

## *Chapter 1*

### **Overall assessment and recommendations**

*This chapter presents the framework applied in the review to analyse the extent to which Brazilian policies are supportive of innovation for productivity and sustainability, and the findings of the review of a wide range of policies in Brazil. In each policy area, it develops specific policy recommendations.*

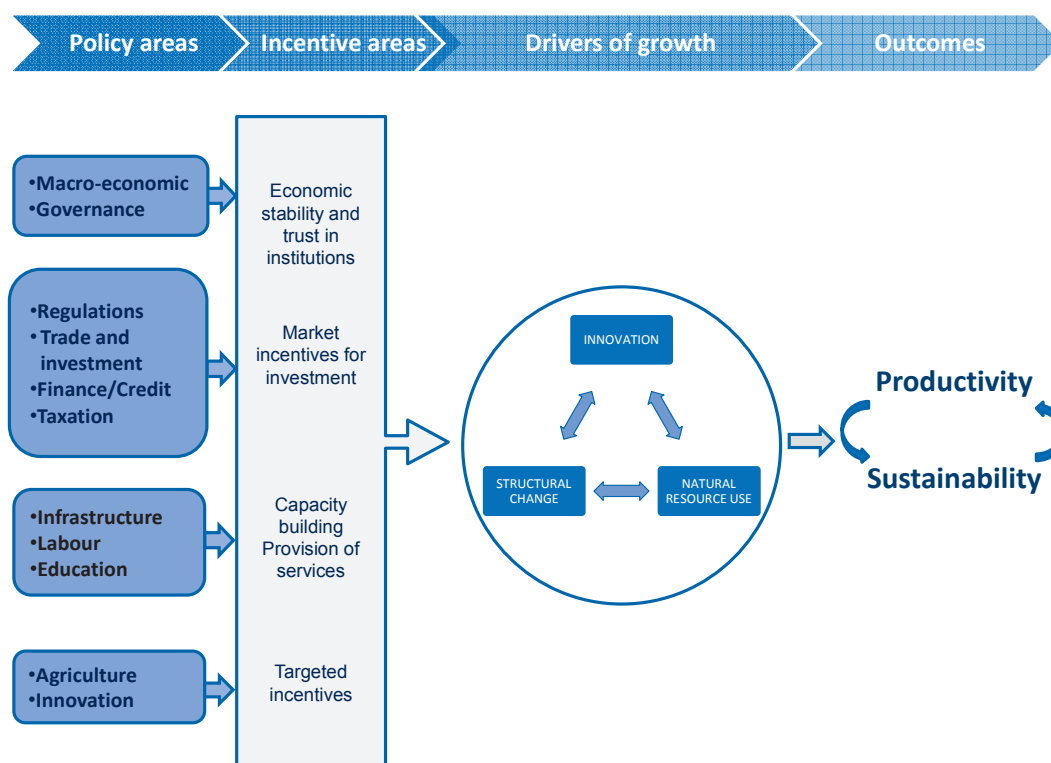
## A framework for analysing policies for innovation, productivity and sustainability in the food and agricultural sector

Improvements in agriculture productivity growth are required to meet the growing demand for food, feed, fuel and fibre, and must be achieved sustainably through 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 sectors, and thus need to be considered alongside agriculture-specific policies. Recognising that innovation is essential to improving productivity growth sustainably along the whole agri-food chain, OECD work has focused on the performance of agricultural innovation systems.

The framework used in this report to review Brazilian policies considers policy incentives and disincentives to innovation, structural change and access to natural resources, which are key drivers of productivity growth and sustainable use of resources (Figure 1.1). The current focus is mainly on agricultural innovation systems. The Oslo Manual defines innovation as the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations (OECD and Eurostat, 2005).

This review begins with an overview of the characteristics and performance of the food and agriculture sector, which outlines the challenges and opportunities (Chapter 2). A wide range of policies is then considered according to the four main channels or incentive areas through which they affect drivers of productivity growth and sustainable use of resources.

