

Unclassified**English - Or. English****27 February 2020****TRADE AND AGRICULTURE DIRECTORATE
COMMITTEE FOR AGRICULTURE****Working Party on Agricultural Policies and Markets****OECD Agro-Food Productivity-Sustainability-Resilience Policy Framework:
Revised Framework**Contact: Jesús Antón (email: jesus.anton@oecd.org).**JT03458184**

Note by the Secretariat

This work is mandated under Expected Output Result 3.2.1.2.1 “Country reviews” of the 2019-20 Programme of Work and Budget (PWB) of the Committee for Agriculture (CoAg).

Responding to requests from the Committee of Agriculture and from the G20, the OECD developed a first framework for Analysing the Role of the Government in Agriculture Innovation [TAD/CA/APM/WP(2012)19/FINAL]. This was followed by a more elaborated framework including the wide range of policy areas impacting the main drivers of productivity growth and sustainable use of resources in the food and agricultural system [TAD/CA/APM/WP(2014)3/REV1]. Since 2015, the framework has been applied in 12 in-depth country reviews: Australia, Brazil, Canada, China, Estonia, Japan, Korea, Latvia, the Netherlands, Sweden, Turkey and the United States. A Review of Viet Nam will be completed in the first half of 2020. A synthesis report “Innovation, Productivity and Sustainability in Food and Agriculture” was published on 3 October 2019 (OECD, 2019^[1]).

In parallel, the OECD Agricultural Policy Reviews have conducted in-depth assessments of agricultural policies in accession countries and selected partner countries like India (OECD/ICRIER, 2018^[2]) and Argentina (OECD, 2019^[3]). These policy reviews have been an important vehicle to integrate new countries in the PSE database, and have recently included chapters on innovation applying the framework (Colombia in 2015, and Argentina in 2019).

The PWB 2019-20 “proposes to integrate these two types of country reviews into one model for the assessment of *Policies towards a productive, sustainable and resilient food system*... The country reviews will incorporate a revised framework as well as lessons and conclusions from thematic and analytical work being undertaken by the Committee.”

This document contains a revision of the Framework with the working title “OECD Agro-Food Productivity-Sustainability-Resilience Policy Framework”. The revisions reflect recent experience with the two types of country reviews (OECD, 2019^[1]) as well as lessons and conclusions from thematic and analytical work at OECD such as (OECD, 2019^[4]). The main objectives of the changes proposed are to strengthen the focus on the productivity-sustainability as well as resilience interactions, and making more explicit the role of digital technologies for innovation, the importance of the management of natural resources, in particular land and water and the value chain dimension of innovation. The main elements of the framework are context, policy areas, drivers and outcomes, each of which has been associated to specific indicators in the framework.

A previous version was presented for discussion in the 78th session of the Working Party on Agricultural Policies and Markets. In light of feedback received, this document has been revised and will be edited, for release as a glossy brochure/document, for widespread public use.

Table of contents

OECD Agro-Food Productivity-Sustainability-Resilience Policy Framework	4
1. Background	4
2. Overview of the OECD Agro-Food Productivity-Sustainability-Resilience Policy Framework	5
3. The impact of policy on productivity, sustainability and resilience	7
4. Indicators for measuring different areas of context, policy, drivers and outcomes	11
5. The Review Process	14
6. Content of policy reviews	15
Annex A. Context, Policies, Drivers and Outcomes covered by the reviews	16
Food and agriculture context	16
Policies and regulations	18
Drivers: Innovation, Structural Change, Natural Resources and Climate Change	31
Outcomes: Productivity, Sustainability and Resilience	32
References	33
Tables	
Table 1. The example of investment support	10
Figures	
Figure 1. The OECD Agro-Food Productivity-Sustainability-Resilience Policy Framework	6
Figure 2. Pathways of productivity growth	8
Figure 3. Productivity and sustainability of natural resources	9

OECD Agro-Food Productivity-Sustainability-Resilience Policy Framework

1. Background

1. Developing policies to underpin competitive, sustainable, productive and resilient farm and food businesses is a high priority for OECD and G20 governments.¹ In June 2012, G20 Leaders asked international organisations to develop a framework to analyse and review policies and “identify best policy options for increasing productivity growth sustainably”. Since then, the OECD has developed and applied a framework for analysing policies to improve agricultural productivity, sustainably, responding to the interest of the OECD Committee for Agriculture and of the G20.²

2. Since the mid-1980s, agricultural policy reforms in OECD countries have reduced distortions to markets and trade: support levels have generally decreased and there has been a shift towards measures having less impact on producer decisions and, in some cases, target policy objectives more precisely (OECD, 2019_[5]). However, progress has been unequal across countries. A large share of support to agriculture continues to support farm income, irrespective of actual income levels and without setting specific targets. Many countries use commodity-specific measures, which are not efficient at transferring income or meeting other productivity-sustainability-resilience objectives. Thus, current policies are not always well-aligned with policy objectives.

3. In 2016 OECD Agricultural Ministerial, ministers recognised “...the need for integrated policy approaches that will better enable farmers and the food sector to simultaneously improve productivity, increase competitiveness and profitability, improve resilience, access markets at home and abroad, manage natural resources more sustainably, contribute to global food security, and deal with extreme market volatility, while avoiding trade distortions.” (OECD, 2016_[6]). They invited the OECD to pay urgent attention to analysing the policy environment for food and agriculture in this context.

4. This revised framework has benefited from the experience of applying an initial version (OECD, 2015_[7]) to several country studies and the corresponding policy lessons that have reinforced the idea of a holistic policy approach, because the whole policy package matters (OECD, 2019_[1]). Policy strategies should cover the whole food supply chain and well-functioning markets and a sound regulatory and policy environment are key to foster innovation and improve productivity, sustainability and resilience. Recent work covers some needs to improve evidence on the linkages between agricultural policies, productivity and environmental sustainability (OECD, 2019_[4]), but the framework needs continuous improvements from additional evidence. ICT and digital technologies can play an important role in innovation and in policy design. Policy coherence and potential trade-offs deserve special attention when applying this framework.

¹ See the G20 Agriculture Ministers’ Declaration 2017 (G20, 2017_[16]); the Interagency Report to the Mexican G20 Presidency (G20, 2012_[17]); and the joint declaration of Agriculture Ministers at the meeting of the Committee for Agriculture at ministerial level at OECD on 7-8 April 2016 (OECD, 2016_[6]).

² This work builds on the OECD Innovation Strategy (OECD, 2010_[20]), the work on Green Growth (OECD, 2014_[12]; OECD, 2014_[13]) and the Agricultural Innovation Systems (OECD, 2013_[21]).

