly environment with ready-to-use infrastructure and social facilities. Businesses in OIZs benefit from substantial investment incentives and a range of concessions related to real estate (Chapter 3, Box 3.1). Of the 211 OIZs, six are organised for animal husbandry and two will be established for greenhouse production.

Box 6.1. Turkish agricultural R&D infrastructure

Agricultural R&D infrastructure in Turkey combines 70 government, 43 higher education, and 35 private institutions.

The *government segment* is represented by the 49 research institutes under the auspices of the General Directorate of Agricultural Research and Policies of the Ministry of Food Agriculture and Livestock (MOFAL). The larger institutions are the West Mediterranean Agricultural Research Institute, the Central Research Institute for Field Crops, the Bahri Dağdaş International Agricultural Research Institute, and the Southeast Anatolia Agricultural Research Institute. In addition, there are 21 institutions under the auspices of various other MOFAL's Directorates which conduct agricultural research. Although the primary mandate of these institutions may not be agricultural research, they are engaged in specific issues, such as development of vaccinations by the Foot and Mouth Disease Institution. With the mandate to guide, coordinate and fund national STI, TÜBİTAK also performs research in strategic R&D areas. Two TÜBİTAK's institutes are involved in agro-food research, both located in the premises of TÜBİTAK's Marmara Research Centre: the Food Institute and the Genetic Engineering and Biotechnology Institute. In 2013, the institutes of MOFAL and TÜBİTAK concentrated close to 57% of total full time equivalent (FTE) researchers engaged in agricultural sciences (Figure 6.3).

Figure 6.3. Turkish R&D personnel by sector of employment, 2014



Note: Employment is expressed in full-time equivalent on R&D activities.

Source: OECD (2016b), OECD Research and Development Statistics, R&D personnel by sector of employment and qualification, http://stats.oecd.org/Index.aspx?DataSetCode=PERS_SCIENCE.

StatLink http://dx.doi.org/10.1787/888933390009

University research is the second largest agricultural R&D performer, employing 27% of total agricultural FTE researchers. The five largest centres of university R&D in agriculture function atat Suleyman Demırel, Ankara, Ege, Atatürk, and Çukurova universities.

The *private sector* is a minor performer in agricultural R&D; its share is far below that of private business participation in other areas of research. Although the vast majority of companies import, test and register seeds, this is not associated with active research. About 35 companies – mainly in the food crop and seed sectors – have only recently begun limited agricultural R&D and companies: for example, MayAgro Seed and Asgen Tarım report sizable research staff, 50 and 27 FTEs, respectively. Given the high start-up costs, most private businesses lack the necessary resources to recruit full-time researchers, so they engage university researchers through short-term consultancies, which in turn provides a valuable source of additional revenue for these institutions.

Source: IFPRI-GDAR (2014), *Agricultural R&D Indicators Factsheet: Turkey*, International Food Policy Research Institute and Turkish Ministry of Food, Agriculture and Livestock, General Directorate for Agricultural Research and Policies, September 2014.

6.3. AIS governance and coordination mechanisms

Governance of the AIS should ensure that national priorities are coordinated and communicated clearly, that progress is monitored, and policy outcomes and impacts are evaluated against the defined objectives. The integration of the AIS into the overall governance of innovation system ensures better use of public funds and increased efficiency through the pooling of different types of expertise.

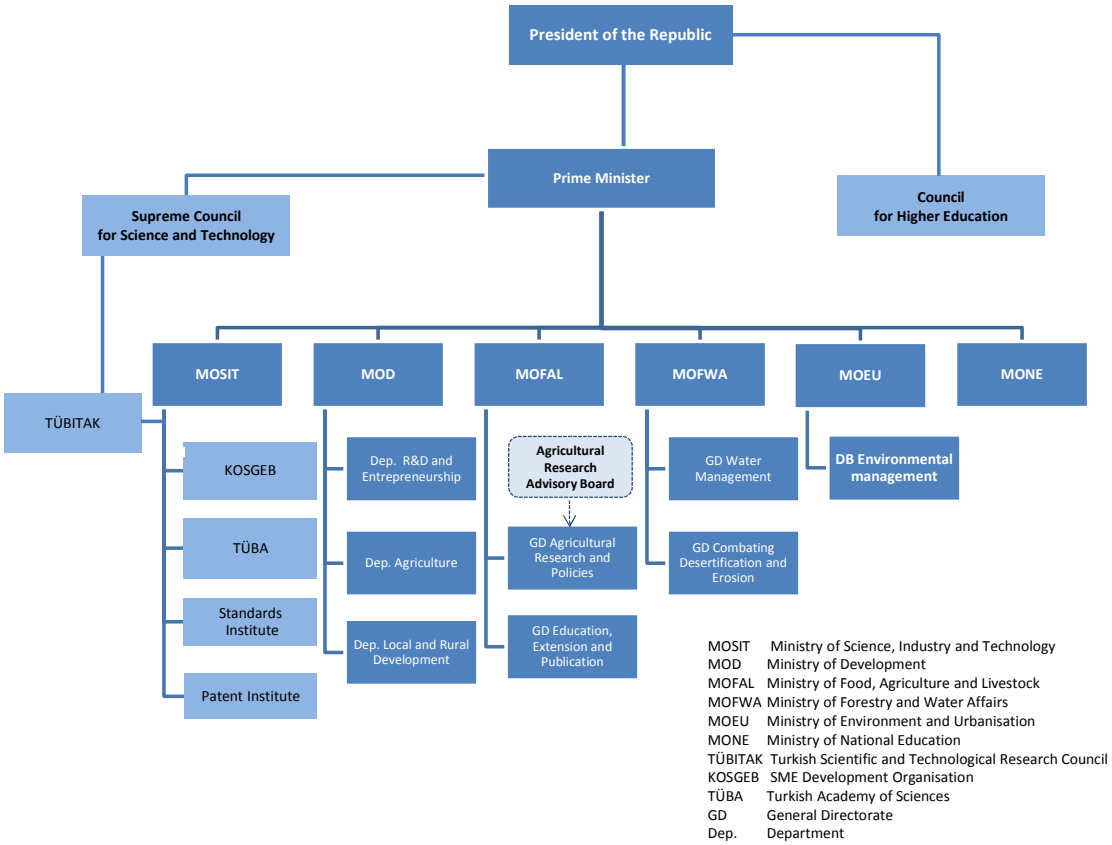
Principal government bodies and agencies involved in AIS

The governance and coordination of the Turkish AIS is part of the centralised national system of STI governance. The Supreme Council for Science and Technology (SCST) is the highest STI policy body (Figure 6.4). It is chaired by the Prime Minister and composed of 18 permanent members representing key ministries, including: Ministry of Science, Industry and Technology, MOFAL, Ministry of National Education, Ministry of Forestry and Water Affairs. Heads of several national agencies, such as the National Treasury, Council of Higher Education, Radio and TV, and the Chairman of the Union of Chambers of Commodity Exchanges of Turkey are also represented. The SCST establishes long-term R&D objectives and priorities and related public funding priorities; it initiates related policies and legislation and assigns the responsibilities of public bodies in the STI area.

The Scientific and Technological Research Council of Turkey (TÜBİTAK), formally affiliated with the Ministry of Science, Industry and Technology, acts as a secretariat for the SCST. TÜBİTAK is governed by the Scientific Board, whose members are prominent scholars from universities, industry and research institutions. This agency performs many functions: it acts as an advisory body to the Turkish Government on research and innovation, it steers the design of the national STI policy, related policy instruments and sectoral plans for public R&D, and coordinates these across government and non-government institutions. TÜBİTAK also acts as an R&D funder, provider and disseminator.

The Ministry of Development (MOD) is responsible for the preparation of the National Development Plans, which include sectoral (e.g. agriculture) and cross-sectoral areas (e.g. STI). With respect to STI, MOD's responsibility consists of determining macro-level policies and planning and financing public R&D infrastructure investment. As applied to agriculture and rural development, this is achieved in coordination with the Ministry units responsible for R&D, agriculture, and local and rural development. MOD is also the coordinating body for public research infrastructures and represents Turkey in international platforms, including EU's Horizon 2020 Programme.

Figure 6.4. Governance of the Turkish AIS



The mandate of the Ministry of Science, Industry and Technology (MOSIT) is to promote innovative business and to support the development of the private sector R&D Centres and Technology Development Zones. MOSIT is the public agency that initiates and elaborates legislation to promote innovation in the business sector. Institutions affiliated with MOSIT, such as the Small and Medium Enterprise Development Organisation (KOSGEB) and The Scıentıfic and Technologıcal Research Councıl of Turkey (TUBİTAK), are important providers of funding for research, development and innovation (RD&I), including to agro-food businesses. The Turkish Patent Institute carries out procedures related to industrial and intellectual property rights and the Turkish Accreditation Agency deals with the accreditation of organisations and laboratories.

The Ministry of Food, Agriculture and Livestock (MOFAL) is the principal agency implementing R&D policy and public R&D programmes in the agriculture and food sectors. These issues are under the responsibility of the Ministry's General Directorate for Agricultural Research and Policies. This Directorate also manages public research institutes that operate under the auspices of MOFAL. The Ministry's Department of Education, Extension and Publications is responsible for agricultural education and extension.

The Ministry of Environment and Urbanisation and the Ministry of Forestry and Water Affairs, among other areas, cover environmental issues of high relevance for agriculture, such as nutrient pollution, irrigation, desertification, and soil erosion. Both ministries are the main contributors to the formulation of RD&I priorities and programmes in these areas.

The Council of Higher Education and the Ministry of National Education (MONE) develop and implement education policies and must ensure their coherence with RD&I needs. The Turkish Academy of Sciences (TÜBA) identifies and recommends priority areas of scientific research and proposes legislation on related issues.

R&D planning, monitoring and evaluation

The National Development Plan is the key policy document formulating sectoral and cross sectoral policies and priorities, including those concerning STI and the food and agricultural sector. These Plans are prepared with the contributions of stakeholders. The priorities indicated in the national STI documents, as well as MOFAL's Strategic Plan and other national policy documents in the light of the National Development Plans, form the framework for R&D programmes and public funding.

Turkey's practice of broad stakeholder involvement in formulating STI priorities is relatively recent and is yet in a search for efficient mechanisms. The first important stakeholder participation was organised in 2002-04 for the foresight study "Vision 2023", which was initiated by TÜBİTAK to identify long-term R&D priorities. Two hundred and forty-eight stakeholders from academic, technology and innovation circles participated in 12 technology foresight panels and 2 323 persons participated in a Delphi survey (EC, 2014b).

Consultative policy principle was further promoted through TÜBİTAK's initiative to create technology platforms to integrate a business perspective into STI priorities. Nine technology platforms were created for the sectors with the highest export and import shares. The "food platform" was also organised considering strategic importance of food area. For the first three years, these technology platforms received financial support from TÜBİTAK. The food platform actively participated in the preparation of the National STI Strategy for 2011-16 and the National Food R&D and Innovation Strategy. This platform has a broad agenda today to join the capacities of Turkish agri-business and research so as to develop the food sector.

The Ministry of Science, Industry and Technology (MOSIT), TÜBİTAK, the Ministry of Development, and the Ministry of Finance are the principal government bodies that ensure cross-agency co-ordination in the STI area. MOFAL, as the body responsible for the agro-food sector, prepares five-year Agricultural Research Master Plans and informs TÜBİTAK via the Advisory Board for Agricultural Research (TADAK). This Board organises consultations with stakeholders, which bring

together MOFAL's central directorates and TÜBİTAK, and representatives from relevant university faculties and the Chamber of Professional Organisations. The Board advises MOFAL on areas of interest for research, on the development of institutional, physical, human and financial capacities, and on the dissemination of research results. Stakeholder consultations take place at different stages in the process of agricultural R&D planning. Performance evaluations of research projects and individual researchers are undertaken (Box 6.2).

Box 6.2. Agricultural R&D planning, monitoring and evaluation

MOFAL's General Directorate of Agricultural Research and Policies and TÜBİTAK organise the preparation of the five-year Agricultural Research Master Plans with contributions from farmer unions, producers, universities, NGOs, private sector, and all related agencies. The priorities and goals formulated in the Master Plans set the framework for R&D proposals at the level of institutes.

At the beginning of each year, new proposals, on-going research projects, interim reports, and final research reports are submitted to the Research Committees of the institutes. These submissions are considered at the nation-wide annual Research Programme Evaluation Meeting organised by TÜBİTAK with the participation of stakeholders. New research proposals are then evaluated in financial terms at the Special Research Opportunity Area Meeting. If approved, projects are included in the research programmes of institutes and receive funding. Finally, at the end of the year, on-going projects are evaluated at the Agricultural Research Advisory Board Meeting, while individual researchers undergo annual performance evaluations within their institutes. The best projects and researchers may be granted "project performance rewards".

Source: Information provided by the General Directorate of Agricultural Research and Policies of the MOFAL.

The practice of overall evaluation of research institutions affiliated to Ministries and or public bodies has not yet been established in Turkey. However, there have been initiatives to establish performance evaluation for university research centres. Law No. 6550 "On Support of Research Infrastructures", adopted in 2014 with further regulations published in 2015, stipulates that university research centres will undergo performance evaluation and that this evaluation will be considered in the provision of public funding for infrastructure, personnel, and operating costs of these centres. This mechanism, however, has not yet been implemented. Another initiative by TÜBİTAK and the Council of Higher Education was the introduction of the Entrepreneurial and Innovative University Index, which is composed of five dimensions: (i) scientific and technological research competency; (ii) economic contribution and commercialisation; (iii) entrepreneurship and innovation culture; (iv) collaboration and interaction; and (v) contribution to intellectual property and patents. This index aims to increase the contribution of university research to the needs of industries. However, it is not used to support public funding decisions. Among the establishments for which this index is produced are 50 public and private universities with agricultural departments.

The STI policy evaluation and STI impact analysis is at an early stage in Turkey. There have been some initiatives by R&D funding institutions. For example, TÜBİTAK began conducting literature reviews in 2010 to develop indicators and surveys for the evaluation of its programmes. Similarly, KOSGEB conducted an independent *ex post* evaluation of its SME support schemes in 2010, including the scheme to support R&D and innovation in SMEs. The most recent development is the creation of a special unit at the Ministry of Science, Industry and Technology with the task to elaborate a methodology for the evaluation of R&D support schemes. The methodology is currently being tested on one scheme with the intention to apply it to a broad range of R&D supports.

6.4. Agro-food R&D and innovation within the national policy frameworks

The political commitment to foster competitiveness and develop an innovative economy increased in the early 2000s in response to the momentum generated by the country's EU accession process. This resulted in a new STI strategy and programmes, changes in the system's governance and more interactions in policy formulation between the government, stakeholders, and society in general. The concept of a Turkish Research Area (TARAL), similar to the European Research Area, was adopted

emphasising the synergies and co-ordination between national actors towards broadly-shared STI goals.[1] The orientations set out in the "Competitiveness and Innovation" section of the Country Action Programme for Turkey's EU Pre-Accession Assistance have largely inspired Turkish STI policy over the last ten years.

All current strategic and planning policy documents position innovation-driven productivity growth as the path towards economic and social progress. The Tenth Development Plan (2014-18) states that national mid-term and long-term development objectives should be achieved through the transition to an innovative economy. Among human development objectives, this document emphasises the need for individual skills to adapt to change and that people be not only users of new knowledge and technologies, but also their generators (MOD, 2014).

The National Science, Technology and Innovation Strategy for 2011-16 is the main framework setting the priorities and objectives of STI (TÜBİTAK, 2013a). It distinguishes three axes (Figure 6.5). Nine priority sectors are selected within the first and second axis. Automotive, machinery and manufacturing technologies, and ICT, are singled out as mission-oriented sectors with strong RD&I capacity. Six other sectors – defence, aerospace, health, energy, water, and food – are identified as requiring need-oriented RD&I to accelerate their development. The triad of energy, food and water priorities was included on the Prime Minister's initiative as forming the critical resource nexus for development. For each of these three areas, R&D strategies were developed as sectoral extensions to the National Strategy. Finally, the third pillar of the National Strategy leaves space for bottom-up initiatives without prioritising particular sectors or areas.

Besides the vertical (sectoral) axes, the National Strategy identifies critical cross-cutting issues to foster national RD&I: from development of human resources, through uptake of innovation, cohesion, integration of SMEs into STI system, R&D infrastructure, to international cooperation.