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



Source: OECD (2014), "Analysing Policies to improve agricultural productivity growth, sustainably: Revised framework", [www.oecd.org/agriculture/policies/innovation](http://www.oecd.org/agriculture/policies/innovation).

- Economic stability and trust in institutions (justice, security, property rights), both of which are essential to attract long-term investment in the economy (Chapter 3).
- Private investment, which in turn requires a transparent and predictable environment that balances the interests of investors and society (Chapter 4).
- Capacity building, including provision of essential public services (Chapter 5).
- Targeted incentives to food and agriculture, which ensure agriculture innovation systems align the supply of innovation with sector demand and facilitate the adoption of innovation at farm and firm levels (Chapters 6 and 7).

A policy area can affect innovation through more than one channel. Policies can affect innovation positively or negatively depending on the type and intensity of measures. This review reports country-specific information when readily available.

This report aims to review the extent to which the Brazilian policy environment contributes to improving productivity growth and sustainable use of resources in the agriculture and agri-food sector by fostering the creation and adoption of innovation. Throughout the report, the likely impacts of each policy area on innovation are first discussed in general terms. Specific country measures are then analysed in this regard. Overall assessment and recommendations are drawn from this review on a large range of policy areas.

### **Challenges to increase agricultural productivity and competitiveness**

The impressive growth of Brazilian agriculture over the past two decades was largely driven by rising productivity. Sustaining agricultural growth is critical to Brazil's development given the weight of agriculture and agro-industries in the national economy and the resource potential that can yet be exploited. Agricultural growth is critical from a social perspective as it means making more income and more affordable food available to poorer people. And finally, it is also important globally due to Brazil's role as a leading supplier on international markets.

The economic reforms of the 1980s and the 1990s gave substantial impulse to agriculture and the associated agro-industries, but their potential to add as much to future growth is diminishing. At present, Brazil's trade opportunities are affected by slow growth in developed economies, loss of momentum in key emerging economies, and greater competition in global agricultural markets. Brazil's broadest challenge today is to sustain high agricultural growth in the conditions when its past powerful supply and demand drivers have weakened. This puts the sector's cost competitiveness into the foreground where increased innovation will play an essential role in achieving it.

The country faces the challenge of reconciling its agricultural growth with fundamental societal objectives. One is to ensure that growth is achieved sustainably. Some environmental issues, such as deforestation, have long attracted policy attention, while others, such as air and water pollution, and climate change, are becoming more prominent. Another societal objective in a country where poverty is still high is to reconcile agricultural growth – and the pressure that structural adjustment places on small farmers – with poverty reduction goals.

Brazil's capacity to realise its agricultural growth potential has become progressively contingent on overcoming its considerable structural deficiencies. These concern its physical infrastructure, the failure of private capital markets to provide adequate resources for long-term development, and low overall education and skills levels. Brazil has made large strides to catch up, but the remaining structural gaps are significant and continue to hinder development.

For a large agro-food exporter such as Brazil, future growth also hinges on increased access to external markets, meaning that the country has a high stake in further opening global markets through the multilateral and plurilateral process.

## **Moving towards a supportive overall policy framework is the main challenge to fostering innovation**

### ***Impressive progress in research and development needs to be matched by better conditions for doing business***

Brazil's macroeconomic conditions have considerably improved over the past decades. Today, local businesses operate in a more stable macro-economic environment and with improved *public* governance. Nevertheless, this review finds that the most important constraints to innovation still concern the general conditions of doing business in Brazil. Easing these constraints requires action, or further reform, in policy areas that are outside agricultural policy or innovation policy as such. Furthermore, efforts to stimulate innovation through agricultural measures or support to agricultural innovation system will have the best outcomes if broader constraints to innovation are eased.