2. Overview of the OECD Agro-Food Productivity-Sustainability-Resilience Policy Framework

5. This framework is a tool to assess policies in a specific country and reorient them towards a more efficient and comprehensive approach, focusing agricultural policy on measures that strengthen the long-term productivity³ and sustainability⁴ performance of the sector (OECD, 2019^[5]). These include investments that promote innovation⁵ and infrastructure capacity, and farmers' access to input and output markets, while ensuring the resilience⁶ of farmers and the agri-food system to future risks and uncertainty, because things change and “resilience thinking” can reduce vulnerability and open new opportunities (Walker and Salt, 2006^[8]). Productivity and sustainability are two sides of the same long-term policy goal of being able to produce more efficiently with the use of less inputs and natural resources. Strengthening the long-term performance of food and agriculture would also require adopting integrated policy approaches that encompass the wider enabling policy environment. The implementation of the framework emphasises the identification of the specific policy challenges ahead, with a long term view of the position of the sector in the upcoming decades.

6. The framework puts the focus on three interrelated policy goals and outcomes: improving productivity and environmental sustainability simultaneously; and increasing resilience, that is, the capacity of the system to absorb the impacts of adverse events, recover from them, and adapt and transform in response to uncertainty and a changing risk environment in the future (OECD, 2018^[9]). Productivity, sustainability and resilience are desired outcomes of the food and agriculture system. The achievement of these long-term goals depends on a complex set of policies and on the structural context of the sector and the economy. The food and agriculture sector is subject to a wide range of economy-wide policies as well as measures specific to the sector itself. The framework covers a broad range of policies that may affect the performance of farmers and the food and agriculture sector. The application of the framework requires systematically analysing the full range of policy incentives and disincentives that might impact agricultural productivity growth and the sustainability and resilience of agriculture production. The framework also proposes to look at the context in which the agro-food sector operates in the whole economy, through markets and value chains, linking to services and digital technologies, financing investment and innovation. Further aspects of the agro-food system, including consumer demands that can shape innovations in the food system and consumer policies will be analysed as these are particularly relevant to influencing the performance of the sector.

³ The most comprehensive productivity indicator is the Total Factor Productivity (TFP), which reflects the efficiency with which firms combine inputs to produce outputs.

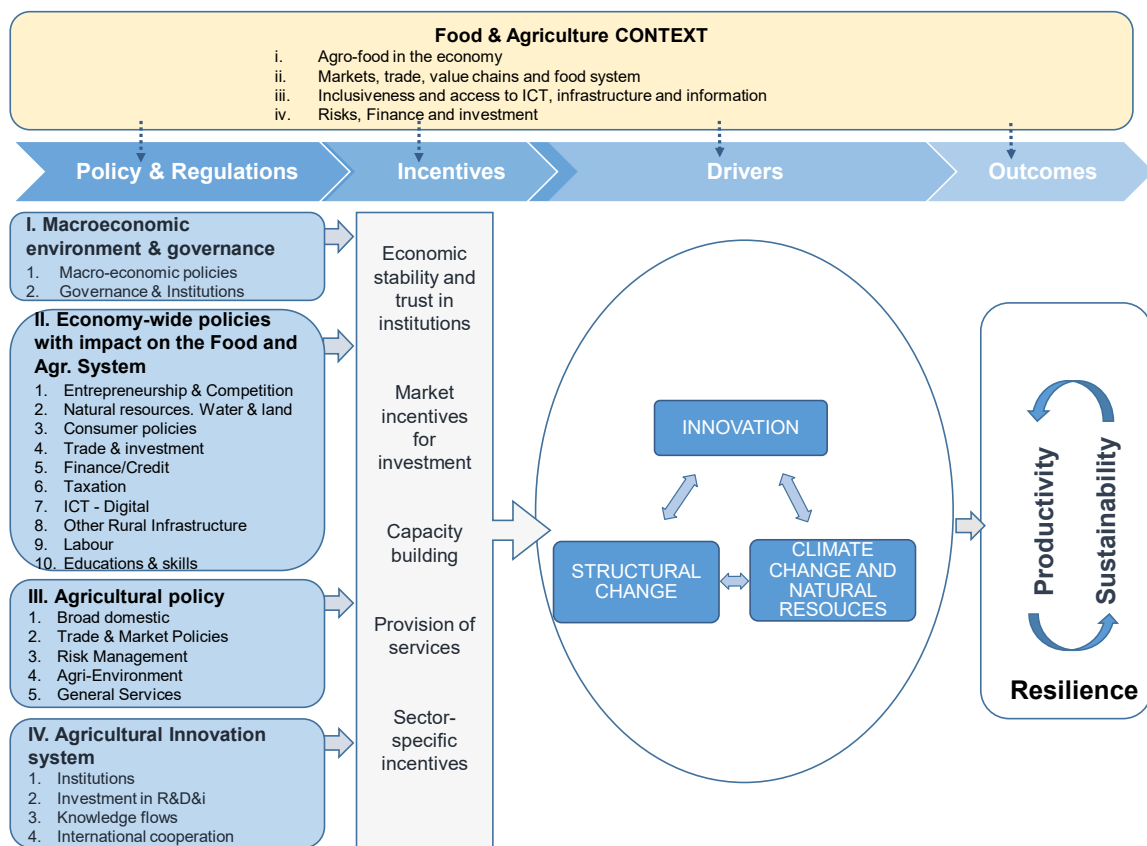
⁴ Sustainability refers to the preservation of natural capital, i.e. environmental sustainability. This encompasses managing agriculture's use of natural resources to ensure their long-term viability and reducing the negative environmental impacts of agriculture production which can damage the natural assets. Sustainable agriculture production systems also need to adapt to the projected impacts of climate change and to mitigate greenhouse gas (GHG) emissions.

⁵ As defined by the Oslo Manual (OECD/Eurostat, 2018^[18]), innovation is a broad concept. It is more than research and development (R&D) and encompasses both the creation and adoption of innovation, which can be “new to the firm, new to the market or new to the world”.

⁶ Resilience can be understood as “the ability to plan for, absorb, respond, recover from, and more successfully adapt to adverse events” (TAD/CA/APM/WP(2018)21), which in agriculture can include market volatility, more variable weather conditions under climate change, pest and disease outbreaks, and natural disasters.

7. Figure 1 represents a schematic overview of the linkages between the different policy areas and the desired outcomes in the framework. The top box in the figure summarises factors that influence and contextualise the agriculture system as part of the whole economy: the relative size of the sector, the market and food system structures, the most relevant inequalities and accessibility to infrastructure, and the risk and finance profile. The boxes in the first column of the same figure collect the different areas of government policy and regulations that may affect the capacity of the agro-food system to deliver good productivity, sustainability and resilience outcomes. The policy coverage is broad and includes not only agricultural policies and the agricultural innovation system, but also non-agricultural specific policies and even the macroeconomic environment and governance.

Figure 1. The OECD Agro-Food Productivity-Sustainability-Resilience Policy Framework



Source: Revisions from OECD (2015^[7]).