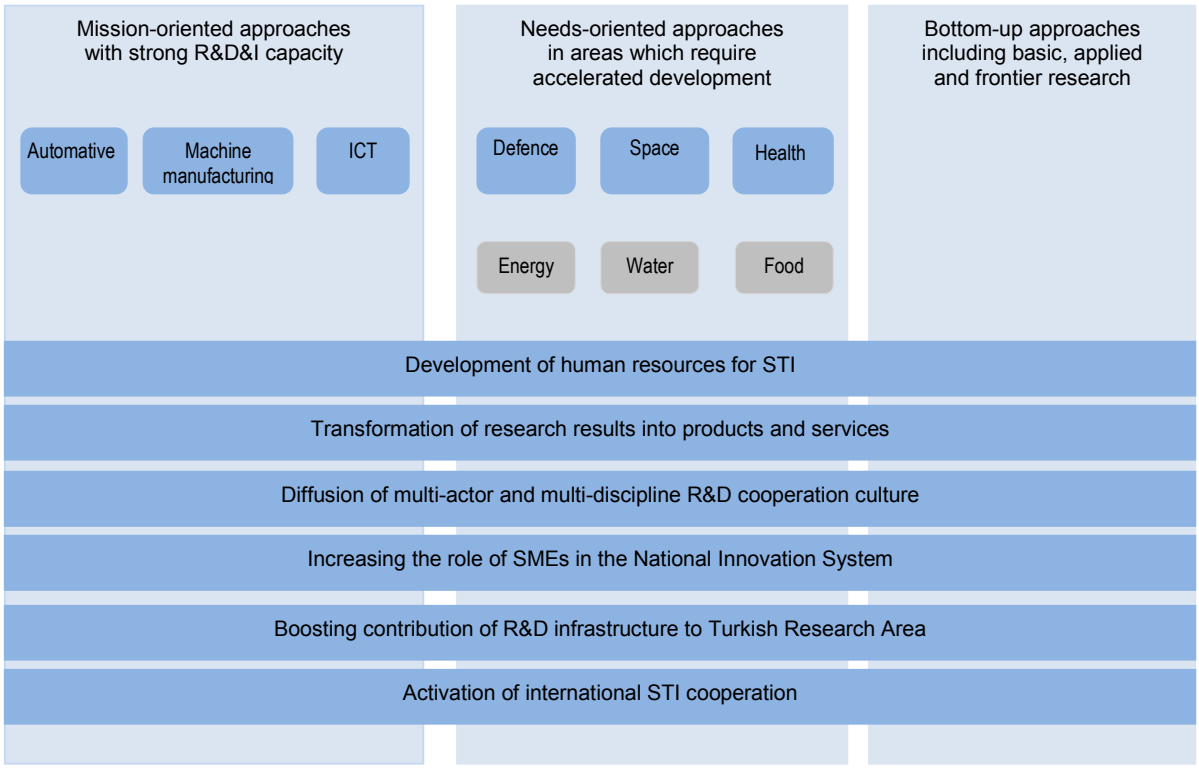
The National Science and Technology Human Resource Strategy for 2011-16 complements the National STI Strategy for 2011-16, recognising that human resources represent a challenge for STI development in Turkey.

The National STI Strategy contains only broad orientations for the food STI, which include food security and safety, agricultural productivity, competitiveness, quality, export enhancement, and sustainable agriculture. The STI objectives and priorities in the food area are spelled out more specifically in the National Food R&D and Innovation Strategy (2011-16) (TÜBİTAK, 2011a). This document was developed with input from many experts. They analysed Turkish R&D needs in the agro-food area and the existing academic competencies, human capacity, programmes and budgets. The Strategy elaborated as a result of this broad consultation considers the whole food supply chain. It includes four axes spanning from the production of raw materials to industrial processing and value-adding at the local level, and food safety (Figure 6.6). For each of the four axes, strategic objectives are identified and further refined for specific technologies, processes and tasks. Among these are seed quality, productivity-enhancing agricultural technologies, and technologies to meet quality requirements of food industry, environmentally friendly farming; advanced technologies for food processing, packaging, storage, transportation, and the ensuring of food safety. The strategy also sets the objectives to increase adoption of R&D results, stronger business participation in R&D, and collaboration amongst different R&D providers (Annex 6.A1).

Water is another STI priority. The National Water R&D and Innovation Strategy, similar to the one for food, was developed in collaboration with academics, public and private organisations, and NGOs. It is oriented at improving the sustainable and productive use of water, ecosystem protection, water access to everyone, and developing water-related technologies. The Water Strategy sets four strategic objectives: i) building an information infrastructure for water issues; ii) investing in mission-oriented priority areas and advanced technologies related to water; iii) developing R&D capacity in the water area, including human resources and physical infrastructure, conducting interdisciplinary research; iv) developing capacity in socioeconomic research and studies on conflict and cooperation in trans boundary waters issues (TÜBİTAK, 2011b). The Water Strategy includes areas which are directly

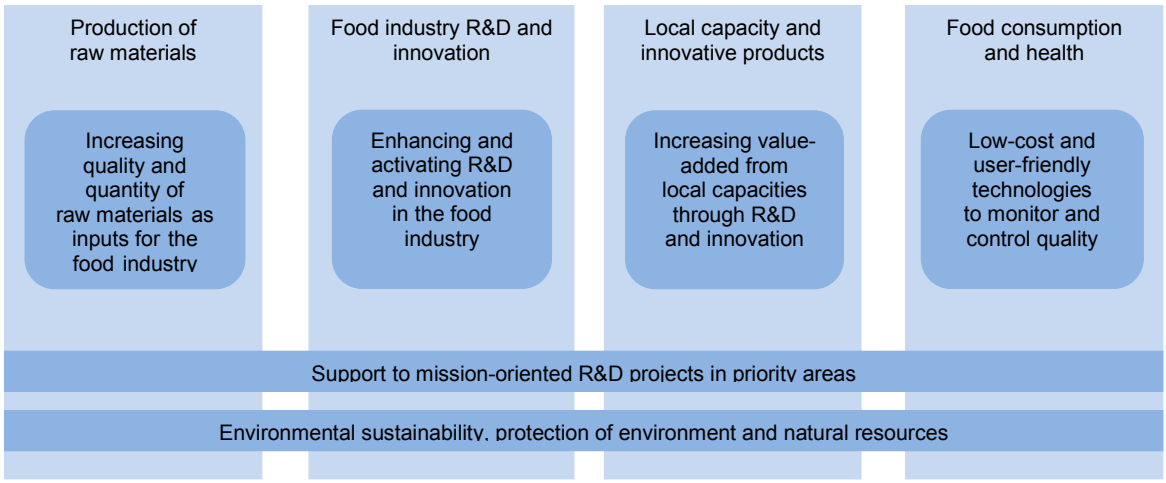
relevant to agricultural productivity and sustainability, for example water saving and optimal use of water in irrigation, impact of climate change on water resources, and development of water information systems.

Figure 6.5. National STI strategy framework



Source: TÜBİTAK (2013b), *Science, Technology, and Innovation in Turkey 2012*, The Scientific and Technological Research Council of Turkey (TÜBİTAK), Ankara.

Figure 6.6. National Food R&D and Innovation Strategy framework

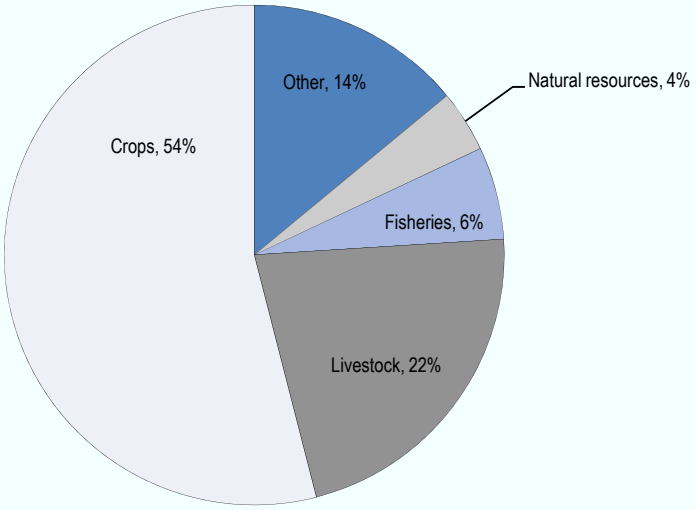


Source: TÜBİTAK (2011a), *Ulusal gida Ar&Ge ve Yenilik Stratejisi* (*National Food R&D and Innovation Strategy*), www.tubitak.gov.tr/en/about-us/policies/content-national-food-rd-and-innovation-strategy .

Box 6.3. Areas of focus in Turkish agricultural R&D

Agricultural R&D is largely focused on crop thematic (Figure 6.7). Of the 2 063 new crop varieties released in Turkey during 2002–12, 1 015 (49%) were from the private sector, 897 (44%) from MOFAL institutes, 102 (5%) from the higher education, and 49 (2%) from other public institutions. Among other topics, livestock and the sustainable use of natural resources have been gaining importance.

Figure 6.7. Research focus of Turkish agricultural R&D institutions



Source : IFPRI-GDAR (2014), *Agricultural R&D Indicators Factsheet: Turkey*.

StatLink http://dx.doi.org/10.1787/888933390014

A range of R&D on sustainable resource use and climate change is currently conducted. Water is a growing R&D priority. The activities in this area include determining water consumption rates, irrigation programmes, and criteria for water deficit irrigation practices for crops in irrigated regions. Studies on deficit irrigation practices are carried out to enable the irrigation of larger areas with the same amount of water; the approach in this case is to allow a certain level of yield loss from a given crop but obtain gains from the diversion of irrigation water to other crops. For the treatment of domestic wastewater, natural wastewater treatment plants are established and studies conducted on the efficient use of water through the reuse of water discharged from these systems for irrigation. This is intended to establish the natural treatment of wastewater in villages without imported or costly material, as is the case for conventional waste water treatment that requires costly investment. The programme on Enhancing Water Use Efficiency in Agriculture is part of the national Tenth Development Plan. MOFAL/GDAR is responsible for its implementation, which foresees the fostering of R&D on new irrigation techniques and increased training and extension in water saving systems in agriculture. The programme also aims to incorporate regional water deficit conditions and environmental protection aspects as criteria for the provision of support.

Understanding the impact of climate change on agriculture and their mitigation is another R&D focus. Research and monitoring are conducted to evaluate the impact of droughts on soil and water resources. This includes studies on hydrological droughts, the evaluation of drought monitoring and forecast methodologies, identifying and monitoring of soil water regimes of basins, water harvesting methods and estimates of their impacts on crop development, the effects of climate change on soil quality parameters, and carbon flows from land use and crop cultivation. No-till farming is also a research topic.

Studies are conducted to identify, prevent, and eliminate water pollution from nitrates that originate from agricultural sources.

The classification of soil and water resources for the purpose of agricultural support is another area of research. A national soil database has been established and maintained; it employs geographic information systems.

Source: Government of Turkey (2015), "OECD Food and Agricultural Review: Innovation for Agricultural Productivity and Sustainability in Turkey: Questionnaire", Responses to the OECD received from the Turkish Government.

The principal sectoral policy documents for the agro-food sector also emphasise knowledge-based development. In the Strategic Plan of the Ministry of Food, Agriculture and Livestock for 2013-17 (MOFAL, 2015a) development and diffusion of advanced technologies are among the seventeen strategic objectives of the Plan. These objectives seek to increase the number of registered plant varieties and animals, of new technologies developed, animals covered by artificial insemination, and the share of highbred animals in total animal numbers, areas allocated to certified saplings and seedlings, and the share of areas on which soil surveys are performed. The Strategic Plan allocates around 16% of its budget to these targets, the second largest amount across the seventeen strategic objectives in the Plan.

The modernisation of agriculture (including processing) is an overarching objective of Turkey's rural development, along with sustainable rural development, particularly in light of Turkey's move towards the *Acquis communautaire* and the need to upgrade local enterprises to EC standards. This objective involves incentives for investment and adoption of new technologies on farms and beyond the farm gate, with a focus on higher environmental, hygiene, food safety and animal welfare standards. Investment support is the dominant component of the EU co-financed Instrument for Pre-Accession Assistance for Rural Development 2014 (IPARD).

All policy documents described above form the basis agro-food R&D planning and knowledge transfer activities, such as extension services and public-industry co-operation for commercialisation and transfer of knowledge. Current research thematic being undertaken by agricultural research institutions in Turkey is discussed in Box 6.3.

6.5. Public and private investments in agriculture and food R&D

It is difficult to arrive at a comprehensive estimate of Gross Expenditure on R&D (GERD) in the agro-food sector which would cover, beyond agricultural science, other fields of concern, such as food engineering, biotechnology, etc. This is due to the difficulties in filtering the relevant science fields from the reported data as they are classified. In addition, information on all sectors of performance – government, education, and business – is lacking for some of the relevant science fields.

GERD data capturing all performing sectors in Turkey is available for agricultural sciences.[2] Turkish agriculture GERD more than tripled between 2005 and 2014 in constant terms. However, the pace of growth, roughly at par with total GERD at the beginning, has slowed since 2008-09. Despite the rapid rise in spending for business R&D, the low dynamics in government and educational sectors resulted in agriculture GERD increasing more slowly than total GERD in real terms over the past ten years (Figure 6.8.A).

The National STI Strategy for 2011-16 has set a target to increase total national R&D expenditures to 3% of GDP by 2023. This ratio was 1.0% for all R&D fields in 2014, while only 0.6% for agricultural science (estimated as agricultural GERD as a percentage of agricultural value added). Agriculture has lagged behind the rest of the economy in R&D spending relative to its size, with this gap widening in the late 2000s (Figure 6.9.A). Among 21 OECD and non-OECD countries for which comparable data is available, Turkish agriculture is one of the least R&D intensive (Figure 6.9.B).

Government and higher education sectors remain the principal performers of agricultural R&D, attracting respectively 46% and 40% of total agricultural GERD in 2012-14. Although the share of the business sector has increased since mid-2000s, this has come from a very low base. In 2012-14, business sector as an R&D performer accounted for only 14% of agricultural GERD compared to 48% for all science fields (Figure 6.8.B). In other countries for which data are available, the share of agriculture R&D performed by the business sector ranges between 4% in the Slovak Republic and 26% in Korea (OECD, 2016a).

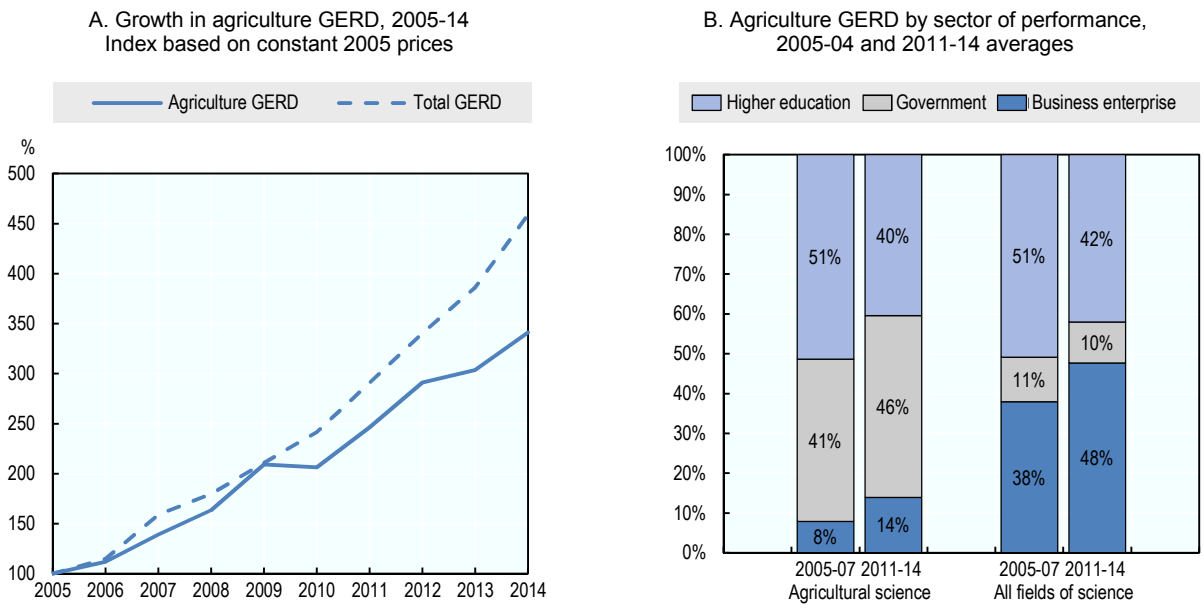
The available data on business R&D expenditures can be disaggregated by economic sector. It shows that nearly 90% of aggregate business R&D spending related to agro-food activities goes to the food and beverage sectors, with only 10% directed to primary agriculture (OECD, 2015).

Business participation in R&D remains limited and may be a factor explaining the overall lag of R&D intensity in the Turkish agro-food system. Businesses in both agriculture and the food and beverage sectors spend far less on R&D in relation to the value added generated (Figure 6.10). This, however, is characteristic of other countries. As for agriculture science, the relatively low business R&D intensity may be related to the fact that as in many countries this field has historically emerged through public investment and continues to be predominantly public. Agricultural research concerns biological processes, and as such may be associated with higher and more specific initial investment (e.g. land), longer horizons and greater uncertainties as compared to some other science fields.

Considering the specific context of Turkey, its business structure is an important factor for the low private investment in agro-food R&D. In many countries, private R&D comes from large national or multinational companies, whereas small family farms dominate Turkish agriculture. SMEs dominate the food processing sector and generally have limited capacity to invest in R&D. More generally, according to one of the initiators of the National Food Technology Platform, Turkish agro-food companies do not typically perceive R&D to be part of their business growth strategies.

Stimulating businesses to invest in R&D and adopt innovations is one of the government's policy orientation. Incentives are provided to increase business R&D across all sectors, while some public funding schemes are available specifically for the agro-food sector as an STI priority sector (see next section).