### ***The economy has performed well, but it is vulnerable to short- and longer-term macroeconomic risks***

Brazil has been praised for its successful economic transition from the tumultuous decades of the 1980s and 1990s. This success is largely due to the ability of the government to pursue stable and predictable macroeconomic policies based on stable inflation, declining public debt, and a flexible exchange rate. Macroeconomic stabilisation has been essential to reducing risk perceptions of Brazilian investors and enhancing incentives for innovation. However, economic growth has been less strong than in other large emerging economies and will need to come increasingly from improvements in productivity. There are current and longer-term risks to macroeconomic stability, including the risk of high inflation, the deterioration of fiscal performance, rising household indebtedness levels, and uncertainties of global economic conditions. Consolidating confidence in the macroeconomic framework requires strengthening the existing system for inflation targeting, tighter fiscal stance, improved clarity of fiscal and quasi-fiscal operations, and greater flexibility to conduct countercyclical fiscal policy.

### ***Businesses face fairly restrictive and complex regulations, and incur high costs for doing business***

As measured by the OECD Product Market Regulation (PMR) indicators, Brazil's regulatory framework is generally more restrictive of competition than in OECD and some other BRIICS countries. The most constraining are the barriers to entrepreneurship, due to complexity of regulations and relatively high administrative burden on start-ups. Regulations translate into *direct* and indirect costs for doing business. According to the World Bank's *Doing Business* survey, they are estimated to be one of the highest internationally in Brazil. Although direct compliance costs to do business in Brazil are typically comparable, for example, with the OECD area or neighbouring Latin American countries, the indirect costs, such as the number of procedures and the time required to accomplish them, are with few exceptions much higher.

### ***Tariff protection for capital and intermediate goods is high, increasing the cost of agricultural inputs***

Brazil's overall trade regime is characterised by relatively high tariffs and barriers to trade facilitation. Tariff protection is high for capital and intermediate goods, although tariff concessions for *these* goods are included in Brazil's free trade agreements. This increases the cost of agricultural inputs, including advanced technological items. In addition to protection at the border, Brazil uses local content provisions in publicly-financed projects; this condition is also applied by the National Bank for Economic and Social Development (BNDES) to loans for capital goods, including by the agro-food and agro-processing sectors. At the same time, the Foreign Direct Investment (FDI) regime has been substantially liberalised, although certain constraints exist, e.g. related to the purchase of agricultural land. Foreign investment, for example, has contributed to the development of fertiliser production in Brazil; FDI has also been very important in the sugar and ethanol sectors, driving their technological development.

***Domestic credit is generally costly and difficult to access, while long-term credit is scarce***

Brazil's domestic finance market is small compared to large OECD economies. Interest rates are high in international terms, largely due to high risk premiums on lending. Opinion surveys show that local businesses feel there is limited availability of financial services and venture capital opportunities and they consider loans difficult to obtain. The short-term bank credit segment is represented by many competing private and public banks, including foreign banks. At the same time, long-term bank credit is scarce and concentrated in one state bank, the BNDES, which provides loans at reduced interest rates and relies on public support. This limited domestic market for investment finance affects in particular small and medium size businesses which have fewer opportunities to tap into external finance sources. Satisfying Brazil's financing needs as the economy develops will require increased private sector participation in the long-term credit market and well beyond distributing BNDES loans. Given the dominant role of BNDES in long-term lending, not least due to its privileged access to state funding, a more level playing field is required to attract private lenders. Increased participation of private providers will ease credit constraints and improve allocation of credit.

***Businesses bear a substantial tax burden and high costs to comply with tax regulations***

The World Bank estimates the total tax rate on Brazil's company profits – including all taxes on income and factor usage above the average in Latin America and in OECD countries. Brazil's taxes are not only high, but burdensome to comply. The principal reason why Brazil compares poorly to other countries in terms of tax compliance costs concerns indirect taxes, including the state value-added tax, for which each of Brazil's states has its own tax code, tax base and tax rates. Due to the "origin-taxation", companies operating nationwide are required to comply with each state's individual tax rules, and credits for interstate transactions are frequently delayed or refused. Brazil needs to establish a simpler tax system that imposes fewer compliance costs. An important move in this direction would be further progress towards the unification of indirect taxes into a national unified system.