8. These policies contribute to defining the incentives for the sector and the economy. They significantly influence the transformation of the sector and its performance in terms of the main drivers of change, often shaped by consumer demands: the structural adjustment needs, the constraints and opportunities generated by climate change and natural resource endowments, and the capacity of the system to innovate. The productivity, sustainability and resilience outcomes are the result of these interactions between these three main drivers.

3. The impact of policy on productivity, sustainability and resilience

9. The linkages between policies, productivity, environmental sustainability and resilience are embedded in the dynamic process of transformation of the sector. Innovations can respond to environmental challenges to reduce the use of natural resources and also facilitate structural adjustment. Structural adjustment needs may drive the development of new technologies and environmentally friendly farm practices. Climate change and environmental and resource constraints may drive results in research and lead to structural change. Demand, whether individually transactional or through trade and stakeholders action is a powerful participatory and ever-evolving tool that shapes and connects the drivers of change. Responding to consumers' demands becomes an important and transparent indicator of accountability. The possibility of increasing accountability is growing due to more accessible transparency tools, access to media, data and technologies such as digital apps, distributed ledgers and direct-to-consumer options.

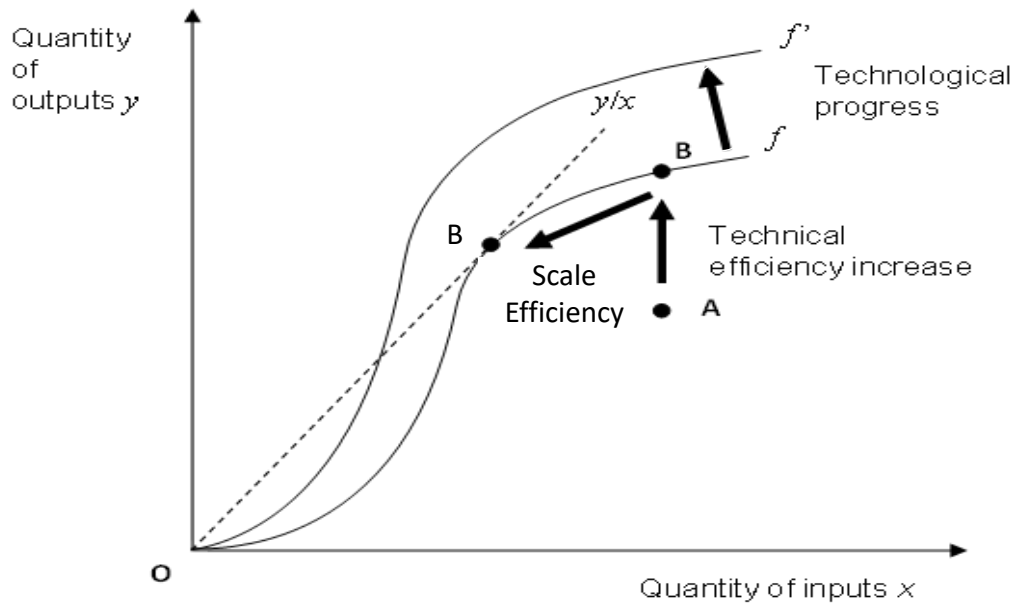
10. Policies affect these three drivers through four main channels or incentive areas. The impact of policy on these incentives and disincentives are the core of the policy analysis under this framework:

- *Economic stability and trust in institutions* (justice, security, property rights), which are essential to attract long-term investment in the economy.
- *Market incentives and private investment*, through a regulatory environment that does not hinder innovation and enables competition, ensures sustainable use of resources, and facilitates the adoption of new technologies; trade that facilitates flows of goods, capital and knowledge; access to finance and tax provisions.
- *Capacity building, including provision of essential public services*, which facilitates access to markets and knowledge, and improves skills needed to innovate and improve resource use efficiency.
- *Agro-food sector-specific incentives* for innovation, structural change and sustainable resource use, derived from agricultural policy and agricultural innovation policy.

11. For each policy area, the Framework considers the impacts of the country's policy measures on productivity growth, sustainability and resilience, through the incentives and intended or unintended disincentives they create on demands and on the three drivers of sustainable productivity growth: innovation, structural change and sustainable use of resources and climate change.

12. The relationship between innovation, economies of scale and productivity is illustrated by Figure 2, which depicts three pathways of productivity growth. Technological progress occurs when the production function is displaced upwards opening new technically feasible opportunities. This may reflect early adoption of innovation by best performers. Technical efficiency change occurs when a firm adopts existing technologies that are being used by the most productive actors: already existing technologies are used to combine inputs in a more efficient manner. This movement represents wider diffusion of innovation. Finally economies of scale occur when the scale of the operator is changed to benefit from the advantage of (bigger or smaller) size to reduce the input output ratio (Sheng et al., 2014_[10]). Structural change also affects the capacity to adopt scale-dependent innovations. By examining these inter-relationships simultaneously, additional complexity is added to the analysis but this is necessary in order to address the complementarities and trade-offs that policy makers confront.

Figure 2. Pathways of productivity growth

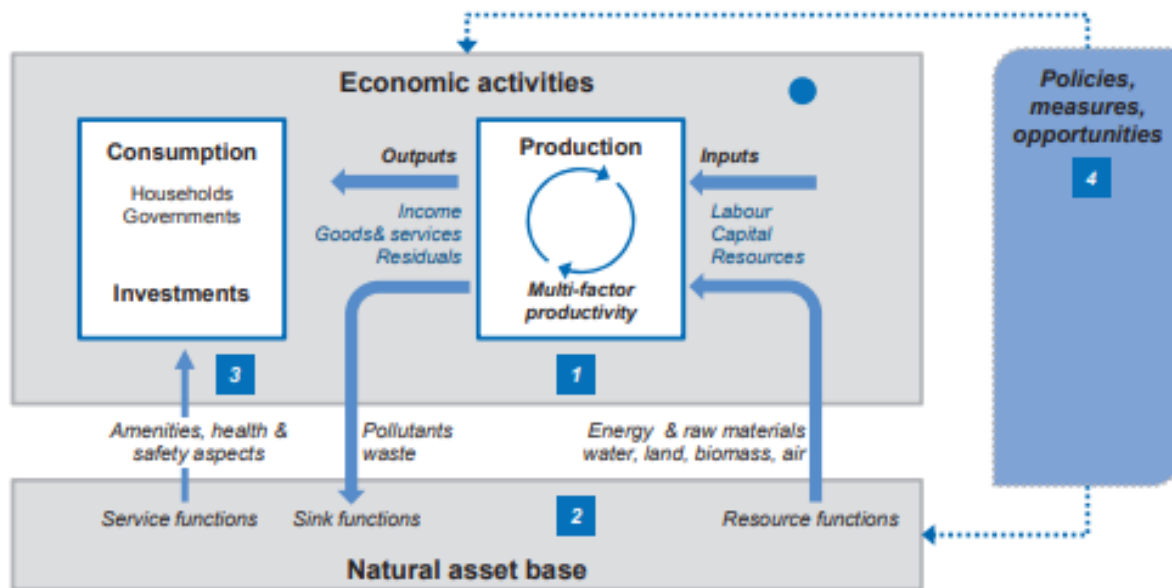


Source: OECD (2011^[11]).