Figure 6.8. Agriculture GERD in 2005-14: Growth and composition by sector of performance

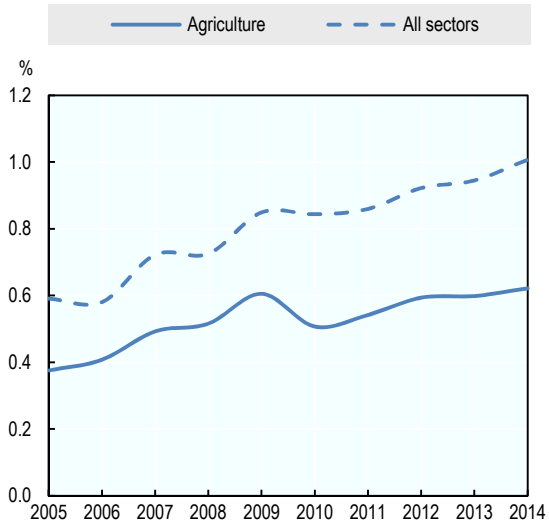


Source: OECD (2016a), *OECD Research and Development Statistics, Gross domestic expenditure on R-D by sector of performance and field of science*, http://stats.oecd.org/Index.aspx?DataSetCode=GERD_SCIENCE.

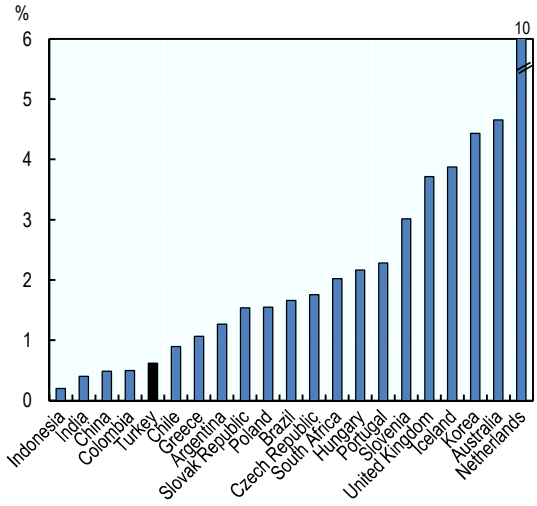
StatLink http://dx.doi.org/10.1787/888933390024

Figure 6.9. R&D intensity of agriculture in Turkey

A. R&D intensity in agriculture and all sectors in Turkey, 2005-14



B. Agriculture R&D intensity: international comparison, 2014 or latest available year

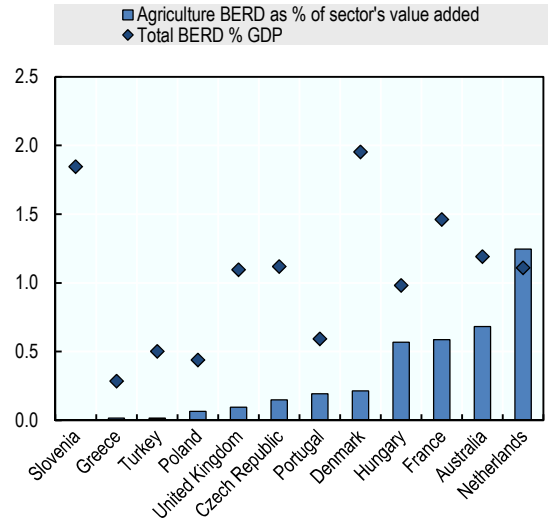


Source: OECD (2016a), *OECD Research and Development Statistics*, Gross domestic expenditure on R-D by sector of performance and field of science, http://stats.oecd.org/Index.aspx?DataSetCode=GERD_SCIENCE; OECD (2016c) *System of National Accounts*, https://stats.oecd.org; ASTI (2014), *Agricultural Science and Technology Indicators*, www.asti.cgiar.org/data 2014 for Argentina, Brazil, Chile, China, Colombia and South Africa.

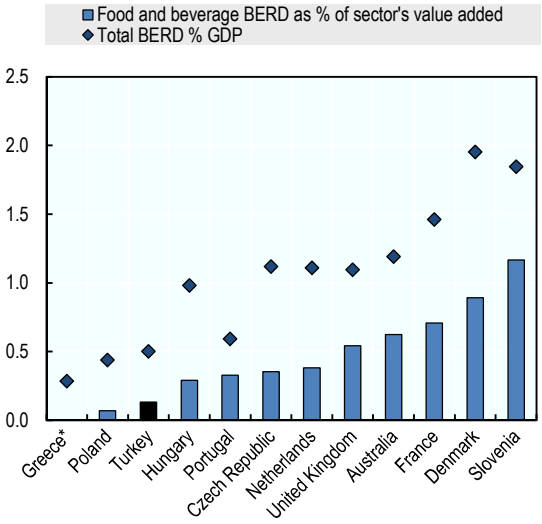
StatLink http://dx.doi.org/10.1787/888933390036

Figure 6.10. Business expenditures on R&D (BERD) in the agriculture and food and beverage sectors[1]

A. Agriculture sector



B. Food and beverage sector



* Data for food and beverage BERD in Greece is not available.

1. The figures are based on the sector shares for the latest available year for each country: the year 2014 for the agriculture sector (panel A); the years 2011 and 2010 for the food and beverage sector (panel B) for most countries, 2009 for Turkey and 2006 for Australia.

Source: OECD (2016a), *OECD Research and Development Statistics*, Gross domestic expenditure on R-D by sector of performance and field of science, http://stats.oecd.org/Index.aspx?DataSetCode=GERD_SCIENCE ; OECD (2016c), *System of National Accounts*, https://stats.oecd.org.

StatLink http://dx.doi.org/10.1787/888933390048

6.6. Sources and providers of funding for R&D and innovation

Public funding

The National STI Strategy 2011-16 and the related National Food STI Strategy, both monitored by the Supreme Council for Science and Technology (SCST), constitute the framework for public RD&I funding provided on an institutional and project basis.

The Ministry of Development operates the institutional R&D funding. It establishes infrastructure and human resources needs and finances these within the framework of Public Investment Programs. Allocations are provided for two types of infrastructure: (i) the Thematic Advanced Research Centres covering established universities and public research organisations that have sufficient human resource and expertise to conduct R&D in priority areas; and (ii) Central Research Laboratories, located at state universities to meet basic research infrastructure needs (TÜBİTAK, 2013a). Between 2003 and 2015, more than TRY 3 billion (USD 1 billion) were invested in constant terms for both infrastructures, part of which was directed to institutions engaged in agriculture, food, biotechnology and other agro-food related research (TÜBİTAK, 2015a). The Ministry of Finance is another provider of institutional funding via its Scientific Research Programme, which allocates funds to higher education establishments conducting R&D.

There is a wide range of project-based funding operated by TÜBİTAK, MOFAL, MOSIT, SME Development Organisation (KOSGEB) and Turkish Technology Development Foundation (TTGV) (Figure 6.12). Since the adoption of the National STI Strategy 2011-16, the scope of project funding schemes has broadened.

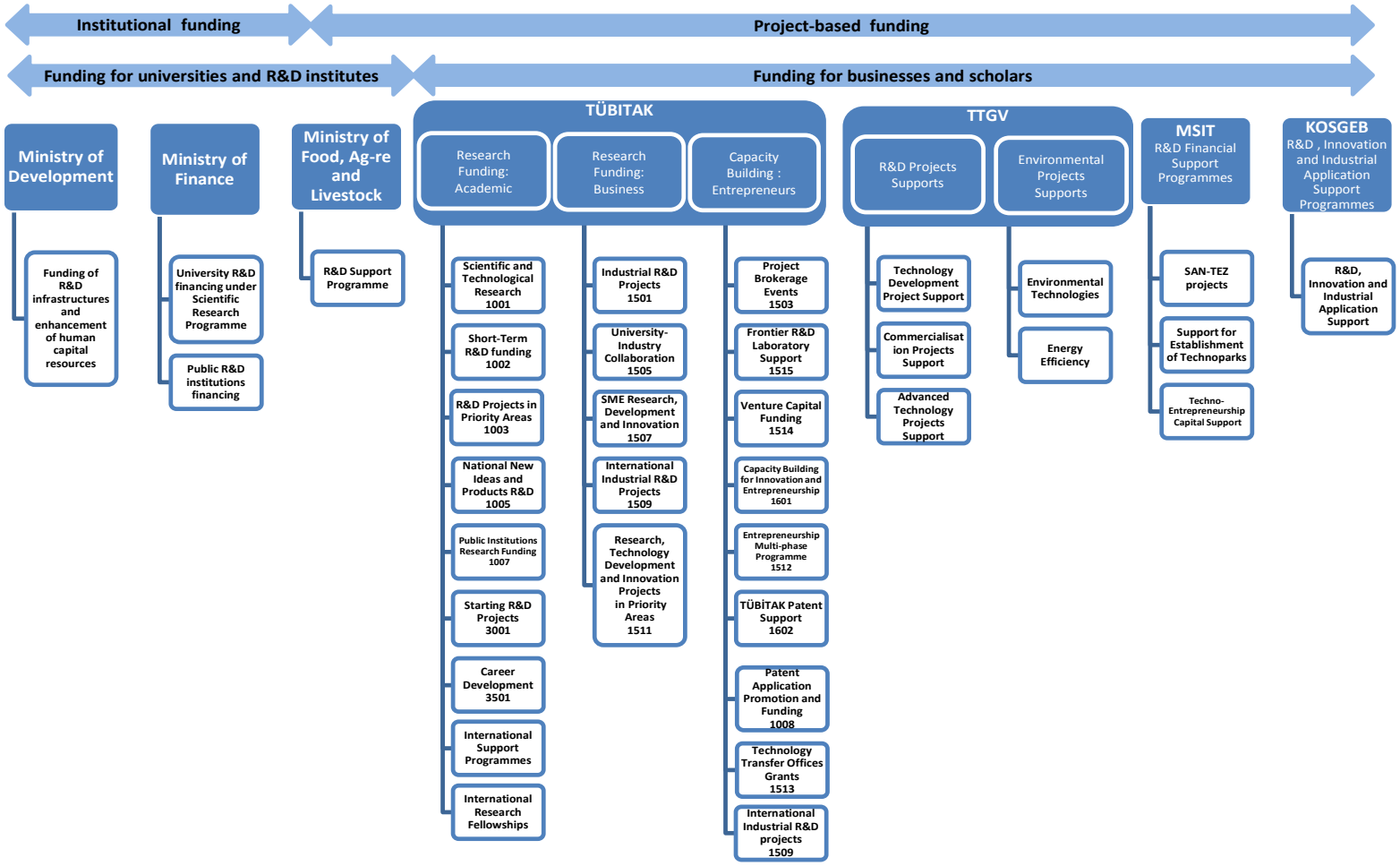
TÜBİTAK offers the largest range of project-based grants under two principal streams: grants for academic research and grants for entrepreneurs, the latter including "technology and innovation" grants for business R&D and capacity building grants (Figure 6.12). Academic grants are focussed on basic and applied R&D, while grants for entrepreneurs support knowledge transfers and the experimental development of R&D products, including through research-university-industry collaboration. Notwithstanding the lack of comprehensive data, it can be seen that agro-food area has been a focus for TÜBİTAK's funding in recent years (Box 6.4).

The General Directorate of Agricultural Research and Policies of the Ministry of Food, Agriculture and Livestock, operates the R&D Support Programme that also provides project financing to agricultural research institutes under the responsibility of this Directorate.

The Ministry of Science, Industry and Technology (MOSIT) is another provider of project-based R&D funding. One project is SAN-TEZ which seeks to stimulate co-operation between firms and universities. It supports graduate students developing new technological products and processes for specific industrial needs. This programme has broad sectoral coverage and a relatively high uptake amongst future university graduates. MOSIT is also responsible for the development of Technology Development Zones (TDZs) by providing support for land procurement, infrastructure, and the construction of management buildings. A related MOSIT funding facility is the Techno-Entrepreneurship Capital Support whereby individuals with certain qualifications and R&D projects can receive grants to establish their own companies, and are encouraged to locate them in TDZs.

The SME Development Organisation (KOSGEB) offers grants to support innovating SMEs. The R&D, Innovation and Industrial Application Programme provides a two-phase assistance: the first (up to 24 months) supports technology start-ups, and the second (18 months) supports an industrial application of new technologies. In certain cases, beneficiaries can obtain a 12-month extension. The programme covers 75% of project development costs, machinery and equipment costs, personnel expenditures, and other items involved in R&D and industrial application of new products and processes. SMEs can also be provided office and laboratory facilities. The up-take by agro-food SMEs seems to have been limited so far. According to the data provided by KOSGEB for 2013-15, around

Figure. 6.11. RD&I funding institutions and schemes in Turkey



Source: TÜBİTAK (2013b); on-line information on support programmes by TÜBİTAK, MOSIT, KOSGEB, and TTGV.

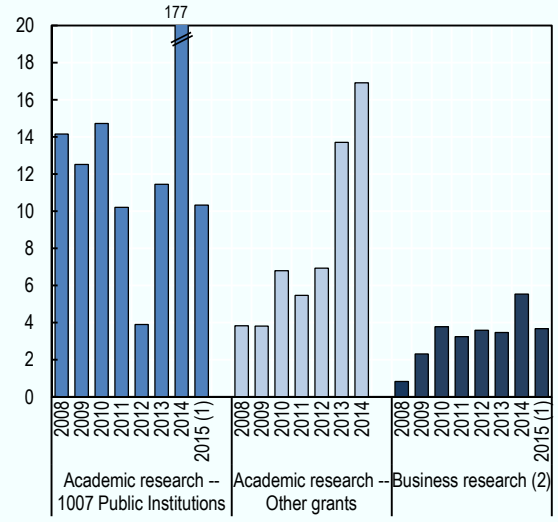
Box 6.4. TÜBİTAK's support for agro-food projects

TÜBİTAK's funding is available to institutions and businesses across all sectors. Following the adoption of the National STI Strategy for 2011-16 which identified nine STI priority areas, TÜBİTAK introduced two specific grant schemes for support in these areas: 1003 Support Program for R&D Projects in Priority Areas for academic research and 1511 Research, Technology Development and Innovation Projects in Priority Areas for business research. Between 2012 and 2015, these two schemes financed 107 projects in the agro-food area, worth TRY 75 million (USD 25 million) (data provided by TÜBİTAK).

The scheme "1007 Public Institutions R&D Funding" has been the most important TÜBİTAK's channel for financing academic research in the agro-food area (Figure 6.12). For example, it has been an important source of funding for MOFAL's R&D institutions. The allocation of funds under this scheme is intended to encourage the adoption of R&D results. MOFAL acts as a "Customer Institution" for the supported projects. Ministry experts evaluate project proposals with a key criterion that they should have "usable" results, and the final financial settlement of grants is based on MOFAL reporting to TÜBİTAK on the effective use of project results. Between 2012 and 2015, eight agro-food projects received funding under this grant. Since the late 2000s, the annual amount of allocations has fluctuated, with a fall in 2012 and a peak in 2014 (possibly due to adjustments in funding programmes following the adoption of the New STI Strategy). Funding through other schemes, for both academic and business agro-food research, has tended to increase.

The available information on the extent to which TÜBİTAK's support focusses on the agro-food sector is partial. Concerning academic R&D funding, agro-food projects constituted the largest recipient group in 2013-14 (TÜBİTAK, 2015b). For all streams of TÜBİTAK's support combined – covering both academic and business research funding, as well as grants for entrepreneur capacity building – the agro-food area emerges as a top recipient (Figure 6.13). Its share reached around 40% of total TÜBİTAK's funding for the five priority sectors identified by the National STI Strategy for accelerated development (Pillar Two sectors). This distribution does not account for the health sector, which was added to the list of Pillar Two priority sectors in 2014 (TÜBİTAK, 2015a).

Figure 6.12. TÜBİTAK grants for academic and business research in the agro-food area



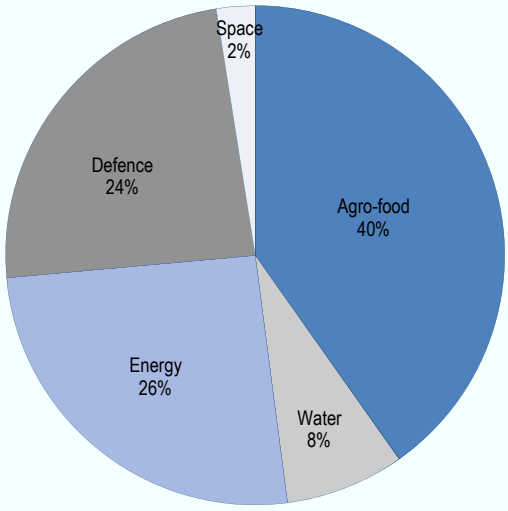
Notes: Data for 2015 covers the period between January and June.

1. Business capacity-building grants not included.

Source: TÜBİTAK (2015b), *Investment in Agricultural Research and Innovation*. TÜBİTAK Presentation at the Meeting of Agricultural Chief Scientists (MACS), 2015.

StatLink http://dx.doi.org/10.1787/888933390054

Figure 6.13. TÜBİTAK grants by priority area, between January 2013 and October 2014[1]

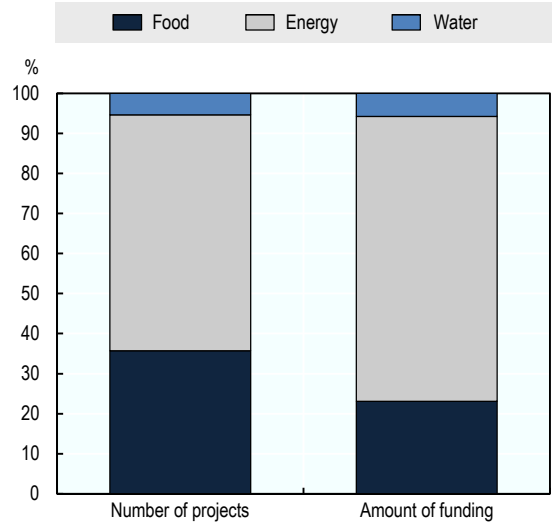


1. All TÜBİTAK's support, including for academic research, business research, and grants for business capacity-building.

Source: TÜBİTAK (2015a) Bilim Ve Teknoloji Yuksek Kurulu 28. Toplantisi Hazirlik Notlari (28th Meeting of Supreme Council for Science and Technology Preparation Report), TÜBİTAK, Ankara.