**Recommendations on the overall policy framework for innovation**

- Reduce overall regulatory burden on entrepreneurship, particularly, by simplifying regulatory procedures and easing administrative burdens on start-ups.
- Undertake a comprehensive review of regulations that govern agriculture and agro-industries to identify areas where the burden of these regulations could be reduced. This includes stronger coherence of regulations across regulatory areas and different administrative levels.
- Reduce industrial tariff protection to lower the cost of imported inputs and technological items, including for the agricultural and agro-processing sectors.
- Facilitate the development of private long-term finance, including, as an interim approach, by requiring private co-financing of BNDES loans. In the longer-term, phase-out financial support to BNDES and concentrate its lending on infrastructure, small and medium-sized enterprises, and on innovation.
- Simplify the tax system, in particular, by further efforts to unify indirect taxes into a single national system.

**The momentum to closing infrastructure and education gaps should be sustained**

***Agriculture is set to gain substantially from infrastructure improvements***

Weaknesses in transport and other physical infrastructure hinder the country's economic development. Road and railway availability in Brazil are below the levels of its main agro-food trade competitors. The gap in quality of infrastructure is also considerable, as evidenced by the opinions of Brazilian businesses. The country is less deficient, however, in terms of ICT development, an important factor for innovative businesses. The deficiencies in infrastructure are well recognised by

the government, which has undertaken institutional and regulatory reforms in the infrastructure sectors. Governments at the federal and state levels have also introduced various tax and credit incentives to encourage private investment in infrastructure, and public investment has recently been increased within a range of national and state-level programmes. These efforts are expected to take effect in the longer-term and need to be pursued. A further challenge would be to inject more competition into the infrastructure sectors where dual public and private service provisions exist, such as in the electricity and network sectors. Investment delays could be reduced and private investment in infrastructure increased with further simplification of regulatory procedures. The agro-system is set to gain a lot from the national infrastructure development projects, which will improve the capacity and the time involved in the handling and transport of agricultural commodities.

### ***Labour regulation framework requires modernisation***

Labour regulations affect innovation through the cost and conditions of employing labour, as well as by their impact on labour mobility. Labour income played a key role in reducing poverty and income inequality in Brazil, helped by the strong rise in minimum wages and the steady decline in unemployment. Minimum wage is subject to an automatic indexation rule and since the early 2000s it has almost doubled, also driving up the average wage level. This indexation rule is scheduled for a review and needs to be adjusted to better connect wages to labour productivity, while protecting the purchasing power afforded by the minimum wage. The minimum wage indexation, a relatively high tax wedge on labour, and the policy focus on consumption stimulus have contributed to a fast rise in labour costs in Brazil. Labour regulations emphasise conditions of work and pay and are quite rigid. This sometimes impedes the establishment of mutually beneficial labour agreements, resulting in discrepancy between common practice and the law and posing legal risks to companies. Policies for the unemployed or those who are at risk of losing their jobs consist predominantly of compensation measures, although there are efforts to enhance market insertion measures. Skills improvement and self-employment as part of the labour market insertion programmes receive more attention, particularly for young people who account for the majority of the unemployed. However, the training component of the labour programmes seems to be inadequate in terms of the resources involved and its outreach, whereas it could play an important role in labour market adjustment to support the innovation process.

### ***Education improvements have been impressive but there is much scope for further catch up***

The nation's education improvement became a policy priority in Brazil in the 1980s. It was seen as a prerequisite to achieving social progress as well as an investment in future development. Brazil has made impressive advancement in access to and greater equity in education. These outcomes were largely driven by a boost to public expenditures on education to attain mandated per student levels of spending and conditional social transfers. Increased funding was complemented by incentives for good performance at the local level. Agricultural education has seen a strong rise in university enrolments and in the disciplines offered, driven by the agricultural boom in Brazil.

The considerable success notwithstanding, Brazil continues to lag in education both in terms of education attainment levels and student performance. The share of 25-64 year-olds who received at least an upper secondary or tertiary education is relatively low compared to some BRIICS and OECD countries, while among those who received an education below the upper secondary level, nearly three-quarters have only pre-primary or primary education. Although Brazil has recently shown the fastest improvements in the performance of 15-year old students, they still need to catch up with their peers from OECD and other BRIICS countries, particularly the students from rural areas. The challenge is to keep the quality of education at par with the broadening access to it.