13. Agricultural production relies on fundamental biological processes, which combine various natural resources, the stock of which is an asset or “Natural Capital”,⁷ with other inputs (Figure 3). In the Framework, sustainable productivity refers to productivity growth compatible with the preservation of natural capital in the short and long run. Like physical capital, natural capital needs investment and maintenance to retain its productive capacity in the long run. To be sustainable, productivity growth will also need to account for the projected impacts of climate change, and the associated adaptation responses, and the potential role of agriculture in the global greenhouse gas mitigation effort.

⁷ Natural capital has become the standard term to define the “natural assets in their role of providing natural resource inputs and environmental services for economic production” (OECD, 2015^[19]).

Figure 3. Productivity and sustainability of natural resources



Note: MFP: Multifactor Productivity.

Source: adapted from The OECD Green Growth Measurement Framework OECD (2014_[12]; 2014_[13]).

14. The OECD framework takes holistic view of ‘productivity’, which is defined as Total Factor Productivity (TFP), a concept which considers the efficiency with which firms combine all inputs to produce outputs (OECD, 2019_[4]). Conceptually, this notion of productivity extends to including natural resources and environmental goods and services (Multi-factor productivity in Figure 3). Therefore, progress towards sustainable productivity could be measured by considering holistic TFP measures, such as ‘environmentally-adjusted TFP’ (EATFP)⁸ that include the use of natural resources. This incorporation of by-products and externalities in the measurement of TFP is already standard in the analytical literature which also highlights its empirical challenges (Chambers, 2016_[14]; OECD, 2014_[15]).

15. In practice most TFP measures at best include environmental elements only partially and agreement at the international level about how EATFP indices should be formulated remains a work in progress. An important part of the OECD co-ordinated Network’s on Agricultural Total Factor Productivity and the Environment activities is the development of methodological and practical guidance that member countries can use to construct productivity accounts for the measurement of TFP and EATFP trends.⁹

⁸ According to the OECD, “Conventional productivity measures often only account for those inputs and outputs for which there are market transactions, while the role of the environment in production is not taken into account. This omission can be a source of systematic bias in productivity calculations and can contribute to incorrect interpretations of the results and subsequent policy conclusions. A comprehensive total factor productivity (TFP) indicator (i.e. environmentally-adjusted TFP) that accounts for the use of natural resources and production of undesirable environmental outputs is needed”. See <https://www.oecd.org/agriculture/events/environmentally-adjusted-total-factor-productivity-in-agriculture-14-december-2015.htm>, accessed September 2019.

⁹ For more details see the Network’s web site: <http://oe.cd/eatfp>.

16. This Framework focuses on the role and impact of policies on the interrelationship between productivity, sustainability and resilience outcomes. In doing so it draws on previous OECD work on agricultural policy evaluation, agricultural innovation and productivity, agri-environmental indicators, and green growth for agriculture.¹⁰ It also draws heavily on policy review experiences in other economic and social policy fields, in particular those of other OECD policy communities. The benefits in terms of productivity, sustainability and resilience have to be compared with the economic and social costs of policies. Table 1 illustrates the implementation of the Framework using the example of investment support.

Table 1. The example of investment support

Policy area	Domestic agricultural policy
Policy measure	Support to farm investment
Incentive area	Reduces the cost of investment and thus facilitates:
Drivers	Demand: responding to specific consumers' demands, standards or norms.
Innovation	The introduction of new technologies, allowing for innovation in production methods, products, marketing and organisation.
Structural change	The purchase of additional fixed inputs (land, buildings), allowing for adjustment and economies of scale.
Sustainable resource use and climate change	The introduction of technologies for a more sustainable use of resources, if there are market and policy incentives to improve sustainable resource use
Outcomes	Will also depend on market and other policy incentives. Impact will be stronger if support is targeted to specific investments.
Productivity	Innovation and economies of scale contribute productivity growth but the extent depends on the type of innovation (e.g. labour saving technologies may improve labour productivity but not total factor productivity)
Sustainability	Some innovations can improve sustainability and climate change adaptation and mitigation. More likely to happen if support is conditional on the adoption of environmentally, climate friendly technologies and practices.
Resilience	If incentives to adaptation are kept, investments on prevention and preparedness will improve the capacity of absorption and recovery to shocks. Investment can also be transformative in response to new market, climate or other conditions

17. Section 4 and Annex A discuss these linkages for each policy area, and suggest a number of questions and associated indicators or sources of information that could help identify policy incentives and disincentives and assess policy outcomes.

18. The complex interactions and linkages between policy productivity and sustainability have been analysed in OECD work. Policies affect incentives through changes in: relative prices, income constraints, risk exposure and incentives for structural change. These incentives affect farmers' decisions in terms of intensive, extensive and entry-exit margins. These decisions will enter into the dynamics of different drives in terms of innovation, structural change and the climate/environmental pressures. The final impacts on productivity and on environmental outcomes are complex and may depend on the policy package, the regulatory framework and the characteristics of the farm. However different policy categories have differentiated impacts on the environmental sustainability and productivity. For instance, according to (OECD, 2019^[4]):

- **“Market price support, support coupled to production** (e.g. payments based on outputs) and **payments based on unconstrained variable input use** generally produce negative environmental outcomes; the exception is where the support changes relative profitability of different outputs in a way which incentivises shifts

¹⁰ See references for a list of most recent TAD reports, upon which the draft framework relies.

towards lower-intensity land uses. These payment types are also generally found to have a negative impact on farm technical efficiency and productivity.

- Support **coupled to production** (e.g. payments based on outputs) generally has a negative impact on farm technical efficiency and productivity, as well as negative environmental impacts. Negative environmental impacts of coupled support are particularly a concern for high-intensity agricultural systems, where existing high input use combined with policy signals to further intensify are more likely to result in environmental pressures exceeding natural attenuation capacity thresholds.
- **Payments based on current area** can provide incentive to maintain marginal land in production: environmental sustainability impacts of this depend on contextual factors such as whether land is simply abandoned, or converted to potentially more environmentally-friendly land uses. **Payments based on current area or animal numbers** mostly affect environmental pressures via the extensive and entry-exit margins. Thus, they could have environmentally positive impacts if they support shifts towards land uses with relatively lower intensity.
- **Decoupled payments** generally do not affect incentives at the intensive or extensive margin, but may affect incentives at the entry-exit margin. Specifically, decoupled payments may supplement incomes and thereby improve the viability of agricultural enterprises, dampening incentives to shift to other land uses.
- Past policies, in combination with other factors, have in several OECD countries produced agricultural production systems which are **highly intensive**, and which have **large negative environmental impacts**, particularly in terms of nutrient runoff and greenhouse gas emissions.”