StatLink http://dx.doi.org/10.1787/888933390061

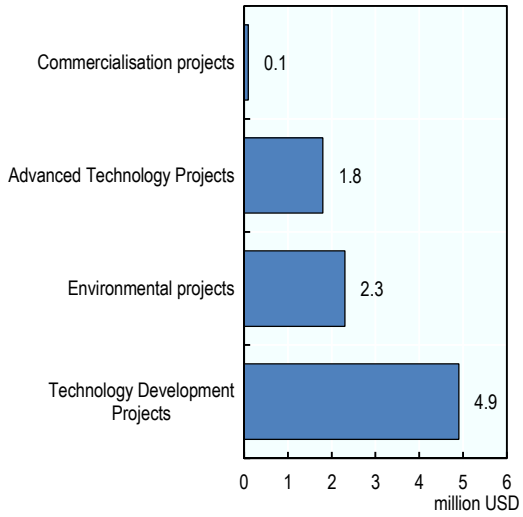
Figure 6.14. TTGV support for food, energy and water priority STI areas, between 2003 and 2014



Source: TÜBİTAK (2015a) Bilim Ve Teknoloji Yuksek Kurulu 28. Toplantisi Hazirlik Notlari (28th Meeting of Supreme Council for Science and Technology Preparation Report), TÜBİTAK, Ankara.

StatLink http://dx.doi.org/ 10.1787/888933390079

Figure 6.15. TTGV support for food area by facility, between 2003 and 2014



Source: TÜBİTAK (2015a) Bilim Ve Teknoloji Yuksek Kurulu 28. Toplantisi Hazirlik Notlari (28th Meeting of Supreme Council for Science and Technology Preparation Report), TÜBİTAK, Ankara.

StatLink http://dx.doi.org/ 10.1787/888933390086

28 SMEs in agricultural machinery manufacturing and 20 in food, beverage and tobacco processing participated per year in this programme. Agricultural machinery manufacturers received on aggregate around TRY 5 million (USD 220 000) over these three years, and food, beverage and tobacco manufactures received TRY 3 million (USD 140 000). SMEs in food wholesaling, retailing and food services did not participate in this programme in 2013-15.

The Turkish Technology Development Foundation (TTGV) supports companies engaged in RD&I through several programmes (Figure 6.12). The Technology Development Project Support provides large concessional loans to companies developing innovative technological products and processes, while the Commercialisation Project Support helps these same companies to commercialise their products. Industrial enterprises and software companies are the target beneficiaries of these programmes; this support therefore does not directly concern the agro-food area, but is in principle available to all food enterprises and developers of software for the agro-food sector.

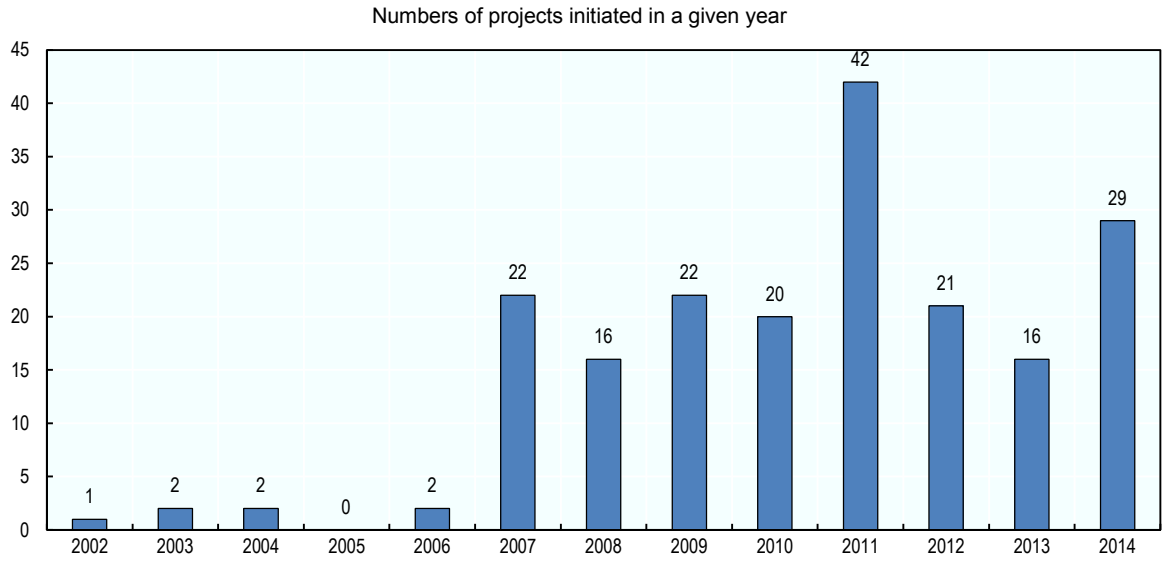
Almost all priority support areas under TTGV's Advanced Technology Projects Support have relevance to agriculture, including the production of bio-products from agricultural waste with high value added and related technologies, production of renewable energy, food technologies, biomedical technologies, and advanced technologies for adaptation to climate change. However, as of end 2014, only one agro-food project was financed.

TTGV also supports environmental projects, such as technology applications for cleaner production (e.g. minimising waste water, environmentally-friendly products, or carbon capture and storage systems) and energy efficiency that target industrial energy-intensive sectors. Figure 6.14 illustrates the distribution of project numbers and related TTGV funds across three STI priority areas: food, energy, and water. Between 2003 and 2014, TTGV financed 20 agro-food projects; this compares to 33 in energy and 3 in water. Technology Development Project Support programme has funded 16 of the 20 agro-food projects and disbursed the largest amount of total credit (Figure 6.15).

R&D public-private and university-private partnerships

A joint research and development project framework between MOFAL and private research was initiated in 2007. Under this arrangement, private research (legal or physical persons) can use public R&D infrastructures (e.g. laboratory equipment) and research personnel, but provide the funding for the implementation of the project. Since the introduction of this framework, 30 agricultural research institutes and 130 private companies and NGOs have initiated 188 joint projects (Figure 6.16).

Figure 6.16. Joint R&D projects of MOFAL's research institutes and private sector



Source: MOFAL (2015b), *Ozel Sektor Isbirligi Projeleri* (Private Sector Cooperation Projects), retrieved 3 February 2016 www.tarim.gov.tr/TAGEM/Menu/17/Ozel-Sektor-Isbirligi-Projeleri.

StatLink http://dx.doi.org/10.1787/888933390092

To date, projects based on public-private partnerships have concentrated on increasing productivity and efficiency of fruit, vegetable, and plant production and high quality seeds. One well-known example is the Development of F1 Hybrid Vegetable Varieties and Public-Private Partnership for Seed Production, initiated in 2004 and involved five MOFAL research institutes, six public and one private university, and 30 private seed companies, extension services of MOFAL, farmers, consumers, and input suppliers (fertilisers, equipment, pesticides, etc.). This project sought to increase the use of hybrid seeds derived from local varieties from 10% in 2004 to 60% in 2014. It included the training of technical personnel from the public and private sectors, the development of inbred materials with high quality characteristics, and testing against biotic and abiotic stresses and nematodes, as well as the release of the inbred lines to the private sector (Akkoyunlu, 2015 based on EC, 2012). This project also aimed at increasing farmer participation in technology development.

Beyond allowing the private sector to use public research infrastructure and personnel, the government also promotes public-private partnerships through public grants. For example, TÜBİTAK's calls for projects under the scheme 1003 Priority Subjects R&D may specify that a project should be conducted by a research consortium, e.g. comprising universities, public and private R&D institutions. In this way, public grant provision promotes collaboration with possible creation of PPPs.

TÜBİTAK's scheme 1505 University-Industry Collaboration supports joint work between universities and private R&D providers. However, regulatory limitations and the complexity of formal procedures hinder university-industry collaboration. The 1981 Higher Education Council Law No. 2547 imposes restrictions on the employment of university researchers outside universities, which led many

universities to establish Technoparks where such restrictions are relaxed (Hiziroğlu, 2010). University scientists engaged in such partnerships must devote much time to adhere to legal and bookkeeping requirements, which reduces the time allocated to actual research (Akkoyunlu, 2015). The current system likely produces diverging signals for the engagement of university scientists in their collaboration with private sector.

Venture capital

Around 30 venture capital institutions operate in Turkey, in addition to angel investors and business incubators. Venture capital is primarily involved in the development of information technology (IT), industry, defence or medical technologies, but there are examples in food and biotechnologies. Regional development agencies (RDA) function across 26 Turkish regions, typically as joint undertakings between provincial and municipal authorities, local businesses and their organisations. The primary role of RDAs is to mobilise funding for regional and local development projects. These agencies may create subsidiaries operating as business angels for small local companies and promoting technology transfer.

Beyond public and private funding considered in this section, agro-food companies can benefit from substantial tax concession on business investment and business R&D (Chapter 3).

6.7. Fostering knowledge flows: Intellectual property protection

Turkey engaged in the reform of intellectual property rights (IPR) in 1995 to align its national regulatory framework with international standards, in particular by joining the WTO's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). In 2000, Turkey signed the European Patent Convention and became a member of the European Patent Office. A new law on Protection of Breeder Rights Related to New Plant Varieties was adopted in 2004, and in 2007 Turkey joined the International Convention for the Protection of New Varieties of Plants (UPOV) (the 1991 Act), thus committing to international standards and rules.

IPR legislation had been considerably strengthened. IPR provisions were included in the Turkish Constitution and specific infringements of IPR have become subject to the Turkish Criminal Code. Numerous laws and regulations on different aspects of IPR were adopted or amended, while the establishment of specialised IP courts and of the Turkish Patent Institute were steps towards stronger law enforcement. The government's 2016 Action Plan includes a new Patent Law providing stronger support to high-value added activities (OECD, 2016d).

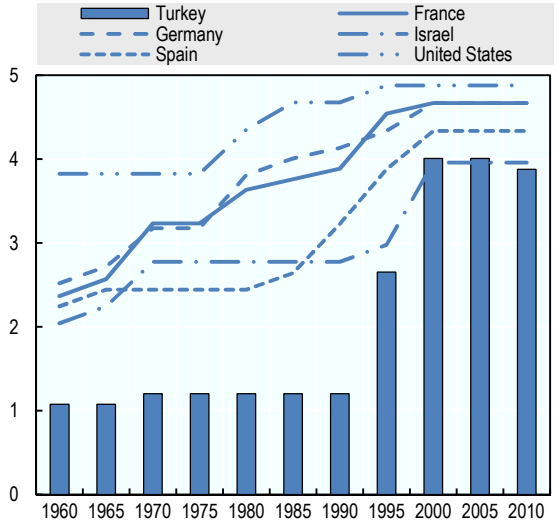
The strengthening of IPR protection since mid-1990s is evidenced by the patent protection index developed by Park (2008). It accounts for patent duration, enforcement, loss of rights, membership and coverage (Figure 6.17.A). Improvements in IPR protection are also reflected in the index on new plant varieties published by Campi and Nuvolari (2013) (Figure 6.17.B). Notwithstanding the progress to date, both indexes show that IPR protection in Turkey is not at the same level as in countries more advanced in this area.

Several sources mention the issues of high transactions costs associated with the execution of IP rights. Gün and Partners (2011), for example, mention the fragmented character of Turkish IPR regulations which consist of numerous pieces on different IPR issues. They also point to discrepancies between national regulations and the European Patent Convention that lead to difficulties in the interpretation and application of the law by the courts. Hiziroğlu (2010) finds IP disclosure procedures burdensome; this is combined with a lack of skilled IP professionals, particularly when it concerns the patenting of inventions generated in the public sector. A Special 301 Report by the United States Trade Representatives in 2014 maintained Turkey on its IPR Watch List. It stated that IPR procedures and practices in Turkey need to become more transparent, while the approval procedures need to respect regulatory approval time. It also qualified law enforcement as an area requiring improvements, in particular on IPR protection (USTR, 2015). These issues, and possibly others, have contributed to

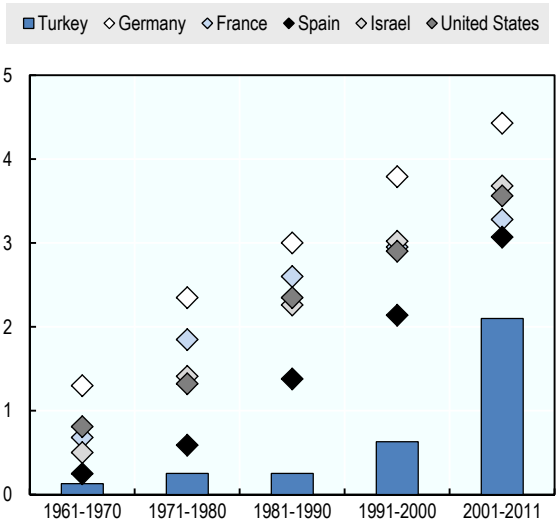
businesses evaluating IPR protection in Turkey as relatively low compared to the majority of OECD countries (Figure 6.17.C).

Figure 6.17. Intellectual Property Protection indicators

A. Patent Protection Index, 1960-2010
Score 1 to 5 (best)



B. Plant Variety Protection Index
Score 1 to 5 (best)

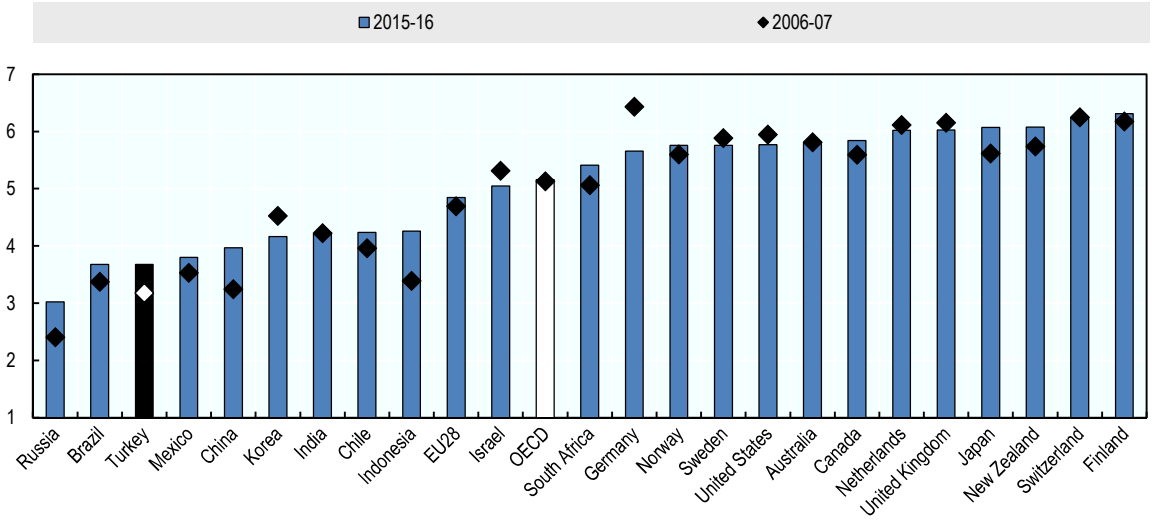


Note: Overall index is the sum of indices for duration, enforcement, loss of rights, membership and coverage.

Source: Unpublished update by the OECD Secretariat of the series from Park, W.G. (2008), "International Patent Protection: 1960-2005", Research Policy, No. 37.

Source: Campi and Nuvolari (2013), IP *Protection in Plant Varieties: A New Worldwide Index (1961-2011)*, http://hdl.handle.net/10419/89567 .

C. WEF Intellectual Property Protection Index
Score 1 to 7 (best)



Note: Indices for EU28 and OECD are the simple average of member-country indices.

Source: WEF (2015), *The Global Competitiveness Report 2015-2016: Full data Edition*, http://reports.weforum.org/global-competitiveness-report-2015-2016/.

StatLink http://dx.doi.org/10.1787/888933390104

IPR protection in agro-food area faces a challenge to provide sufficient incentives to inventors (and investors), while making innovations accessible more broadly, in particular for small farmers. Karapinar and Temmerman (2010) suggest this requires exploiting the flexibilities in international IP agreements which form the basis of IP regulation in Turkey. Thus, WTO TRIPS Agreement sets the minimum standards for IP protection and leaves considerable discretion to national governments in the adjustments of regulations. It leaves open to national governments whether to patent or not plants, animals, essentially biological processes for production of plants and animals and other subjects related to agro-food. Under the European Patent Convention, plant and animal varieties and essentially biological processes are not generally patentable, but this provision has significant exclusions that give national bodies wide freedom to regulate the scope of IP rights and claims.

Karapinar and Temmerman (2010) argue that the flexibility embodied in international IP bindings, such as research exemptions, purpose-bound protection, and farmer privileges, could strengthen the adoption of innovations in the agro-food area.[1] It could also provide opportunities to adjust regulations in a way to provide greater benefits to smallholders, an issue highly relevant in Turkey. For example, the broad use of "farmer privileges" provision would allow agricultural producers to re-plant protected crops. Given that the majority of Turkish farmers keep seeds for replanting, they may receive substantial benefits from the broad application of such a provision, particularly small producers. Another avenue is the development of *sui generis* systems ("systems of its own"). Such systems could be beneficial for inventions created through PPPs and for low-tech innovations, for example in livestock breeding.