### Recommendations on capacity for innovation

- Sustain the commitment to accelerated development of infrastructure and move forward planned infrastructure projects; reduce investment delays and increase private investment in infrastructure through further simplification of regulatory procedures.
- Modernise labour regulations to allow for greater flexibility in establishment of labour agreements and to reduce uncertainties in the interpretation and application of regulations. Enhance labour market insertion programmes with a greater focus on training and re-training of job seekers.
- Maintain progress in education by ensuring that improvement in its quality is on par with a wider access to it.
- Support the advancement of poor students, particularly from rural areas, to higher levels of education and performance.
- Continue to develop the agricultural vocational training system and facilitate greater use of apprenticeships to enhance agricultural skills.
- Promote co-operation between agri-business and educators in the development of curricula and their adjustment to business demands. Encourage arrangements for industry-public co-funding of training and job placement programmes.

## Agricultural policy can be better targeted to productivity and sustainability outcomes

### *Agricultural policy serves two distinct farm segments and is driven by different rationales*

Agricultural policy rationale, objectives and programmes differ between commercial agriculture and small-scale family farming. For the commercial sector, policy objectives consist of boosting production, while making it more technologically advanced and sustainable. Policy towards family farming is predominantly driven by an equity rationale. The agricultural support programmes for both commercial and small farm segments use a broad range of instruments, including price support, concessional credit and insurance support. These are complemented by various regulations on land use, agricultural zoning requirements, regulations on biofuel use and organic production. Brazil also directs substantial public funds into land reform to empower the poor to generate better incomes. This consists of providing to disadvantaged groups access to agricultural land, financial resources, and knowledge and skills necessary to undertake farming and other economic activity.

### *Agricultural policy has been liberalised and increasingly incorporates sustainability criteria*

The economic deregulation in the late 1980s and 1990s has progressively enabled agricultural resources to be re-allocated to where Brazil has a comparative advantage. Agricultural growth has been increasingly subjected to sustainability criteria through government policy and industry initiatives. A spectrum of new agricultural programmes has recently emerged which provide incentives to commercial and family farmers to follow environmental criteria or undertake environmentally beneficial activities. Regulations have become more constraining of environmentally harmful practices.

### *But it can be more strongly oriented to productivity and sustainability outcomes*

At present, agricultural policy results in a relatively moderate aggregate support to farmers. However, over three-quarters of this support is provided through measures that alter farm prices and current costs, with a strong variation of support levels across commodities. Being still predominantly based on such measures, agricultural support diminishes producer incentives to employ production factors more efficiently and to innovate so as to become more competitive. Such policy also impedes structural adjustment and in the longer run, results in a less productive agricultural sector. A relatively small part of total support is directed to systems which would ensure long-term productivity gains, such as knowledge system, infrastructure, and supporting institutions. Altogether,

this suggests there is a scope for policy to become better targeted to productivity and sustainability outcomes.

***Refocussing credit support to well-specified investments could spur innovation***

An important opportunity for such policy re-orientation may be present in the reform of rural credit policy. The system works to provide commercial producers, family farmers, and, to a lesser extent, the agro-industry with reduced-cost credit. It employs public funds and also obliges private banks to use their obligatory reserves for lending to rural borrowers. The main rationale of the rural credit policy is to reduce the high cost of domestic borrowing to agriculture. However, it also creates a crowding-out problem: the availability of subsidised credit reduces the opportunities for provision of credit on market terms for lenders and the incentives to take up such loans for borrowers.

Annual allocations through rural credit system are concentrated on working capital loans to commercial producers. The focus of credit policy on subsidising current costs through provision of reduced-interest working capital loans makes producers less responsive to market conditions and weakens their incentives to adopt cost-reducing strategies. Borrowers have perverse incentives to build-up debt. In fact, farm debt to the rural credit system undergone major rescheduling in the late 1990s and 2000s, and was further re-negotiated on several occasions. The government should consider a gradual downsizing of working capital loans to commercial producers. On-going efforts to simplify procedures for access to bank credit by rural borrowers, to expand agricultural insurance, and to promote non-bank financial instruments would facilitate such a move. Credit resources could be re-directed to support long-term investment and increasingly allocated to well-specified innovation, environmental, and infrastructure projects.