19. These and other key findings from OECD thematic and analytical work and from empirical research are the main tools for the policy analysis in the framework. Further results from ongoing work on productivity, environmental sustainability and resilience will be incorporated into the framework as they become available.

4. Indicators for measuring different areas of context, policy, drivers and outcomes

20. The application of this framework follows an evidence-based approach to policy assessment. For that purpose, pertinent information and indicators are collected and analysed. The approach is organised around four types of indicators – outcomes, context, drivers and policy – covering the main areas of the framework. Some indicators may fit in more than one category. However in this framework they are presented only under one type. For instance, agro-environmental indicators often capture only imperfectly final impacts and reflect more environmental pressures that may be considered under either drivers or outcomes. This section provides the basic rationale and ideas on the potential indicators. Annex A further develops the links between the main policy questions on outcomes, context, drivers and policies and core indicators.¹¹

21. The structural **context** defines current conditions under which the agro-food sector operates. Some of these conditions might result from a sectoral economic path followed in the past; while all of them affect the capacity of the sector to respond to policy incentives and consumer demands, and to facilitate innovation, structural change and sustainable use

¹¹ A full list of indicators and sources, including core indicators and additional indicators is available in an excel working file. The Secretariat regularly updates this file and will make it available upon request.

of natural resources. They also define the needs to concentrate policy incentives in specific areas. The context indicators are grouped into four main categories:

Agro-food in the economy. Share of agriculture and food in GDP, employment and trade.

Markets, trade, value chains and food system. Market developments, participation of the sector in value chains, flows of value added from and to other sectors (like services), and other countries, market structures, and other aspects of the food system, including the demand side.

Inclusiveness and access to ICT, infrastructure and information. Easy access to basic infrastructure, digital technologies and skills, and information such as on markets and weather; disparities between regions, rural-urban and minorities.

Risks, finance and investment. Potential risks related to weather, markets and diseases, access to credit and banking services; private investment.

22. The **policy** coverage is broadly defined and it captures both economy-wide as well as agriculture-specific policy areas. What is more, it encompasses budgetary and regulatory policy initiatives. Even if all these information will be looked at, no detailed analysis will be undertaken for economy wide policies. Information and policy indicators cover the following areas:

1. *Macroeconomic environment.* A favourable macroeconomic environment generates the stability required for a good functioning of markets and investment decisions.
 - Macroeconomic policies: Public debt and deficit, and monetary policy.
 - Governance and institutions: Governance rules and quality of institutions.
2. *Economy-wide policies with impact on the Food and Agricultural system.* The analysis of economy-wide policies will focus on their specificities for the food and agriculture sector, such as differentiated provisions or expected differentiated impact, compared to other sectors.
 - Entrepreneurship. Businesses and market regulations, including competition policy.
 - Natural resources. Access to natural resources, water management provisions, land use and environmental standards.
 - Consumer and health (food safety) policy, including regulations on products and processes and standards.
 - Trade & investment. Import and export protection including on services, custom procedures, non-tariff measures and investment regulations.
 - Finance/Credit. Banking regulations, interest rates and credit programmes for agro-food sector.
 - Taxation. Tax provisions as applied to food and agriculture, including possible differential treatment and tax incentives for investment, R&D and innovation.
 - ICT – Digital economy. Policies promoting access to digital infrastructure and services.
 - Other rural infrastructure. Public and private finance of rural infrastructure and services in rural areas.

- Labour. Labour legislation, efforts to improve the matching of labour supply and demand in food and agriculture, including incentives in job declining areas and industries, and migration rules.
 - Educations & skills. Agriculture education programmes and institutions.
3. *Agricultural Policy*. The policy framework, objectives and whole set of sectoral agricultural policies have a direct incidence in sectoral incentives. Corresponding indicators for the OECD countries and the key emerging economies are currently available in the OECD “Producer and Consumer Support Estimates” database. For countries that are not included in this database, the application of the framework requires an additional investment to create comparable indicators based on national sources. To address policies targeting specific goals like risk management or the environment more detailed classification and analysis of policies may need to be conducted.
- Broad domestic. General payments and programmes to farmers based on commodity outputs, input use or land, animal numbers, receipts and income. Investment support, including adjustment and innovation measures
 - Trade, market and product specific policies. Tariffs, taxes or subsidies to imports or exports, as well as other interventions in domestic markets, measured as market price support. Biofuel policies.
 - Risk management. Support to insurance or stabilisation programmes, as well as to climate change adaptation and disaster assistance.
 - Agri-environment. Measures aiming at lowering the negative and increasing the positive environmental impacts of agriculture: facilitating better resource allocations, encouraging the adoption of environmental practices and the production of specific environmental outcomes, or the prohibition of specific practices.
 - General services and public goods. Provision of other services and public investment for the agricultural sector as a whole.
4. *Agriculture Innovation System (AIS)*. The AIS is a complex network of actors and institutions participating in research, education, training, extension, farming, input supplying, marketing, processing and consuming. Some of these actors come from outside of the agricultural sector, and they can influence innovation from any point in the value chains. The AIS links research and innovation along the chain with demands from farmers, consumers and the civil society.
- Institutions. Main actors and institutions in the AIS and their links with the economy-wide innovation system, sources of finance and priorities setting.
 - Investment in R&D&I. Public investment is a main source of funding for research and development and innovation; other alternatives such as Public Private Partnerships (PPP) might also be available with different government roles.
 - Knowledge flows. Intellectual Property Rights, knowledge markets and networks, adoption including investment support in firms and farms and extension and advisory services for farms, as well as training on new technologies.
 - International cooperation. Linkages of the national AIS with other international networks and systems, including cooperation between countries.

23. The **drivers** of productivity, sustainability and resilience are factors generating a dynamic evolution of the system, increasingly shaped by consumer demands. The three main drivers are:

- a. *Innovation*. Performance of the innovation system in terms of patents, publications and, particularly, adoption, and other indicators and measurement of innovation in the agro-food system.
- b. *Structural change*. Distribution of farms in terms of income and production size, structure of farms and firms in the sector and the economic development of regions and rural areas where agriculture is produced.
- c. *Climate Change and Natural resources*. Impacts of climate change in the sector; and country-specific indicators of agri-environmental pressures such as land use, crop profile or livestock density. Sometimes agri-environmental indicators are proxies for outcomes or pressures and may be used to describe both outcomes and drivers.

24. Finally, there are three main **outcomes** analysed in this food and agriculture policy framework: the capacity to innovate and produce more with a more efficient combination of different inputs; and the capacity to ensure the sustainability of natural resources and the environment impacts, and the resilience of the agricultural system. The possibility of using indicators that combine more than one outcome will be explored.

- a. *Productivity*. Total factor productivity and other measurements of productivity at farm and sector level.
- b. *Sustainability*. Agri-environmental indicators that measure the impact of the sector on the environment and the efficiency in the use of natural resources.
- c. *Resilience*. Indicators, if available, would measure the physical and economic capacity of the food system, the industry the sector and farmers to absorb, recover, adapt and transform in response to shocks and hazards.