6.8. Facilitating knowledge flows and linkages within the AIS

Agricultural extension is a traditional AKIS institution that allows for knowledge flows. Other, less formal, institutions such as knowledge networks, platforms, consortia, and more formal ones, such as knowledge transfer offices, technoparks, and regional development agencies are all important structures for knowledge flows.

Agricultural extension services

The public system of agricultural extension in Turkey has a long history and continues to play the dominant role in transferring knowledge to producers. This system has a hierarchical territorial organisation, combining MOFAL's Department of Farmer Training and Extension and offices within the territorial administrations at the provincial and district levels. The territorial extension offices operate in 81 provinces and 957 districts across Turkey, with 10 000 extension workers on the ground who live and work in villages as employees of district administrations. Ozcatalbas et al. (2011) characterise this system as top-down, and which is predominantly based on the technology transfer philosophy whereby scientists determine research priorities, and pursue innovations they believe beneficial to farmers, and then release and disseminate the results to extension agents. This approach tends to underestimate the feedback from farmers and their participation in the formulation of research and extension agenda. Savran et al. (2011) also argue that the resources (finance, staff, and infrastructure) of the public extension service are insufficient for the number of people involved in agriculture. They highlight the need to involve more non-government providers. Bostan-Budak et al. (2005) and Sezgin (2010) have shown that Turkish farmers and producers are willing to pay for agricultural extension services as long as the information is useful.

Private companies and NGOs also provide extension services to agricultural producers and agro-businesses. The government has recently encouraged the involvement of non-government providers. In 2006, farm organisations, private companies and independent agricultural advisors were authorised to provide extension and consultancy services. Today, over 1 000 individual and non-government institutions operate in 80 provinces. MOFAL provides training and issues certificates of competency. The Agricultural Extensions Support System has been in place since 2009; 823 non-government

advisers have received on average TRY 600 (USD 222) as government support. In 2009, these advisors served 3 145 agricultural businesses, with their outreach increasing to 155 964 businesses in 2015.

The government has been promoting a pluralistic and participatory approach to agricultural extension involving private agricultural consultants and consultancy companies, private sector, cooperatives, farmers' and agricultural organisations, universities and NGOs, as well as government agencies.

An example is the Leader Farmer Project (LFP) which was first implemented in Tekirdağ with the support of the Turkish Union of Chambers of Agriculture (TZOB), German Agricultural Union (DLG), and German Agency for Technical Cooperation (GTZ). Two German experts, one advisor, and the volunteer farmers collaborated in a project to increase agricultural productivity through innovation. The project also sought to increase farmer engagement with extension and to encourage them to be responsible producers capable of problem solving. Agricultural knowledge and information was transferred from the experts to farmers. In the course of adopting new practices, the farmers were monitored and received advice. As a result, 91% of the LFP participants made savings on agricultural inputs, 73% produced new agricultural products, 81% discussed agricultural issues amongst each other, 38% have achieved productivity increases due to improved animal husbandry, 16% have seen increases in crop yields, and 91% have renewed machinery and equipment. This experience subsequently spread to other regions in Turkey (Ozcatalbas et al., 2011; Akkoyunlu, 2013).

Universities as disseminators of knowledge to farmers

Several universities, such as Cukurova University (located in an agriculture intensive zone Adana) and Sutcu Imam University (Kahramanmaras), have Agricultural Extension and Research Centres within their structures. These centres provide training for farmers in modern agricultural technologies by establishing direct contact with farmers and encouraging them to use new agricultural applications and techniques developed at the universities. They also cooperate with MOFAL's provincial directorates in providing training to farmers. Firat University has launched the Farmers' Education Centre as part of its Agriculture and Husbandry Application and Research Centre for the training of local farmers in modern technologies. Ege University has been engaged in knowledge dissemination to farmers for quite some time. In 2014, for example, it signed an agreement with Bademler Village Agricultural Development Cooperative to provide scientific support to the activities of cooperatives. This agreement serves as a framework for university researchers to identify the problems of farmers and find scientific solutions to their technological difficulties. Another more recent initiative of Ege University was the signing of a cooperation protocol with Bornova Municipality of Izmir in January 2016. It foresees the provision of education and training of farmers in Bornova with an emphasis on environmentally-friendly production techniques.

Other channels of knowledge transfer to farmers

In regions where strong agricultural cooperatives exist, the Aegean and Izmir regions for example, they are active in agricultural research and the main disseminators of innovations. For example, Bademli Arboriculture Cooperative (BAC) in Odemis of İzmir is active in R&D and extension services in nursery plant and nursling production. However, in other regions, such as South Eastern Anatolia, cooperatives either do not exist or are too weak to perform R&D and extension.

Mass media and internet are important channels for the transmission of agricultural knowledge in Turkey. Yener and Oguz (2014) find that 91.8% of dairy farmers in Eregli-Konya learned about innovations through television. They also show that for the dairy farms, farm size, education level and visits to agricultural departments of city or town administrations had an impact on the adoption of innovations. However, only 18.4% of dairy farms benefitted from the contacts with faculties of agriculture, suggesting weak links between farmers and research centres, universities and centres of agricultural publications; this is consistent with the results of Boz et al. (2008), and Gul and Tatlidil (2012).

University-industry knowledge flows: Technology Transfer Offices

Technology Transfer Offices (TTO's) are institutions that facilitate the commercialisation of university R&D products by linking university research with business. Although TTOs are not new, the government has recently promoted their establishment as part of the initiatives to increase the contribution of university research to economic development. Since 2011, TÜBİTAK has offered support schemes for the initiation, capacity building and the setting-up of TTOs. The Technology Transfer Offices Support Program (N1513) provides grants for a period of ten years based on annual budgetary plans of TTO's. The rate of support for the first five years is 80%, and 60% for the following five years. The annual upper limit of support is TRY 1 million (USD 370 000). Support coverage is wide and includes staff costs, accommodation, equipment, software, publications, purchase of services, costs of meetings, publicity and organisation, and other general costs. In addition to this programme, Support Program for Capacity Development in Innovation and Entrepreneurship Program (N1601) also provides grants for TTO's and their establishment. One condition for universities to benefit from this programme is to be listed amongst at least one of the "Entrepreneurial and Innovative University Indices" and not have benefited from grants of the 1513 Programme. Since 2012, 25 such structures have been created in different universities with support from TÜBİTAK's 1513 Programme and nine others were supported in the preparation stage within 1601 Programme.

TTO's perform various functions. The principal one is the consultancy on legal issues related to contracting between universities and industry, patenting, and intellectual property rights. Another important activity is the inventory of university R&D, matching it with industry demand, and identifying the marketing opportunities for university R&D. TTOs are also a source of information on national and international R&D funding opportunities, project preparation, documentation, and project management.

TTOs have multiple organisational and legal status variations and often operate as part of the university Technoparks. In principle, TTOs and Technoparks are open to businesses in all sectors, but usually their business focus depends on the specialisation of universities. ICT businesses typically have substantial presence in university Technoparks and TTOs, reflecting the importance of the ICT in university activities; this is also due to a relatively quick commercialisation of ICT innovations and less costly R&D infrastructure. The cooperation of Middle East Technical University (METU), for example, is focussed on ICT-Telecommunications, and also areas such as electronics, life sciences and advanced materials and design. METU is not engaged in agricultural sciences, but has a prominent food engineering department and hosts five agro-food companies in its Technopark.

Universities with large agriculture and food faculties are likely to be engaged more substantively in the co-operation with agro-businesses. Forty-three universities in Turkey have R&D capacities in the fields of agriculture and food. An example is Ankara University with a large and nationally reputed agricultural faculty. Eight companies in agro-business and four in veterinary medicine are established in Ankara University Technopark among 90 companies operating there; the university has plans to establish an Agrokent Technopark specifically for agro-food projects. Another example is Technopark of Selcuk University which identifies agricultural technologies as a top theme; Aegean University and Cukurova University, important centres for agriculture and food, are also likely to engage with agro-businesses, although no exact information about such activities in these universities is available.

Hiziroğlu (2010) highlights the associated challenges of university R&D commercialisation. Among the issues on the business demand side, the typically early-stage nature of university technologies diminishes the willingness and capacity of corporations to take them up, while among small innovating businesses only a few are able to negotiate with universities to license a technology. According to the representatives of METU Technopark, companies that operate domestically may not be aware of the available university R&D products and tend to look for technologies abroad. Hiziroğlu (2010) points out that university R&D outputs are often vague in terms of commercial application, and are often not tested or patented. They also require significant investment to be functional and lack assessments of market perspectives.

6.9. R&D outcomes

Monitoring progress in innovation across time and across countries is necessary to evaluate and adjust R&D policy and decide on its future directions. A range of indicators can be employed, including those from international databases. These indicators cover primary agriculture and upstream and downstream industries, and the types of innovation. In addition, surveys can inform about the variety of innovators and types of innovations generated and show the extent to which farms and firms have adopted innovations.

The number of patents in a country is a possible indicator of innovation. Based on data from the Turkish Patent Institute, Karapinar and Temmerman (2010) estimated a considerable increase in patents granted in Turkey in the fields of agriculture and biotechnology during the 2000s. However, the vast majority (90% in agriculture and 99% in biotechnology) were registered by non-residents. These authors consider the precedence of foreign generators of new technologies as an indication of the weakness of "home-grown" innovation. Plant variety development is an active area in Turkey, still in 2013 non-residents received almost 54% of all plant variety titles granted in Turkey (WIPO, 2014).

Turkey's performance in patenting can be compared internationally by looking at the filings under the Patent Co-operation Treaty (PCT). [2] Agro-food patents[3] constitute only a small share of the country's total patent applications under the PCT. Although the number of filings has been increasing, it lagged behind most OECD countries, both in absolute and relative terms. Over 2006-11, Turkey made only 66 PCT agro-food filings (2.7% of the applications in all fields) compared to 1 194 (5.6%) for the OECD on average (Table 6.1 and Annex 6.A2). This modest ranking can unlikely be related to the low importance of the agro-food sector in Turkey but rather to the institutional impediments, such as transactions costs to submit a patent as discussed above.

Patenting is a partial indicator of innovation as only a fraction of inventions are effectively patented and adopted. Patent numbers should be considered along with patent quality in order to obtain a more comprehensive evaluation of progress in innovation OECD (2013). Furthermore, not all types of innovations are patentable according to law, while separate systems protect other IP products: Plant Breeders' Rights for plant varieties, trademarks for processed agricultural products (and in some cases for animal breeds), and geographical indications. As partial as it is, patenting remains a useful measure of R&D outcomes, while the availability of international databases on patents allows for an international benchmarking of countries.

Bibliometrics on agriculture and food sciences provides additional measures of R&D outcomes. Compared to patents, bibliometrics indicates a somewhat higher weight of agriculture and food sciences in Turkey and a higher contribution to world R&D. Agriculture and food sciences constitute around 9% of all scientific publications in Turkey, which is approximately in the range of OECD countries with similar agricultural specialisation, such as Italy, Greece, Spain, or Hungary (Table 6.1, Annex 6.A3 and Annex 6.A4). This share is roughly comparable with the aggregate share of the agriculture and food sectors in Turkish GDP (in all other countries mentioned above the weight of agro-food publications exceeds the sectors' GDP shares).

Comparisons across time show a considerable increase in Turkey's world share of agriculture and food scientific publications, in part reflecting the increase in R&D investments and strengthening of performance-based funding (Figure 6.18). Citations can reflect the quality of the R&D contribution. However, despite this increase in Turkey's contribution to the agro-food science literature, which has surpassed the EU average, citation rates remain low. This may be due, for example, to an insufficient quality or relevance of publications, or limited recognition or internationalisation of Turkish scientific output.

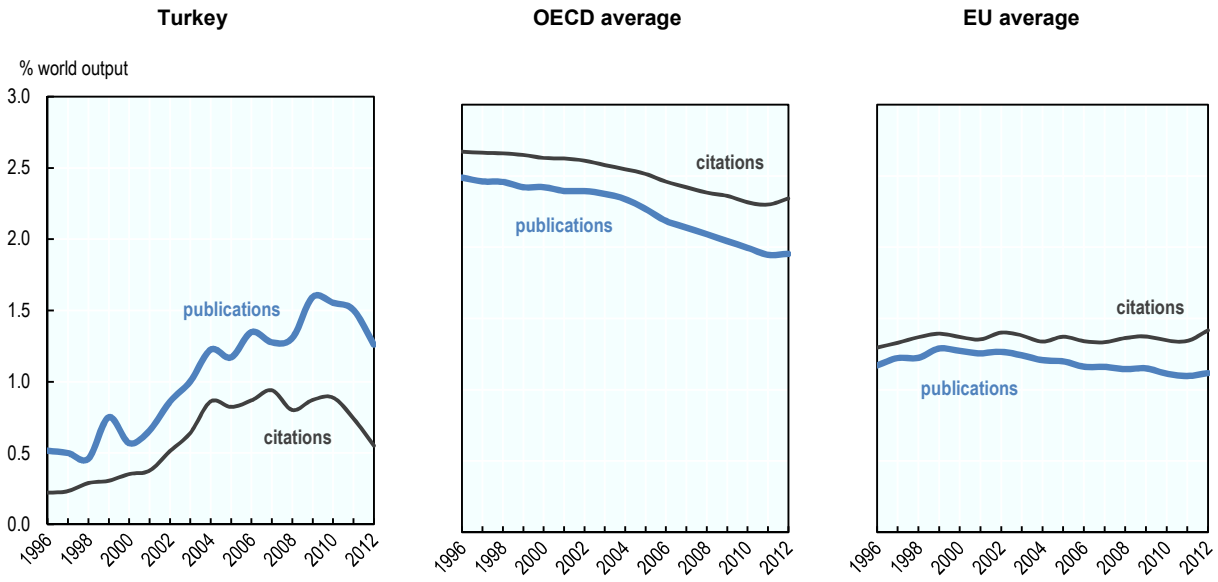
Table 6.1. Turkey's R&D outcomes in international comparison, 2007-12

Turkey	Italy	Greece	Spain	Hun-gary	Poland	Ger-many	France	Nether-lands	Israel	United States	EU28 average	OECD average
Specialisation: Agriculture and food science outputs as a share of country's total (%)												
Patents[1]												
2.7	5.1	6.5	10.2	6.2	9.4	4.4	5.3	8.8	6.2	6.8	5.7	5.6
Publications												
9.0	7.0	6.8	10.4	10.6	7.5	6.4	7.1	6.9	6.5	6.7	8.4	9.4
Citations												
8.5	6.2	7.0	10.8	21.9	16.4	16.9	8.0	6.4	14.8	6.3	10.7	11.9
Contribution: Country's share of world agriculture and food science output (%)												
Patents[1]												
0.04	0.6	0.02	0.6	0.05	0.1	2.7	1.3	1.0	0.4	10.8	9.5	0.7
Publications												
1.4	2.9	0.6	3.6	0.5	1.1	4.5	3.6	1.6	0.5	18.3	1.1	2.0
Citations												
0.7	3.7	0.7	2.9	0.3	0.7	5.7	4.5	2.8	0.7	27.2	1.4	2.4

1. Patent data refer to 2006-11.

Source: OECD (2014c), *Patent Database*, www.oecd.org/sti/inno/oecdpatentdatabases.htm; SCImago (2014), *SJR — SCImago Journal & Country Rank*. Retrieved19 March 2014, from www.scimagojr.com.

Figure 6.18. Publications and citations in agricultural and food sciences, 1996-2012



Note: Agricultural and food science publications include the following Scopus journal classifications: agronomy and crop science, animal science and zoology, aquatic science, ecology/evolution/behaviour systematics, forestry, horticulture, insect science, plant science and soil science, and food sciences.

Source: SCImago (2014), *SJR - SCImago Journal and Country Rank*, retrieved 19 March 2014, from www.scimagojr.com.

StatLink http://dx.doi.org/10.1787/888933390116

6.10. International co-operation in R&D

International co-operation in agricultural R&D offers universal benefits. While this is generally true given the public good nature of many innovations in agriculture, it is particularly the case in view of current global challenges, such climate change, and when initial investments are exceptionally high. International co-operation allows national systems to specialise in areas of particular relevance, while at the same time benefit from international spill-overs. In countries with limited research capacity, scarce resources could better focus on local specificities.

The strengthening of international STI co-operation is an objective of the current National STI Strategy 2011-16 that cut across all STI subject areas (Figure 6.5). The Strategy spells out specific tasks to foster international co-operation, such as identifying priority partner countries and learning from their experiences, promoting the participation of national experts in supra-national STI organisations, greater engagement of the private sector in international STI agreements, inclusion of STI activities in Turkey's international aid, and developing science diplomacy (EC, 2014b).

EU collaboration constitutes the main vector of Turkey's international co-operation. Turkish policy has sought to encourage domestic actors to exploit the benefits of existing EU frameworks and platforms for networking, knowledge and technology transfer, joint research and innovation activities, access to new markets, etc.

Turkey has integrated the European Research Area (ERA). It is represented in the European Research Area Committee (ERAC) and its sub-committees, such as High Level Group for Joint Programming (GPC), Strategic Forum for International cooperation (SFIC), Knowledge Transfer Group, Steering Group for Human Resources and Mobility (SGHRM) (EC, 2014d).