**Recommendations on agricultural policy**

- Move away from interventions that lower producer current costs and eliminate cross-commodity variations in support levels as a broad policy re-orientation.
- Underpin this re-orientation by a reform of the concessional credit system with the view to gradually limiting the scope of eligible commercial producers and their supported activities. Consider a gradual downsizing of concessional loans for working capital to commercial producers.
- Further promote the development of private non-bank financial instruments for agriculture and agro-industries, subject to a review of existing instruments.
- Pursue efforts to ease access to credit by rural borrowers through simpler regulations and procedures.
- Assess concessional investment credit with the view to streamlining existing programmes and simplifying access procedures, particularly for newly-introduced programmes that support innovation and environmental projects. Enhance criteria for loan eligibility to better screen out borrowers that would have invested without support.
- Increasingly shift concessional investment credit to projects that explicitly incorporate technological innovations, and advanced farm management and environmental practices.
- Maintain the new focus of concessional investment credit on farm infrastructure support, subject to performance assessment of new infrastructure credit programmes.

**The agricultural innovation system is an effective provider of innovation, but adoption could be faster and more widespread**

Science and technology played an important role in the spectacular development of the Brazilian agricultural sector. Investment in research and development (R&D) has resulted in high growth in Brazilian scientific production, in particular as concerns tropical agriculture. The system met the strong demand for technological innovation generated by agribusiness development and



technological improvements resulted in fast rising agricultural production, with a diversification of products, and high levels of total factor productivity growth.

***The Brazilian Corporation for Agricultural Research (Embrapa) plays a central role in the system***

Embrapa has provided comprehensive recommendations ranging from how to correct acid soils and low fertility, the development of varieties that are adapted to the low latitudes and higher temperatures of tropical environments, and to pest and disease control and production systems. It is a major contributor to research in tropical agriculture. The main strengths of Embrapa are: 1) good governance mechanisms, including a leading role in the coordination of public research and regular performance and impact evaluation that demonstrate high returns on investment; 2) a focus on applied research of direct interest to the Brazilian agribusiness; 3) good spatial distribution of the agricultural R&D infrastructure; 3) highly qualified human resources; 4) sustained support to public R&D from the Federal government; and 5) the emphasis on R&D collaboration, which has facilitated integration into the international innovation system and training. Embrapa has facilitated the creation of solutions to practical problems, which were quickly disseminated to commercial farmers.

***Universities contribute with high quality education and research***

Universities also produce high level research in areas complementing Embrapa's activities, such as in nutrition, health and the environment. They are an essential link between research and education. They contribute to basic and general-purpose research, which is crucial for applied research. The federal and state universities are also active in applied research in the agrarian sciences, especially those linked to the agricultural sciences.

***Foreign R&D co-operation is developing fast***

Foreign co-operation, which focused traditionally on tropical areas in Latin America, is developing with a wider range of countries in the OECD area, in Africa and in South-East Asia. The collaboration of Embrapa with other developed countries benefited from a pioneer mechanism, the LABEX (Virtual Laboratories Program), which is being implemented by a growing number of OECD countries. This mechanism could also facilitate participation in global or regional agricultural research networks. Embrapa is also actively collaborating on technology transfers with developing economies, with an emphasis on tropical areas in Latin America, the Caribbean and Africa. With this strategy, the Brazilian government is stimulating public R&D organisations and the private sector to expand their international actions.

***The contribution of agribusiness should continue to increase***

The role of the private sector in Brazilian agricultural innovation system has grown significantly over the last two decades due to the boom in agribusiness, especially in the Cerrado region located in central Brazil. Its role is primarily oriented to the supply of inputs and technical assistance to farmers, but agricultural research is growing (seeds, equipment, machines, feed, agrochemicals, etc.).