5. The Review Process

25. Applying this OECD Agro-Food Productivity-Sustainability-Resilience Policy Framework requires a policy engagement with the government of the corresponding country and a consultation with experts and stakeholders. The review process will include a systematic identification of the main factors behind the country's outcome performance. At least two policy discussions need to be undertaken with the country stakeholders.

- The first one – at the beginning of the review process – has an emphasis on identifying the priority policy challenges ahead in terms of productivity-sustainability-resilience performance, with a long term view of the position of the sector in the upcoming decades. A significant investment needs to be made in a good identification of these issues that deserve a particular attention in the review process and in the final report.
- The second policy consultation – at the end of the review process – serves to present, refine and discuss the policy implications.

26. The engagement with the government to gather the appropriate information is a continuous effort along the whole review process, including the exchange and response to questionnaires and other formal and informal channels of communication. The final set of outcomes of the review process under this framework includes: a policy report with specific policy recommendations; and a policy discussion in the appropriate policy fora.

27. The process and the results will be peer-reviewed by experts or policy makers from two or three different countries. They will have the opportunity to ask questions to the reviewed country officials during the final policy dialogue.

28. A formal review of the implementation of the policy recommendations will take place one to three years after the finalisation of the review.

6. Content of policy reviews

29. The content of the final report covers all policy areas, drivers and outcomes defined in this framework, as well as the context. The exact content and structure of the report can change for different countries to be adapted to the specific relevant policy issues in each country as identified during the review process, without losing its holistic approach. Each of the elements listed in Section 4 and characterised in Annex A will be included in the final report, but the structure and order of chapters may differ in order to facilitate the communication of the main storyline in each report. Chapters will combine information from outcomes, context, drivers and policy as needed for the analysis. The subsequent assessment will particularly focus on the policy coherence between different areas, instruments and goals, and potential trade-offs and needs of arbitrage of relevance for policy makers.

30. All the work and analysis in the review converges into a section that makes an overall assessment of the policies for productivity, sustainability and resilience in food and agriculture. This assessment provides a comprehensive picture of the extent to which the policy environment is supportive of the needed investment in innovation, the required structural changes, and the sustainable use of and impact on natural resources; and delivering the productivity growth, sustainability performance and resilience appropriate for the country. For each policy area, it outlines main issues and develops specific policy recommendations that, over time, would improve the incentives and reduce the disincentives to an improved balance of increased productivity growth and sustainable resource use in the food and agriculture system. The basis of the assessment and recommendations is the impacts and links between the policies and the productivity, sustainability and resilience outcomes.

Annex A. Context, Policies, Drivers and Outcomes covered by the reviews

Food and agriculture context

i. Agro-Food and in the overall economy

Purpose	Questions	Indicators
<p>The overall economic, social and environmental context in which the sector operates, and the natural resource base upon which it relies, are important drivers of sector performance. The structural characteristics of the sector affect its capacity to adapt to new challenges and opportunities. In the long-term, sector productivity, sustainability and resilience performance are determined by demand, innovation, natural resources, climate change, and structural change – which in turn are influenced by a range of policies (as discussed in the Policies and regulations part of the table).</p>	<ul style="list-style-type: none"> • What are the country's main economic and geographical characteristics? • What is the share of agriculture in the economy? • What are the main food and agriculture outputs? • What impact does consumer influence hold 	<ul style="list-style-type: none"> • GDP (level and per capita). • Population and population density. • Total country land area. • Freshwater resources (level and per inhabitant). • Share of agriculture and food in total GDP, employment, imports and exports. • Composition of food and agriculture outputs. <i>[national and international data sources]</i>

ii. Markets, Trade, Value Chains and the Food System

<p>Market development play an important role in leading innovation processes. Integration in value chains and trade, as well as new demands from the food system are major factors leading innovation and structural adjustment.</p>	<ul style="list-style-type: none"> • What is the structure of trade flows in terms of commodities, markets and regions? • What are the main structural characteristics of upstream and downstream industries? • What is the profile of participation in value chains? Are services a growing input for the agro-food sector? • How is the country performing in the demand side in areas such as different types of malnutrition or food waste? • To what extent is production constraint by private standards? 	<ul style="list-style-type: none"> • Trade openness (Agro-food trade in total GDP and agro-food trade in value added) <i>[Calculation based on UN Comtrade and national and international data sources]</i>. • Composition of imports and exports, and net trade position <i>[UN Comtrade]</i>. • Indicators of participation in domestic and global value chains based on the upstream and downstream value added flows <i>[national and international data sources]</i>.
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iii. Inclusiveness and access to ICT, infrastructure and information

Purpose	Questions	Indicators
Access to infrastructure and information has become a main resource for innovation. In particular, digital technologies play a role in facilitating knowledge flow and adoption of new practices.	<ul style="list-style-type: none"> Is physical and ICT infrastructure adequate to the needs of environmentally-sustainable economic development, in particular with respect to the food and agriculture sector? If not, what are the bottlenecks? How easy is it for producers and other actors in rural areas to access information about market developments, technical options, policy and regulatory developments and weather? 	<ul style="list-style-type: none"> Quality of transport infrastructure index [<i>World Economic Forum, Global Competitiveness Index (WEF GCI)</i>, http://reports.weforum.org/global-competitiveness-report-2018/]. Share of irrigable agricultural land [<i>OECD, Agri-environmental indicators</i>]. ICT penetration per 100 inhabitants [<i>e.g. World Bank</i>].

iv. Risk, Finance and Investment

Purpose	Questions	Indicators
Access to finance for investment, including the foreign direct investment, is the basic facilitator on the innovation process in agriculture.	<ul style="list-style-type: none"> Which are the main risks and potential shocks for farmers and for the agro-food sector? Do food and agricultural firms have sufficient access to credit and finance? If not, what is the nature of the constraint? 	<ul style="list-style-type: none"> Variability of prices and weather and incidence of diseases (national sources) Financial market development index [<i>WEF GCI</i>, http://reports.weforum.org/global-competitiveness-report-2018/]. Access to financing of investment. (national sources) Foreign Direct Investment (FDI) stocks and flows (as a % of GDP; for agricultural and food processing sectors as well as for the whole economy) [<i>OECD</i>, http://www.oecd.org/corporate/mne/statistics.htm].