Turkey has been associated with ERA's Framework Programmes (FPs) since 2003. Under the previous FP7 period (2007-13), over 1 000 participants from Turkish public and private institutions in some 950 projects received almost EUR 200 million in EU funding. These included science projects selected by the European Research Council and support for young researchers under the Marie Skłodowska-Curie Actions. Some projects concerned food, rural development and environmental issues. More than 200 participants took part in joint research projects by Turkish SMEs (EC, 2014d). Turkey's engagement in ERA continues under the Horizon 2020 Programme (FP8 for 2014-20). The EU Commission has highlighted that more funding will become available for small companies; given the importance of SMEs in the Turkish economy this opens possibilities to increase its participation in Horizon 2020 (EC, 2014c).

Beyond EU Framework Programmes, Turkey is a member of the European Cooperation in Science and Technology research networking (COST). It currently chairs three COST networks, including the network on one of the food safety topics. Turkey's participation in COST activities has been increasing and now concerns almost 500 topics in various fields, including 77 directly related to agriculture and food, and also topics in the fields of forestry, environmental protection, climate change, water, and renewable energy (COST, 2016).

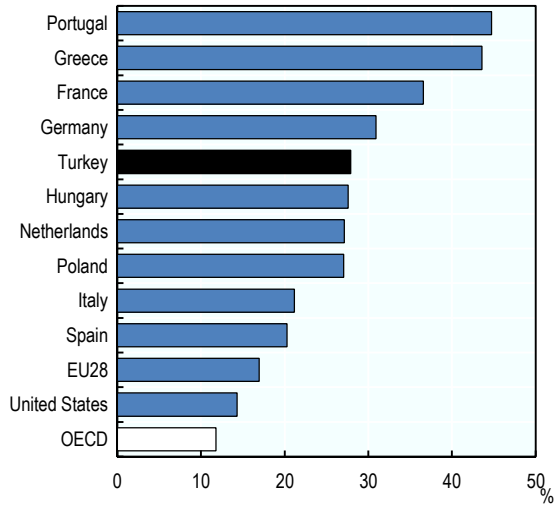
Turkey is a member of the EU Standing Committee on Agricultural Research (SCAR), which plays a major role in the coordination of agricultural research efforts across the ERA.

Turkey has been increasingly active in EUREKA, an international platform for entrepreneurs performing R&D, and chaired it between July 2012 and July 2013. Since November 2010, Turkey has participated in 120 projects and ranked 12th among 39 EUREKA partner countries. In 2011, it improved its ranking to become 11th among 42 countries. One of EUREKA's umbrella organisations is EuroAgri network (EuroAgri FoodChain 2), in which Turkey is one of 12 country-participants.

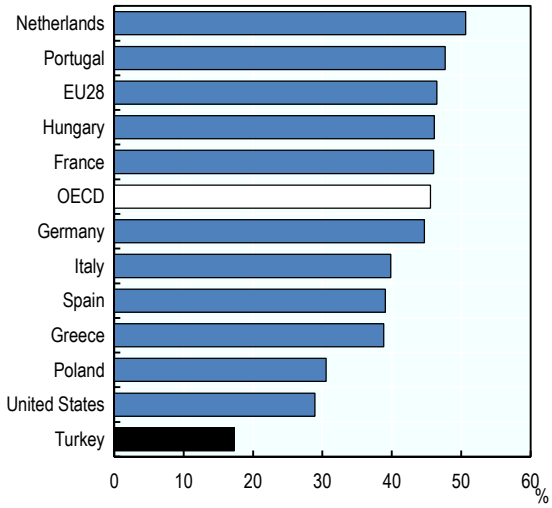
TÜBİTAK is a member of the European Science Foundation (ESF) which seeks to facilitate international collaboration on research programmes through peer reviews, evaluation, and conferences, as well as through support to career tracking.

Figure 6.19. International co-operation in agro-food R&D

A. Agriculture patents with foreign co-inventor as a share of total agricultural patents, 2006-11



B. Agriculture publications with foreign co-inventor as a share of total agricultural publications, 2007-12



Note: Agriculture patents include IPC classes A01, A21, A22, A23, A24, B21H 7/00, B21K 19/00, B62C, B65B 25/02, B66C 23/44, C08b, C11, C12, C13, C09K 101/00, E02B 11/00, E04H 5/08, E04H 7/22, G06Q 50/02. Patent counts are based on the priority date (first filing of the patent worldwide), the inventors' country of residence, using simple counts.

Source: OECD (2014c), *Patent Database*, www.oecd.org/sti/inno/oecdpatentdatabases.htm.

Note: Agricultural science publications include the following Scopus journal classifications: agronomy and crop science, animal science and zoology, aquatic science, ecology/evolution/behavior systematics, forestry, horticulture, insect science, plant science and soil science, and miscellaneous agriculture/biological sciences.

Source: SCImago (2014), *SJR - SCImago Journal and Country Rank*, retrieved 19 March 2014, from www.scimagojr.com.

StatLink http://dx.doi.org/10.1787/888933390128

Research projects with international collaboration can receive financial support from TÜBİTAK through several international support schemes. These are largely oriented at EU frameworks for collaborative research and provide the opportunity to tap into EU co-financing. Thus, academic research can benefit from TÜBİTAK's International Support Programmes scheme, while national entrepreneurs can receive grants from the International Industrial R&D Projects Support Programme, for example, for EUREKA projects. Arrangements exist to promote inward mobility of international researchers. Individual foreign researchers and Turkish citizens working abroad who wish to work in Turkey can receive various TÜBİTAK's fellowships, depending on their academic status, project specificity, and the length of engagement. Foreign scholars can also benefit from special residence permits. Local researchers have access to EURAXESS – Researchers in Motion, a pan-European initiative that provides researchers wishing to pursue their careers in Europe or stay connected to it access to a complete range of information and support services.

International co-operation in agro-food area beyond the European Union includes activities with the World Bank, UN Food and Agriculture Organization (FAO), and the International Fund for Agricultural Development (IFAD). In 2005, Turkey joined CGIAR (Consultative Group for International Agricultural Research), a global partnership for agricultural research for development mandated to work on poverty, hunger and major nutrition imbalances, and environmental degradation. As an OECD member, Turkey participates in OECD's Global Science Forum and in its thematic activities.

Based on the most recent available information, Turkey cooperates with 90 global and regional organisations through specific science and technology agreements in all areas of research. TÜBİTAK

also had project-based bilateral cooperation with 40 organisations from 31 countries. There is also a bilateral international cooperation at the level of individual research institutes and universities.

Internationally co-authored patents and publications reflect the degree of international collaboration. Considering the filings under the PCT, Turkey had only a small number of agro-food patents with a foreign co-inventor: during 2006-11 it was 29 versus around 330 for Italy or Spain. Turkey's co-authored patents, nevertheless, represented almost 28% of its all agro-food patents; a similar share for OECD area was 12% and 17% for the European Union. Almost three quarters of country's co-authored patents were in food processing, suggesting that within the agro-food area co-patenting in agricultural sciences is limited. This is, however, common internationally (Figure 6.19 and Annex 6.A5).

Between 2007 and 2012, Turkish authors produced a relatively small number of joint publications with foreign co-authors in agro-food sciences. In an international comparison, this constituted one of the lowest shares of total agricultural science publications in a country. Less than one out of five agriculture science publications by Turkish scholars had foreign co-authors, while almost every second publication in the OECD area and in the European Union (Figure 6.19.B and Annex 6.A5).

The indicators discussed above suggest that while Turkey has been active in the integration of international collaboration frameworks in the agro-food area, particularly at EU level, it has yet to advance substantially in exploiting the potential of these frameworks.

Summary

- The Turkish Agricultural Innovation System (AIS) functions as part of the overall STI system. This results from the National STI Strategy and its objectives to improve STI performance that cut across all economic sectors. The integration of the AIS into the overall STI system is also due to the centralised R&D planning and funding, and the cross-sectoral applicability of the main R&D support programmes.
- Alignment with EU principles of STI governance has been the main driver of change. The provisions of the "Competitiveness and Innovation" section of the Country Action Programme for Turkey's EU Pre-Accession Assistance have largely fed into the National STI Strategy and the underlying implementation documents.
- The concept of a Turkish Research Area, similar to the European Research Area, has been adopted and emphasises the synergies and co-ordination between national actors towards the broadly-shared STI goals. A consultative approach to STI policy formulation and R&D planning has been promoted through stakeholder consultations and arrangements such as the Ministry's advisory board and food technology platform.
- Research projects and individual researchers undergo regular performance evaluations. The overall evaluation of research institutions is not yet systematically carried out in Turkey. There is also no systematic evaluation of support programmes. However, initial work has begun to establish such practices.
- Agro-food is an STI priority area, and together with water and energy, forms the resource nexus for development. The National Food R&D and Innovation Strategy views higher productivity of agriculture, stronger integration between primary production and the food industry, increased value added at all stages of the food chain, and sustainable use of natural resources as priorities. It also emphasises the development of a robust national food safety system.
- The government has been making important investment in R&D infrastructure, including in agro-food research. Scientists and businesses in the agro-food area can receive project-based funding through a range of general schemes available from various public and semi-public institutions. Agro-food projects can also tap into specific support targeted to priority STI areas. The data on overall funding of all these sources are partial, which prevents any generalisation on the

importance of agro-food activities in the overall public support to R&D and innovation. For certain funding flows, however, agro-food appears to be an important recipient of support.

- Despite more than tripling real gross expenditures on agricultural R&D since the mid-2000s, this is one of the lowest levels relative to the value added in agriculture within the OECD area. The catch-up in R&D intensity has been developing from a low base and takes time. Low business participation may also be a factor in explaining the overall lag in R&D intensity of the agro-food system in Turkey.
- Government and higher education sectors remain the principal performers of agricultural R&D, with the business sector share far below those across all science fields in Turkey (this is a common feature internationally). Business participation in agro-food research in Turkey is limited when compared to other countries.
- Turkey's agro-food R&D outputs – patents, publications, and international citations – have increased rapidly over the past 20 years, but the country yet remains a modest agro-food R&D performer in international comparison.
- Although active in integrating international collaboration frameworks in the agro-food area, particularly at the EU level, Turkey has yet to advance substantially in exploiting the potential of these frameworks.
- Turkey has made important efforts since the early 2000s to develop its STI capacities and introduce new governance principles into this area, as well as new support instruments. However, there is considerable room for improvement in STI performance when compared with the majority of OECD countries, particularly where "quality" and "impacts" of STI are concerned. The current National STI Strategy will end in 2016. This will be an important juncture for to evaluate current policies and support mechanisms.

Notes

1. TARAL emphasises conceptual integrity and co-ordination of STI activities within a common strategic framework. This concept also implies that R&D institutions (universities, research institutes, industry, etc.), R&D beneficiaries (private and public institutions, NGOs, etc.) and R&D funders function in coordination in view of the National Science and Innovation Strategy (TÜBİTAK, 2005).
2. According to the Frascati Manual, this definition covers agriculture; forestry; fishery; soil science; horticulture, viticulture; agronomy, plant breeding; and plant protection; animal and dairy science; veterinary science; agricultural biotechnology; and other agricultural sciences. This definition does not include fields of science related to agriculture, such as industrial biotechnologies (e.g. bioproducts and biofuels), food and beverage technologies, and environmental engineering (OECD, 2007).

1. The research exemption provides for free access to patented inventions as long as they are being used for research purposes. Purpose bound protection has particular relevance for biotechnology in patenting gene sequences: it establishes that only the specific use disclosed in the patent application can be claimed.
2. Patent Cooperation Treaty is an international patent law (with 36 signatories as of beginning 2016) providing a unified procedure for filing patent applications to protect inventions in each of its contracting states.
3. Agro-food patents include patents in agricultural inputs, agricultural sciences, and food processing. A detailed list of IPC classes included in each of the three groups is contained in Annex 6.A2.

References

Akkoyunlu, S. (2013), "Agricultural Innovations in Turkey", *NCCR Trade Working Paper* No 2013/30.

Akkoyunlu, S. (2015), "Turkish innovation policy and Agricultural Innovation System (AKIS)", Consultant's report prepared for the OECD Secretariat, unpublished.

ASTI (2014), *Agricultural Science and Technology Indicators*, www.asti.cgiar.org/data.

Bostan-Budak, D., F. Budak and O.O. Kacira (2005), *Livestock Producers' Needs and Willingness to Pay for Extension Services in Turkey*, 17th European Seminar on Extension Education. August 30-September 3, İzmir, Turkey, 2005.

Boz, I. and O. Ozcatalbas (2010), "Determining Information Sources Used by Crop Producers: A Case Study in Gaziantep Province of Turkey", *African Journal of Agricultural Research*, Vol. 5(19): 980-987.

Campi M. and A. Nuvolari (2013), *IP Protection in Plant Varieties: A New Worldwide Index* (1961-2011), http://hdl.handle.net/10419/89567

COST (2016), "European Cooperation in Science and Technology (COST) on-line", COST Countries: Turkey, www.cost.eu/about_cost

EC (2014a), *Research and Innovation performance in EU Member States and Associated countries: Innovation Union Progress at Country Level 2014*. European Commission http://ec.europa.eu/research/innovation-union/pdf/state-of-the-union/2014/iuc_progress_report_2014.pdf

EC (2014b), "Country Pages: Turkey", *ERA-Watch: Platform on Research and Innovation Policies and Systems*, http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/tr/country, accessed in December 2015.

EC (2014c), "Turkey Joins Horizon 2020 Research and Innovation Programme", Press Release, European Commission, Brussels, 4 June 2014.

EC (2014d), *European Research Area Facts and Figures 2014: Turkey*, European Commission, Brussels, https://ec.europa.eu/research/era/pdf/era_progress_report2014/country_fiches/era-turkey.pdf.

EC (2012), *Agricultural Knowledge and Innovation Systems in Transition – a Reflection Paper*. Standing Committee on Agricultural Research (SCAR) Collaborative Working Group AKIS. Luxembourg: Publications Office of the European Union. http://ec.europa.eu/research/bioeconomy/pdf/ki3211999enc_002.pdf.

Government of Turkey (2015), "OECD Food and Agricultural Review: Innovation for Agricultural Productivity and Sustainability in Turkey: Questionnaire", Responses to the OECD received from the Turkish Government.

Gul, U. and H. Tatlidil (2012), "Hayvancılıga Yonelik Uurutulen Yayim ve Egitim Faaliyetlerinde Damizlik Sigir Yetistiricileri Birliginin Rolu", *Turk Bilimsel Derlemeler Dergisi*, 5(2): 64-67. ISSN: 1308-0040, E-ISSN: 2146-0132, Ankara

Gün and Partners (2011), *Overview of IPR Policy, Legislation and Enforcement*, Istanbul.

Hiziroğlu, O. (2010), "University Technology Commercialisation in Turkey", Presentation at the Conference of the Licensing Executives Society (LES) Turkey, Istanbul, 2010.

IFPRI-GDAR (2014), *Agricultural R&D Indicators Factsheet: Turkey*, International Food Policy Research Institute and Turkish Ministry of Food, Agriculture and Livestock, General Directorate for Agricultural Research and Policies, September 2014.

Karapinar, B. and M Temmerman (2010), "Intellectual Property Rights and Innovation: Promoting New Technologies in Turkish Agriculture" in B. Karapinar, F. Adaman and G. Ozertan (eds.) *Rethinking Structural Reform in Turkish Agriculture: Beyond the World bank's Strategy*, Nova Science Publishers, New York, 2010.

MOD (2014), *The Tenth Development Plan 2014-2018*, Republic of Turkey, Ministry of Development, Ankara. www.mod.gov.tr/Lists/RecentPublications/Attachments/75/The%20Tenth%20Development%20Plan%20(2014-2018).pdf

MOFAL (2015a), *Strategic Plan for 2013-2017*, Republic of Turkey, Ministry of Food, Agriculture and Livestock, Ankara. www.tarim.gov.tr/SGB/Belgeler/Stratejik%20Plan%202013-17-EN.pdf

MOFAL (2015b), "Ozel Sektor Isbirligi Projeleri (Private Sector Cooperation Projects)", Republic of Turkey, Ministry of Food, Agriculture and Livestock, Ankara. Retrieved February 03, 2016 www.tarim.gov.tr/TAGEM/Menu/17/Ozel-Sektor-Isbirligi-Projeleri.

OECD (2016a), *OECD Research and Development Statistics, Gross domestic expenditure on R-D by sector of performance and field of science*, http://stats.oecd.org/Index.aspx?DataSetCode=GERD_SCIENCE

OECD (2016b), "R&D personnel by sector of employment and qualification", *OECD Research and Development Statistics*, http://stats.oecd.org/Index.aspx?DataSetCode=PERS_SCIENCE.

OECD (2016c) *System of National Accounts*, https://stats.oecd.org.

OECD (2016d), *OECD Economic Surveys: Turkey 2016*, OECD Publishing, Paris. http://dx.doi.org/10.1787/eco_surveys-tur-2016-en.

OECD (2015), *Main Science and Technology Indicators* (database), www.oecd.org/sti/msti.htm.

OECD (2014a), "Analysing Policies to improve agricultural productivity growth, sustainably: Revised framework". www.oecd.org/tad/agricultural-policies/Analysing-policies-improve-agricultural-productivity-growth-sustainably-december-2014.pdf.

OECD (2014b), *OECD Science, Technology and Industry Outlook 2014*, OECD Publishing, Paris. http://dx.doi.org/10.1787/sti_outlook-2014-en.

OECD (2014c), *OECD Patent databases*, OECD Publishing, Paris, www.oecd.org/sti/inno/oecdpatentdatabases.htm.