There is still unrealised potential for contributions by the private sector in agricultural innovation due to the general business environment and lack of capacity of local companies to do this. The main constraints to investment in innovation for the private sector, in particular for the bioeconomy, are the confused and complex regulatory framework, the deficient basic infrastructure for development of cutting-edge technology, and the lack of qualified human capital, of public investment in private R&D, of management flexibility, and of synergy between the private sector, government and academia.

It is important to foster and support private investment in agricultural R&D by reducing regulatory and policy impediments for investment in innovation and simplifying programmes that finance private innovation. The capacity of businesses to participate in local innovation projects

could be strengthened, for example by supporting networking and actions to raise awareness and facilitate exchanges of staff and trainees with public research organisations.

***The agricultural innovation system benefits from well-established governance mechanisms***

The Ministry of Agriculture, Livestock and Food Supply (MAPA) is responsible for the coordination of agricultural research through Embrapa, and the Ministry of Agrarian Development (MDA) is leading rural technical assistance and extension services which focus on family agriculture. At the national level, the priorities for R&D are established by the national government through the different ministries involved in innovation, led by the Ministry of Science and Technology (MCT) which also has a strong role in the coordination of agricultural research, especially at the university R&D level. Coordination of agricultural research is thus integrated into the general innovation system and follows clear mechanisms at both the federal and state levels. Stakeholders are represented in councils and boards that discuss sectoral demands and priorities. Embrapa applies regular performance and impact evaluations, internally or with outside experts, and the results are made available to the public. Estimates of the social benefits of research have been published yearly for over ten years.

***Reinforcing the capacity of extension services to reach poorer farmers would help reduce the technology gap***

The main weakness of the Brazil agricultural innovation system reflects the duality of the agricultural sector, with the coexistence of large commercial farms and small farms imperfectly connected to markets and operated by poor households. Commercial farmers are well-served by R&D and have access to technical assistance from input suppliers, cooperatives, private services, and public rural extension services. These same assets are not available to poorer farmers who are not linked to a supply chain or the credit market. The National Agency for Technical Assistance and Rural Extension (ANATER) was created in 2013 by the Federal government to expand the resources and scope of public extension services to poorer farmers and to address sustainability issues. Once fully operational, this new agency is expected to increase the capacity of public services to reach poor small farmers and to facilitate their integration into the market. In implementing ANATER, it would be important to include research organisations and universities.

**Recommendations to strengthen incentives to innovation**

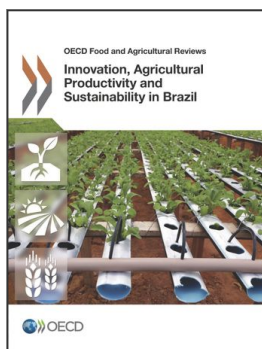
- In supporting Embrapa's activities, strengthen its capacity and flexibility to collaborate with other researchers in universities and the private sector in Brazil and abroad. Possible actions could be to remove restrictions for public institutions to hire foreign researchers and trainees, to facilitate temporary transfers of Brazilian researchers abroad, and to explore arrangements regarding the sharing of property rights, and which could facilitate public-private partnerships.
- Promote research co-operation across sectors (Centres of Competitiveness or Excellence).
- Strengthen the capacity of businesses to participate in local innovation projects by supporting networking and actions to raise awareness and providing training opportunities.
- Consider strengthening Intellectual Property Right protection (e.g. by signing the International Convention for the Protection of New Varieties of Plants of 1991, UPOV-91) to attract private investment.
- Reinforce technical assistance and rural extension services to ensure they provide expected services and improve opportunities for small family farms. Financial assistance to poor farmers, as planned under ANATER, should improve access, in particular if clear eligibility rules are set and impact monitored. Broaden the scope of advisory services to cover technical, financial and organisational aspects to improve the social, economic and environmental performance of farm households and their contribution to the rural economy.
- Strengthen links between R&D and technical assistance, for example by adding a technology transfer component to research projects, or by encouraging networking between researchers, advisors and producer groups.
- Continue to promote forward-looking thinking as done within the Agropensa system.

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