Policies and regulations

Policies I: Macro-economic environment and governance

I.1. Macroeconomic policies		
Purpose	Questions	Indicators
<p>At the broadest level, stable and sound macroeconomic policies, leading to high growth and low and stable inflation rates, play an important role in setting a favourable environment for investment in farms or agri-food firms seeking to introduce new products, to adopt new production methods, or to undertake organisational changes that can lead to higher productivity growth, more sustainable use of natural resources and responses to climate change and stronger resilience for the sector. Assessment of the country's overall growth and growth potential in the short- to medium-term has implications for sector specific prospects as well. In some circumstances, macroeconomic policies and their impacts can contribute to implicit and perhaps unintended biases for or against the food and agriculture system.</p>	<ul style="list-style-type: none"> • How does the overall economy perform; what are medium term prospects for growth? • What measures is the government taking to promote economic growth and jobs? • In what ways do macroeconomic fundamentals facilitate or discourage investment and trade, including in the food and agriculture sector? 	<ul style="list-style-type: none"> • Trends in key indicators of economic performance: real GDP growth, inflation, exchange rate, unemployment rate [OECD, <i>Economic outlook</i>]. • Trends in total government deficit and debt (as a % of GDP) [OECD, <i>Economic outlook</i>].
I.2. Governance and quality of public institutions		
Purpose	Questions	Indicators
<p>Good governance systems and high-quality institutions provide economic actors with the assurance that the government is accountable, transparent and predictable. They are a fundamental pre-condition both to encourage public and private investment in the economy and to enable those investments to achieve the intended benefits, both for investors and the host country. Moreover, governance systems play an important role in addressing market failure, influencing the behaviour of firms in terms of investment and compliance to regulations, as well as the efficient functioning of farm input and output markets. Finally, how the environment and natural resources are part of the institutional framework and public decision making is important in the capacity for designing efficient and acceptable policy tools.</p>	<ul style="list-style-type: none"> • What are the governance rules regarding policy design implementation and evaluation? Levels of government and their respective responsibilities? • To what extent are governance rules and institutions, including the regulatory process, transparent, clear and predictable? • To what extent do they protect investors, innovators, and the host society? • Do they apply equally to all regions, including rural areas, and people? • To what extent are environmental and natural resources concerns represented in the institutions and the decision-making process? • What are mechanisms to ensure policy coherence, consideration of trade-offs between policy objectives, and the balance the interests of diverse stakeholders? 	<ul style="list-style-type: none"> • Worldwide Governance Indicators [World Bank, https://datacatalog.worldbank.org/dataset/worldwide-governance-indicators]. • Quality of public institutions index [WEF GCI, http://reports.weforum.org/global-competitiveness-report-2018/].

Policies II. Non-agriculture specific policies with impact on the food and agriculture system

II. 1. Environment for entrepreneurship and regulations on products and processes		
Purpose	Questions	Indicators
<p>The overall regulatory environment establishes basic conditions within which all firms, including farms, input suppliers, and food companies, operate and make investment decisions. Competitive conditions in domestic markets, including low barriers to entry and exit, can encourage innovation and productivity growth, including through their impact on structural change. Regulations may also enable or impede knowledge and technology transfer directly, contributing to more or less innovation, including in sustainability-enhancing technologies.</p>	<ul style="list-style-type: none"> • How prevalent is the state in business ownership or control, in particular in food and agriculture? • Are business regulations clear, are there excessive constraints on business start-up and exit? • How effective is competition policy? Do general competition rules apply equally to agricultural and agri-food firms? 	<ul style="list-style-type: none"> • Product Market Regulation (PMR) index and its main components [OECD, PMR indicators, http://www.oecd.org/economy/reform/indicators-of-product-market-regulation/]. • Ease of Doing Business indicators [World Bank Group, Doing Business database, http://data.worldbank.org/indicator/IC.BUS.EASE.XQ].
II. 2. Consumer policies		
Purpose	Questions	Indicators
<p>Regulations on products and processes aim to protect human, animal and plant health and can also impact on natural resource use. Environmental and health related regulations can boost innovation by building consumer and societal trust in the safety and sustainability of new products or processes, but unnecessary or disproportionate regulations can stifle innovation and technological developments.</p>	<ul style="list-style-type: none"> • How are regulations and private standards affecting processes and products established and enforced? Are there specific environmental regulations for products and processes? What are recent developments? • How are regulatory impacts assessed when developing new and reviewing existing regulations? • Are there regulations specific to farms, input suppliers, or food companies that encourage or discourage development or adoption of new technologies and production practices? • What is the demand for regulatory reform? 	<ul style="list-style-type: none"> • Share of land, number of farmers, agricultural production or value-added covered by specific practices (organic, environmental) (with and without labels) (national sources).
II.3. Policies and Regulations on Natural Resources. Water and Land.		
Purpose	Questions	Indicators
<p>Regulations on natural resources are central to ensuring the long term sustainable use of natural resources and in large part determine access to and use of land, water and biodiversity resources. They also impose limits on the impact of industrial and agricultural activities on the state of the natural resource. The design of natural resources policies is important in terms of their incentives for innovation and sustainable productivity growth. Water and land are the key natural resources in agriculture and therefore policies and regulations incentivising their use require a special attention.</p>	<ul style="list-style-type: none"> • What are the rules governing access to and use of natural resources (pricing, ownership, management, etc.)? How are they designed and enforced? Are there specific provisions governing agriculture uses? • How is water management governed among the different levels of government and stakeholders? • What are the regulations governing the use of land and its ownership? • What are the regulations governing the use of land for forestry and agriculture and the changes in land use? 	<ul style="list-style-type: none"> • Environmental policy stringency index [OECD, https://stats.oecd.org/Index.aspx?DataSetCode=EPS]. • Share of land or water under higher protection. • Climate targets: Intended Nationally Determined Contributions (INDCs) [United Nations Climate Change, http://unfccc.int/focus/indc_portal/items/8766.php]. • <i>Water management targets.</i>

II.4. Trade and investment policy		
Purpose	Questions	Indicators
<p>Trade can facilitate the flow of goods, capital, technology, knowledge and people needed to innovate. Openness to trade and capital flows is conducive to innovation as it provides a larger market for innovators, reinforces competition, increases access to new technologies, ideas and processes, including from foreign direct investment (FDI) and related technological spill-overs, and facilitates cross-country collaboration. Trade and investment openness can influence innovation throughout the food supply chain, from input suppliers to food service and retail firms. Input and output markets that operate effectively can foster productivity growth. Trade and investment openness can also facilitate the development of market mechanisms to foster more environmentally sustainable production.</p>	<ul style="list-style-type: none"> • To what extent are customs and border procedures efficient and effective? • What is the level of import (export) protection (restriction or subsidy), including for capital and intermediate goods? What measures are used? • Are there special provisions for technological goods and knowledge supporting services? For environmentally-friendly technologies? • Are the laws and regulations dealing with investments and investors clear, transparent, readily accessible? Do they avoid imposing unnecessary burdens on businesses and on society? • Are there specific restrictions on, or incentives for, foreign investment in agriculture? 	<ul style="list-style-type: none"> • Tariff profile: Average tariffs in agriculture and other sectors (WTO) • Regulatory restrictions to trade and investment [OECD, PMR indicators, http://www.oecd.org/economy/reform/indicators-of-product-market-regulation/]. • Trade facilitation indicators [OECD, http://www.oecd.org/trade/topics/trade-facilitation/]. • FDI Restrictiveness Index for all sectors, agriculture and food manufacturing [OECD, http://www.oecd.org/investment/fdiindex.htm].
II.5. Finance and credit policy		
Purpose	Questions	Indicators
<p>Efficient financial markets are one key to enable balanced development of any economy and society. Access to financial services can be limited or unequal across regions and firms when financial markets fail or when risks are too high. Policies that improve the functioning of financial markets can facilitate productivity enhancing investments in agriculture and farm size growth. Policies may also facilitate access to funding for sustainability enhancing investments. Low cost loans and venture capital can also be an important source of funding for innovative firms with high growth sectors potential.</p>	<ul style="list-style-type: none"> • What is the supply of finance and state of competition in the formal financial sector, including in rural areas? • Do food and agricultural firms have sufficient access to credit and finance? If not, what is the nature of the constraint? • Are there government programmes to improve access to finance (grants, interest concessions, guarantees)? Are there any that are specific to agricultural and agri-food firms? • Are there any programmes that target credit for innovation or for investment in environmentally-friendly technology? Are there any that are specific to agricultural and agri-food firms? 	<ul style="list-style-type: none"> • Government support to investment targeting innovation or adoption of environmentally-friendly technology, in general and for agri-food (trends and share in total support) [national sources].