OECD (2013), "Foreword", in *OECD Science, Technology and Industry Scoreboard 2013: Innovation for Growth*, OECD Publishing, Paris. http://dx.doi.org/10.1787/sti_scoreboard-2013-en

OECD (2007), "Revised Field of Science and Technology (FOS) Classification in the Frascati Manual", DSTI/EAS/STP/NESTI(2006)19/FINAL, www.oecd.org/sti/inno/38235147.pdf.

Ozcatalbas, O., I. Boz, K. Demiryurek, D. Bostan-Budak, B. Karaturhan and H. Akcaoz (2011), "Developing Participatory Extension Applications in Turkey", *African Journal of Agricultural Research*, Vol. 6 (2).

Park, W. G. (2008), "International Patent Protection: 1960-2005", *Research Policy*, No. 37, 761-766

Savran, F., K. Demiryurek, O. Ozcatalbas, A, Akin and I. Boz (2011), "The Agricultural Extension System and Practices in Turkey", *Scientific Research and Essays*, Vol. 6(8).

SCImago (2014), *SJR — SCImago Journal & Country Rank*, Retrieved 19 March 2014, www.scimagojr.com.

Sezgin, A. (2010), "Ciftcilerin Tarimsal Yayimin Finansmanina Katilma Desteklerini Etkileyen Faktorlerin Analizi: Erzurum Ili Ornegi, Tarim Bilimleri Dergisi" ("Analysis of Factors Affecting Willingness of Farmers on Their Taking Part in Financing Agricultural Extension Work: The Case of Erzurum Province"), Vol. 16.

TOBB (2013), *Tarim Raporu (Agriculture Report)*, Turkiye Odalar ve Borsalar Birligi (The Union of Chambers and Commodity Exchanges of Turkey), Ankara.

TÜBİTAK (2015a) *Bilim Ve Teknoloji Yuksek Kurulu 28. Toplantisi* Hazirlik Notlari (*28th Meeting of Supreme Council for Science and Technology Preparation Report*), TÜBİTAK, Ankara.

TÜBİTAK (2015b), "Investment in Agricultural Research and Innovation", TÜBİTAK Presentation at the Meeting of Agricultural Chief Scientists (MACS), 2015.

TÜBİTAK (2013a), *National STI Strategy 2011-2016*, www.tubitak.gov.tr/en/about-us/policies/content-national-sti-strategy-2011-2016.

TÜBİTAK (2013b), *Science, Technology, and Innovation in Turkey 2012*, The Scientific and Technological Research Council of Turkey (TÜBİTAK), Ankara.

TÜBİTAK (2011a), *Ulusal gida Ar&Ge ve Yenilik Stratejisi (National Food R&D and Innovation Strategy),* Ankara, TÜBİTAK, www.tubitak.gov.tr/en/about-us/policies/content-national-food-rd-and-innovation-strategy.

TÜBİTAK (2011b), *Ulusal su ar-ge ve yenilik stratejisi (National Water R&D and Innovation Strategy*), Ankara, TÜBİTAK, www.tubitak.gov.tr/en/about-us/policies/content-national-water-rd-and-innovation-strategy

TÜBİTAK (2005), *Bilim ve Teknoloji Yüksek Kurulu 11. Toplantısı Gelismelere Iliskin Degerlendirmeler (11th Meeting of Supreme Council for Science and Technology Evaluation of Developments),* Ankara, TÜBİTAK, www.tubitak.gov.tr/tubitak_content_files/BTYPD/btyk/11/11btyk_karar.pdf.

USTR (2015), "Special 301 Report", Office of the United States Trade Representative, Wahington D.C. https://ustr.gov/sites/default/files/2015-Special-301-Report-FINAL.pdf.

Yener, A. and C. Oguz (2014), "Factors Affecting the Adoption of Innovations in the Dairy Farms: Eregli Case Study of Konya, Turkey", *Journal of Selcuk University Natural and Applied Science*, Vol. 3(4).

Wedekind, G. K. (2013), "Turkey's Research, Development and Innovation Targets for 2023: Realistic or Far-fetched?", *Centre for Policy and Research on Turkey Research Papers*, Vol. 2(8).

WEF (2015), *The Global Competitiveness Report 2015-2016: Full data Edition*, World Economic Forum Geneva 2015, http://reports.weforum.org/global-competitiveness-report-2015-2016/.

WIPO (2014), *World Intellectual Property Indicators – 2014 Edition. Economics and Statistics Series*, World Intellectual Property Organisation, www.wipo.int/ipstats.

Annex 6.A1

Strategic objectives and tasks of the national food R&D strategy in Turkey

	Action	Main institution responsible	Related institutions	Term (Short-term: Up to 1 year; Medium-term: 1 to 3 years; Long-term: 3 to 5 years)		
				Short	Medium	Long
	SO1: Production of Raw Materials					
	Strategy 1.1: Increasing productivity of crop, livestock and fisheries production as primary raw materials					
1	Developing special mechanisms to promote R&D and innovation activities to provide inputs to production of raw materials	Ministry of Food Agriculture and Livestock (MOFAL)	Ministry of Finance, Ministry of Science, Industry and Innovation, Ministry of Economy, Ministry of Development, TÜBİTAK		X	
	Strategy 1.2: Develop crop and livestock systems conforming to quality requirements of the food industry					
2	Developing mechanisms to transfer R&D results on quality of raw materials to firms	MOFAL	Ministry of Science, Industry and Innovation, TÜBİTAK, sectoral Councils of the Union of Chambers and Commodity Exchanges of Turkey (UCCE), NGO's, Universities		X	
3	Organising periodic meetings at universities and research institutes to identify needs of primary agricultural producers	MOFAL	Relevant Cooperatives, Local Authorities, UCCE's sectoral Councils, Universities and Research Centres (Public and university), Higher Education Council (HEC), Relevant CSO's, TÜBİTAK		X	
	SO2: Food Industry R&D and Innovation					
	Strategy 2.1: Developing new technologies for food industry to reduce costs and increase quality and quantity of output					
4	Cooperating with academia to respond to the needs of food industry in qualified staff for technology development	Higher Education Council	UCCE's sectoral Councils, Universities, Ministry of Science, Industry and Technology, Ministry of National Education, Ministry of Development, MOFAL, Relevant NGO's, TÜBİTAK		X	
5	Organising information meetings for food firms on importance of R&D and innovation	TÜBİTAK	Ministry of Science Industry and Technology, Ministry of Development, Relevant NGO's, National Food Technology Platform, Turkish Patent Institute (TPI), UCCE's sector Councils	X		
6	Developing mechanisms to transfer R&D from the public sector and universities	Ministry of Science Industry and Technology	Ministry of Economics, Turkish Exporters Assembly, Universities, Research Institutes, TÜBİTAK, HEC, MOFAL		X	

	Action	Main institution responsible	Related institutions	Term (Short-term: Up to 1 year; Medium-term: 1 to 3 years; Long-term: 3 to 5 years)		
				Short	Medium	Long
7	Organising and supporting scientific activities and project markets for continuing or completed research	National Food Technology Platform, Federation of Turkish Food and Beverage Industry Associations (TGDF)	Ministry of Science Industry and Technology, TÜBİTAK, MOFAL, Universities, UCCE's food sector council, KOSGEB, Turkish Exporters Assembly, Technoparks	X		
	Strategy 2.2: Promoting participation of food industry in international R&D and consortiums					
8	Informing food industry on international supports available through frameworks such as EU Framework Programmes, EU Competitiveness and Innovation Framework Programme (CIP), EUREKA, EBN Innovation Network	TÜBİTAK	Ministry of Science Industry and Technology, UCCE relevant sector councils, Relevant CSO's	X		
9	Forming lobbies by sector unions to participate in development of international regulations	Federation of Turkish Food and Beverages Industry Associations	MOFAL, Sector Unions, Turkish Exporters Assembly, MFA			X
	Strategy 2.3: Increasing production efficiency of food industry SMEs					
10	Ensuring a more effective use of support available from KOSGEB by food SMEs	KOSGEB	Ministry of Science Industry and Technology, TÜBİTAK, UCCE's sectoral Councils, professional organisations of the food sector			X
	SO3: Local Capacity and Innovative Products					
	Strategy 3.1: Using modern techniques and technologies for production and branding of local and traditional foods, while preserving their characteristics					
11	Developing an inventory of local and traditional foods; identifying foods potentially qualifying for geographic indicators: Identifying the economic potential of traditional foods in domestic and international markets.	MOFAL	Turkish Standards Institute (TSE), Local Authorities, Universities, Related Institutions		X	
12	Promotion of categorization and standardisation of local and traditional foods and their registry for geographical signs	MOFAL, Turkish Patent Institute (TPE)	TSE, Local Authorities, Universities, Related Institutions		X	
13	Transferring R&D on production of local and traditional foods to food industry	National Food Technology Platform	Ministry of Science Industry and Technology, TÜBİTAK, HEC, National Academic Network and Information Centre, Turkish Exporters Assembly, Turkish Patent Institute , UCCE's sectoral Councils		X	

	Action	Main institution responsible	Related institutions	Term Short-term: Up to 1 year; Medium-term: 1 to 3 years Long-term: 3 to 5 years		
				Short	Medium	Long
	Strategy 3.2: Developing products with high value added and functional food products					
14	Transferring R&D on functional foods to food industry	National Food Technology Platform	TÜBİTAK, Ministry of Science Industry and Technology, Research Centres, Universities, KOSGEB, National Academic Network and Information Centre, Turkish Patent Institute, UCCE's sectoral Councils		X	
15	Developing and producing new high-value added and functional foods and marketing them internationally	Ministry of Economy, MOFAL	Turkish Patent Institute, TÜBİTAK, Ministry of Science Industry and Technology, Research Centres, KOSGEB, Turkish Exporters Assembly, Universities, , UCCE's sectoral Councils, Federation of Food and Drink Associations of Turkey		X	
16	Promoting R&D and innovation in the field of development and production of food additives	MOFAL	Ministry of Science Industry and Technology, Ministry of Economy, MOFAL, Universities, TÜBİTAK, KOSGEB		X	
17	Promoting R&D and innovation in the field of auxiliary products, such as starter cultures, enzymes, and ferments	MOFAL	Ministry of Science, Industry and Technology, Ministry of Economy, MOFAL, Universities, TÜBİTAK, KOSGEB		X	
18	Promoting R&D and innovation in genetics and biotechnology related to primary production and food production	MOFAL	Universities, Ministry of Development, TÜBİTAK, KOSGEB		X	
	SO4: Food Consumption and Health					
	Strategy 4.1: Increasing the efficiency of food quality monitoring and control and strengthening of food safety					
19	Supporting R&D Units which paves the way for more efficient use of existing infrastructure for food safety	MOFAL	Ministry of Development, Ministry of Science Industry and Technology, Research Centres, Universities, TÜBİTAK, Federation of Food and Drink Associations of Turkey, UCCE's sectoral Councils		X	
20	To provide a base for R&D work undertaken in the context of protecting consumer health, creating of a national database to monitor incidence of food-related diseases and nutrition-related health issues	Ministry of Health	MOFAL		X	

	Action	Main institution responsible	Related institutions	Term (Short-term: Up to 1 year; Medium-term: 1 to 3 years; Long-term: 3 to 5 years)		
				Short	Medium	Long
	Strategy 4.2: Developing new technologies for food industry to control quality during production					
21	Organising markets for special projects to transfer public-sector and university R&D on food quality control in production	National Food Technology Platform, Federation of Food and Drink Associations of Turkey	UCCE's relevant sector councils, Ministry of Science Industry and Technology, National Academic Network and Information Centre, HEC	X		
	SO5: Priority R&D Projects					
	Strategy 5.1: Undertaking R&D relevant to all stages of food production and consumption					
22	Continuous updating of priority research themes in the field of primary production and inputs to primary production; ensuring participation of all stakeholders and communication with supporting institutions	MOFAL	TÜBİTAK, Universities, National Food Technology Platform, Federation of Food and Drink Associations of Turkey, UCCE's related sector councils, Research Centres		X	
23	Continuous updating of priority R&D themes related to innovative products and production techniques in food industry; ensuring participation of all stakeholders and communication with supporting institutions	UCCE's related sector councils	Ministry of Science Industry and Technology, TMMOB (Union Of Chambers Of Turkish Engineers And Architects), National Food Technology Platform, TÜBİTAK		X	
24	Continuous updating of priority R&D themes in the field of food quality and safety and food and health; ensuring participation of all stakeholders and communication with supporting institutions	MOFAL	Universities, Research Centres		X	
25	Promoting R&D and innovation in the context of Technology Development Projects (TGP) at all stages of food production and consumption	Turkish Technology Development Foundation (TTGV)	Ministry of Economy, Ministry of Science Industry and Technology		X	
	Strategy 5.2: Supporting R&D projects related to priority areas of food production and consumption					
26	Establishing an expert group to review and prioritise technological areas at all stages of production and consumption in terms of R&D potential, human resources, infrastructure, and current account balance	TÜBİTAK	All relevant stakeholders	X		

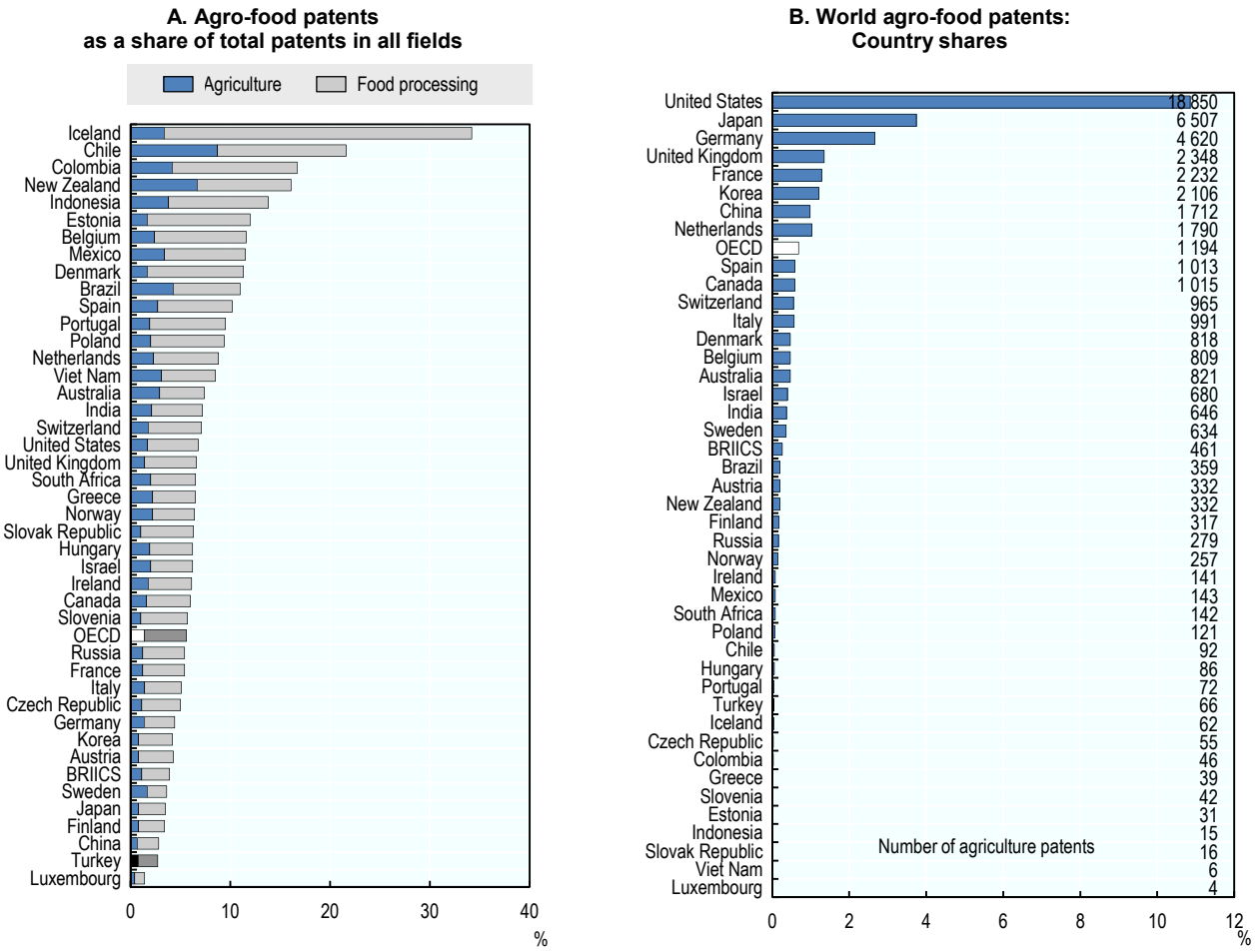
	Action	Main institution responsible	Related institutions	Term Short-term: Up to 1 year; Medium-term: 1 to 3 years Long-term: 3 to 5 years		
				Short	Medium	Long
27	Supporting R&D projects in prioritised themes of food production and consumption	TÜBİTAK	All relevant stakeholders	X		
28	Providing infrastructure support across all stages of food production and consumption to R&D areas requiring investments	Ministry of Development	All relevant stakeholders	X		
29	Introducing Graduate and Doctoral programmes across all stages of food production and consumption in R&D areas requiring development of human resources	HEC	All relevant stakeholders	X		
30	Introducing scholarships for education and research across all stages food production and consumption in areas requiring human resource development	TÜBİTAK	All relevant stakeholders	X		
31	Identifying R&D themes across all stages food production and consumption and consideration of these themes in calls	TÜBİTAK	All relevant Public Sector Institutions	X		
32	Promoting advanced technology development in framework of Advanced Technology Projects Support	TTGV	Ministry of Economy, Ministry of Science Industry and Technology		X	
	SO6: Environmental Sustainability, Protection of Environment and Natural Resources					
	Strategy 6.1: Preventing food losses and waste by improving temporary storage and transport facilities					
33	Promoting R&D and innovation in storage and transportation facilities	TÜBİTAK	MOFAL, TGDF, TÜBİTAK, UCCE's relevant sector councils		X	
34	Promoting R&D and innovation related to food storage and transport technologies in the framework of Technology Development Projects Support	TTGV	Ministry of Economics, Ministry of Science Industry and Technology		X	
35	Promoting R&D and innovation related to food storage and	TTGV	Ministry of Economy, Ministry of Science Industry and Technology		X	

	Action	Main institution responsible	Related institutions	Term Short-term: Up to 1 year; Medium-term: 1 to 3 years Long-term: 3 to 5 years		
				Short	Medium	Long
	transport technologies in the framework of Advanced Technology Development Projects Support					
	Strategy 6.2: Developing technologies to guarantee sustainable use of natural resources in primary agriculture					
36	Promoting R&D and innovation in technologies to guarantee sustainable use of natural resources in primary agriculture in the context of Advanced Technology Projects	TTGV	Ministry of Economy, Ministry of Science Technology and Industry		X	
37	Promoting the development of technologies for sustainable use of natural resources in primary agriculture in the framework of Environmental Projects - Clean Production Support	TTGV	Ministry of Economy, Ministry of Environment and Urbanization		X	
	Strategy 6.3: Developing environmentally friendly technologies in the food industry					
38	Periodically informing the food industry on R&D and innovation in environment friendly technologies	UCCE's sectoral Councils	TÜBİTAK, Federation of Food and Drink Associations of Turkey, HEC, MOFAL	X		
39	Promoting R&D and innovation in environmentally friendly technologies in the food industry in the framework of Advanced Technology Projects Support	TTGV	Ministry of Economy, Ministry of Science, Industry and Technology		X	
40	Promoting R&D and innovation related to packaging materials in food packaging	TÜBİTAK	MOFAL, Relevant CSO's		X	
41	Promoting development of environment friendly technologies in the framework of Environmental Projects - Clean Production and Energy Efficiency Supports	TTGV	Ministry of Economy, Ministry of Environment and Urbanization		X	
42	Developing 'climate-friendly product' certificates to promote	Ministry of Environment and Urbanization	MOFAL, Turkish Standards Institute			X

	Action	Main institution responsible	Related institutions	Term Short-term: Up to 1 year; Medium-term: 1 to 3 years Long-term: 3 to 5 years		
				Short	Medium	Long
	local low-carbon technologies in production					
	Strategy 6.4: Creating value add through recycling of waste and residuals					
43	Promoting R&D and innovation to reuse waste and residuals in the food industry in other sectors	TÜBİTAK	MOFAL, Ministry of Environment and Urbanization, Energy Markets Regulatory Authority, National Food Technology Platform, Federation of Food and Drink Associations of Turkey, TÜBİTAK, UCCE sectoral Councils		X	

Annex 6.A2

Agriculture patents applications filed under the Patent Co-operation Treaty, 2006-11



Notes: Agro-food patents include patents from IPC classes: agricultural science (A01); agricultural inputs (B21H 7/00, B21K 19/00, B62C, B65B 25/02, B66C 23/44, C09K 101/00, E02B 11/00, E04H 5/08, E04H 7/22, G06Q 50/02), and food processing (A21, A22, A23, A24, C08B, C11, C12, C13).

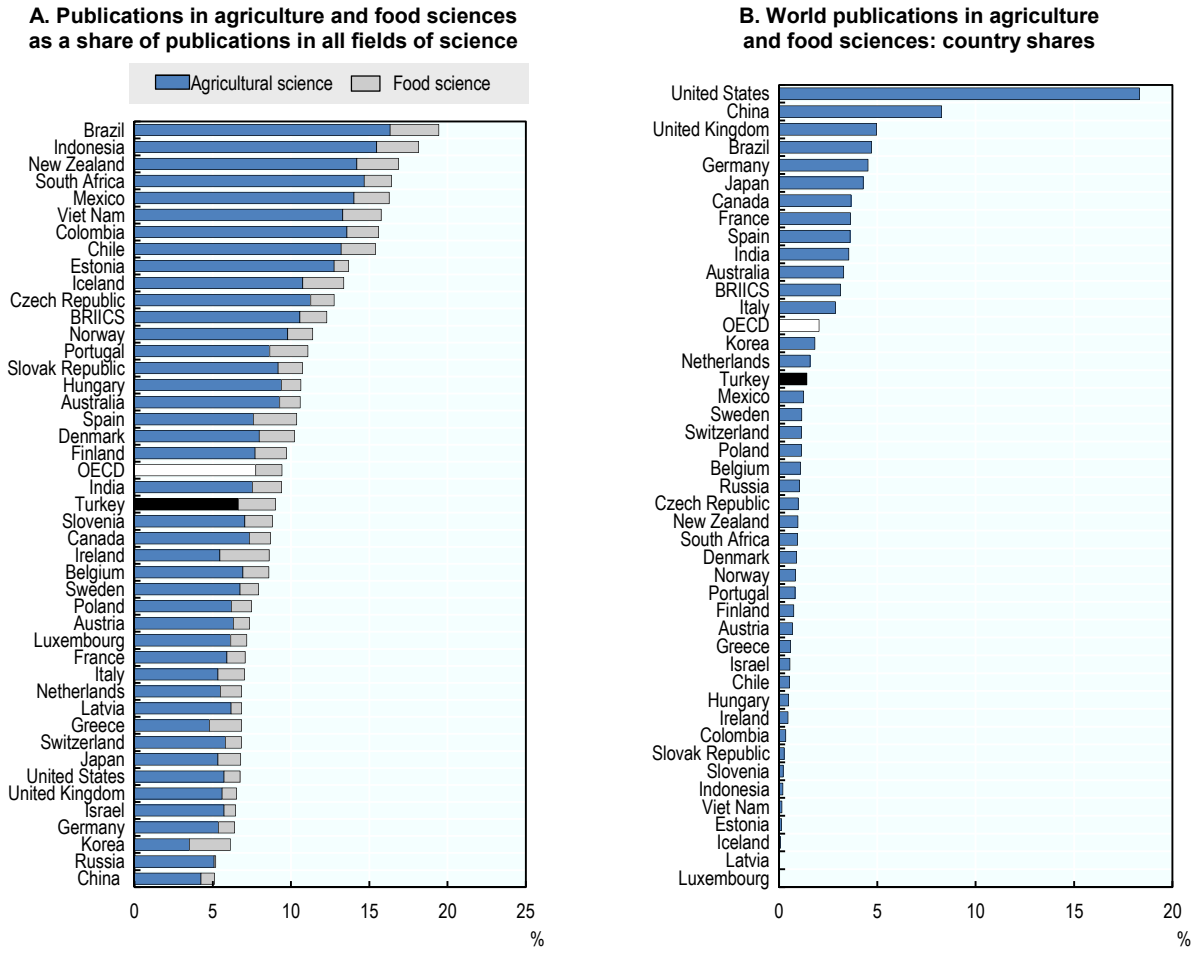
Patent counts are based on the priority date (first filing of the patent worldwide), the inventors country of residence, using fractional counts.

Source: OECD (2014c), *Patent Database*, www.oecd.org/sti/inno/oecdpatentdatabases.htm.

StatLink http://dx.doi.org/10.1787/888933390137

Annex 6.A3

Scientific publications in agriculture and food sciences, 2007-12



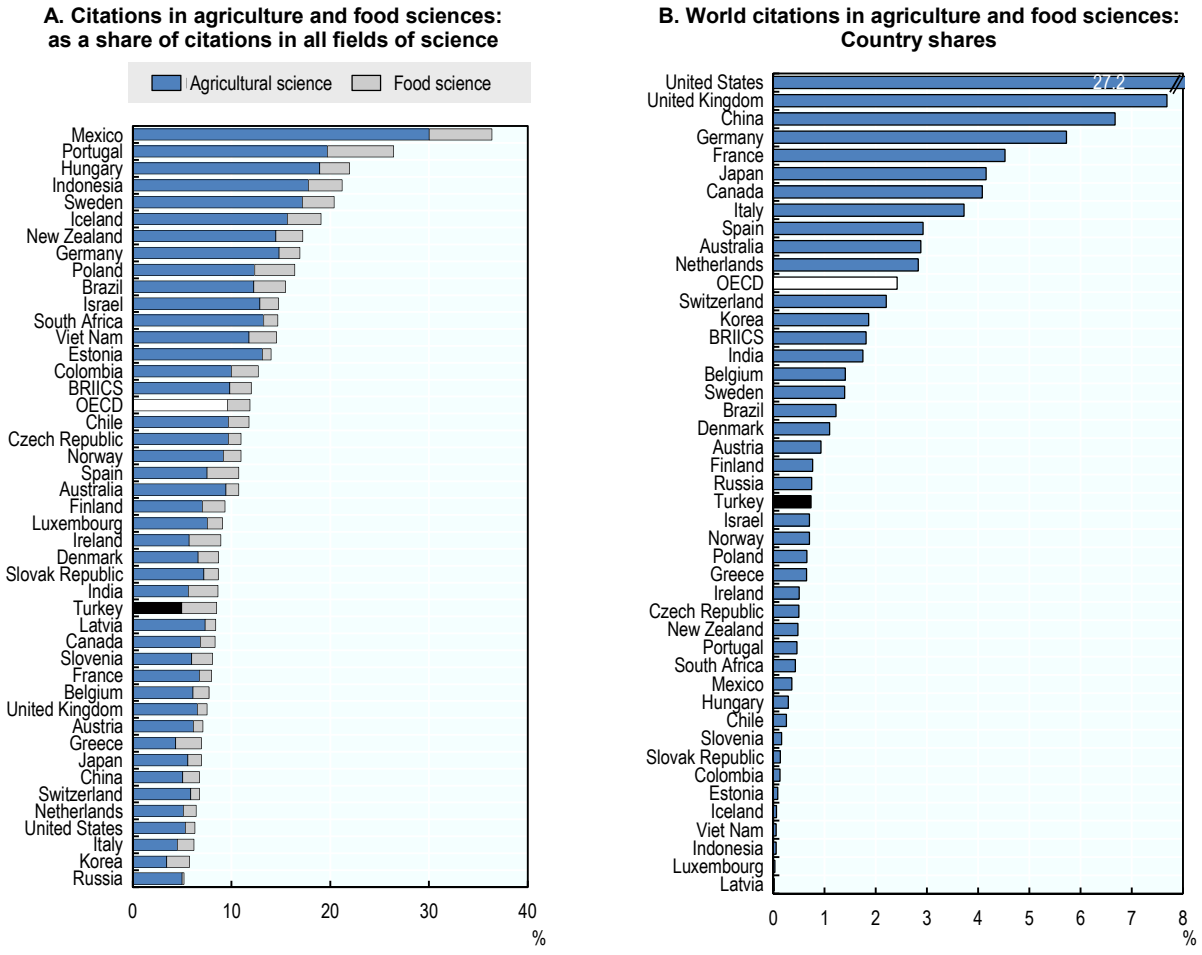
Note: Based on Scopus journal classifications, agriculture and food science refers to agronomy and crop science, animal science and zoology, aquatic science, ecology/evolution/behaviour systematics, forestry, horticulture, insect science, plant science and soil science, and miscellaneous agriculture/biological sciences, and food sciences.

Source: SCImago (2007), *SJR — SCImago Journal & Country Rank*, Retrieved 19 March 2014, from www.scimagojr.com.

StatLink http://dx.doi.org/10.1787/888933390141

Annex 6.A4

Citations in agriculture and food sciences, 2007-12



Note: Based on Scopus journal classifications, agriculture and food science refers to agronomy and crop science, animal science and zoology, aquatic science, ecology/evolution/behaviour systematics, forestry, horticulture, insect science, plant science and soil science, and miscellaneous agriculture/biological sciences, and food sciences.

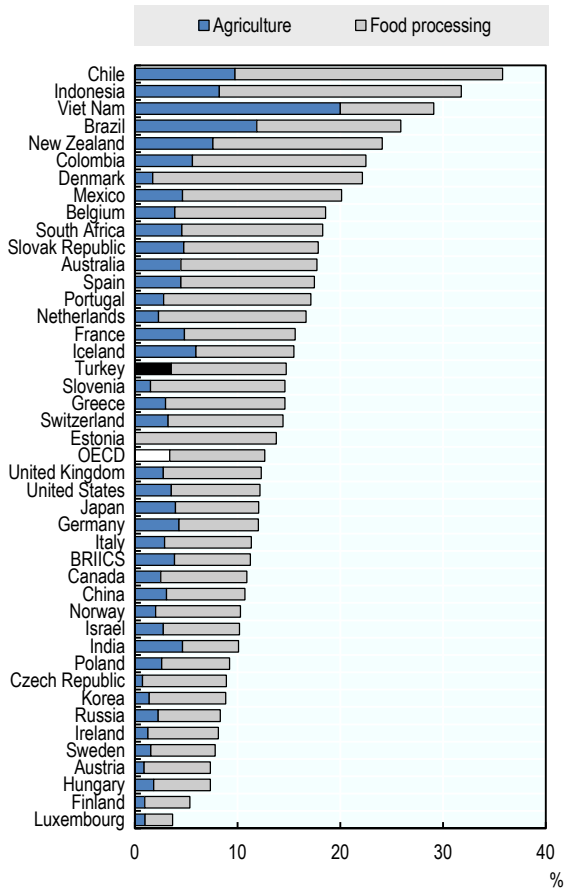
Source: SCImago (2014), *SJR — SCImago Journal & Country Rank*, Retrieved 19 March 2014, from www.scimagojr.com.

StatLink http://dx.doi.org/ 10.1787/888933390153

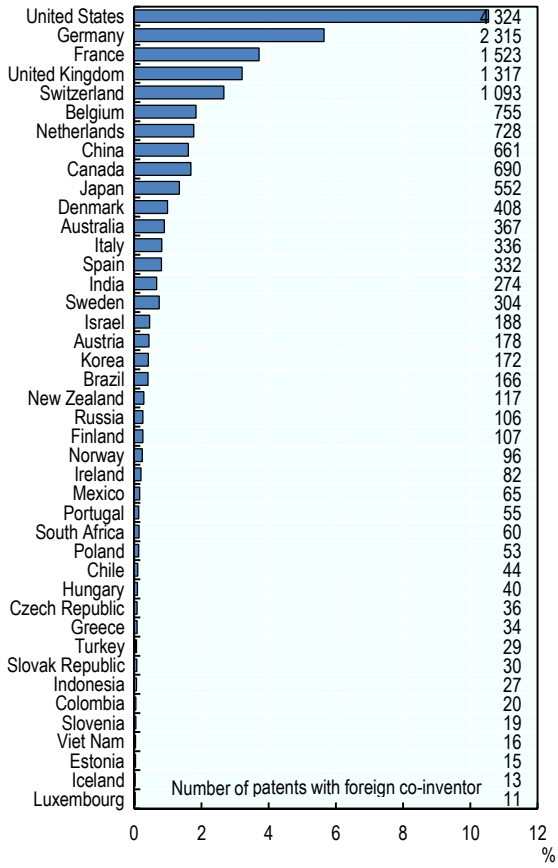
Annex 6.A5

International collaboration in agro-food R&D

A. Agro-food patents with foreign co-inventor as a share of patents in all fields



B. World agro-food patents with foreign co-inventor: Country shares



Note: Agro-food patents include patents from IPC classes: agricultural science (A01); agricultural inputs (B21H 7/00, B21K 19/00, B62C, B65B 25/02, B66C 23/44, C09K 101/00, E02B 11/00, E04H 5/08, E04H 7/22, G06Q 50/02), and food processing (A21, A22, A23, A24, C08B, C11, C12, C13).

Patent counts are based on the priority date (first filing of the patent worldwide), the inventors' country of residence, using simple counts.

Source: OECD (2014c), *Patent Database*, www.oecd.org/sti/inno/oecdpatentdatabases.htm .

StatLink http://dx.doi.org/ 10.1787/888933390162

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The OECD is a unique forum where governments work together to address the economic, social and environmental challenges of globalisation. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the information economy and the challenges of an ageing population. The Organisation provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.

The OECD member countries are: Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The European Union takes part in the work of the OECD.

OECD Publishing disseminates widely the results of the Organisation's statistics gathering and research on economic, social and environmental issues, as well as the conventions, guidelines and standards agreed by its members.

OECD PUBLISHING, 2, rue André-Pascal, 75775 PARIS CEDEX 16
(51 2016 04 1 P) ISBN 978-92-64-26118-1 – 2016

OECD Food and Agricultural Reviews

Innovation, Agricultural Productivity and Sustainability in Turkey

Contents

Also available in this series:

Australia (2015)

Brazil (2015)

Canada (2015)

Netherlands (2015)

Consult this publication on line at ***http://dx.doi.org/10.1787/9789264261198-en***.

This work is published on the OECD iLibrary, which gathers all OECD books, periodicals and statistical databases.
Visit ***www.oecd-ilibrary.org*** for more information.

OECD*publishing*
www.oecd.org/publishing

ISBN 978-92-64-26118-1
51 2016 04 1 P