II.6. Tax policy		
Purpose	Questions	Indicators
<p>Tax policy affects innovation, productivity sustainability and resilience in many ways: it affects the decision of firms and households to save or invest in physical and human capital, and thus the adoption of innovation; it raises government revenues, which can then finance public services, including those enabling innovation such as education and skills, R&D, and strategic infrastructure; it can also be used to provide direct incentives, for example preferential tax treatment to investments in private R&D or to young innovative companies. In addition to its economy-wide impacts, tax policy influences the conduct, structure and behaviour of farm, input suppliers and food companies. Taxes on income, property and land and capital transfer, including land, may affect structural change, while differential tax rates on specific activities (polluting or environmental friendly), resources, or input use may affect sustainability.</p>	<ul style="list-style-type: none"> • What tax arrangements apply to business that might encourage or discourage investment (income, property, sales, import and export taxes)? • Are there specific provisions for farms or agriculture related businesses? e.g. income smoothing, tax rebates on land transfer, taxes on farm inputs. • Do tax arrangements – general or agriculture-specific – have impacts – measured or potential – on the environment, the use of natural resources and the resilience to climate change? If yes, what types of incentives lead to such impacts? • Are there specific tax incentives for private investment in R&D? Are there specific tax incentives for companies adopting innovation? 	<ul style="list-style-type: none"> • Tax burden on company profits (corporate income tax rates as a % of profit) [OECD, <i>Tax database</i>; World Bank Group, <i>Doing Business database</i>, http://www.doingbusiness.org/]. • Tax rates in agriculture compared to other sectors, e.g. income, farmland and farm transfers, fuel tax rebates and subsidies [national sources].
II.7. Policies and regulations on ICT and the digital economy		
Purpose	Questions	Indicators
<p>Access to Information and Communication Technologies and adoption of new digital tools facilitate the flow of knowledge and access to information. Basic ICT infrastructure and the appropriate regulatory framework are policy areas that strongly affect the adoption of innovation and the use of data. Agricultural data (for example, farm level or field level data) is needed to design, implement and evaluate the effectiveness and efficiency of agricultural and agri-environmental policies, as well as for research and to develop new, tailored services for agricultural producers.</p>	<ul style="list-style-type: none"> • What is the regulatory framework governing agricultural data collection, access and transfer? What conditions determine access to data that is relevant for agriculture, in particular, farm-level agricultural data held by governments? • What policies or regulations govern the use of agricultural data for government policy making or regulatory compliance and enforcement? • What are the roles of government on ICT infrastructure: investor, policy/rule maker, enforcer, technology consumer or provider? • Which are the main policy impediments to access and adopt digital technologies by farmers and entities providing services to the agriculture sector? • What is the penetration of ledger technology and its impact on transparency and access to agricultural data at the consumer level? 	<ul style="list-style-type: none"> • Service Trade Restrictiveness Index (STRI) on Digital (OECD)

II.8. Other Infrastructure and rural development policies		
Purpose	Questions	Indicators
<p>Investments in infrastructure are important for overall growth and development. They are vital to the delivery of and access to important services and play a critical role in linking farmers and related businesses to markets, reducing food waste, boosting agriculture productivity, raising profits, and encouraging investment in innovative techniques and products. Productive and profitable enterprises may have higher incentives to invest in sustainable practises that yield long term benefits.</p> <p>Broader rural development measures also affect sustainable agricultural development and structural adjustment. Increased off-farm income and employment opportunities mitigate farm household income risks, facilitate farm investment, and enable a wider range of farm production choices. Improved rural services, from banking to education and health, are important to ensure needed connectivity and attractiveness of rural areas for suppliers, customers, and collaborators. Rural policy can also attract innovative upstream and downstream industries, with possible spill-over effects locally. By reducing inequalities in economic development and access to services across regions, rural development policies improve the diffusion of innovation.</p>	<ul style="list-style-type: none"> • What are infrastructure development priorities? To what extent do they focus on agriculture and agri-food needs? To what extent do they facilitate efficient use of resources? • How is infrastructure development funded? Does the government provide incentives to private investors in infrastructure projects through, e.g. grants, tax concessions, public-private partnerships, etc. Are there specific guidelines in place that govern public-private partnerships for infrastructure projects? • What are the institutions and policy and market mechanisms managing access to infrastructure or resources? • Are public services in rural areas sufficient to maintain/attract people and businesses? 	<ul style="list-style-type: none"> • Infrastructure expenditures in rural areas and /or for agriculture and food, as a % of GDP (national sources).

II.9. Labour market policy		
Purpose	Questions	Indicators
<p>Labour market policy influences employment composition and labour mobility, in particular by facilitating (or discouraging) labour to adapt to new circumstances. It can play an important role in facilitating structural adjustment, including farm consolidation, by assisting excess labour in farming to exploit more remunerative non-farm income and employment opportunities. Policies on skills improvement and on international mobility of human resources can also help to better match labour supply with demand, and can affect innovation and knowledge transfer through exchange of skills and skilled labour. Structural adjustment allowing younger and better educated farmers to enter the sector, and skills improvement policies are expected to improve the adoption of sustainable practices.</p>	<ul style="list-style-type: none"> • Does labour market legislation facilitate adjustment to new opportunities? To what extent are employment and labour conditions protected? • Are there specific provisions for farm operators and workers? • Are there specific initiatives to create new jobs and assist labour adjustment from declining to growing sectors? • To what extent do migration rules ensure labour market demand is met? Do they encourage inflow of skilled labour? • Do significant domestic tensions exist due to skill shortages, and associated migration policies? 	<ul style="list-style-type: none"> • Employment protection indicators [OECD, <i>Employment protection database</i>, http://www.oecd.org/employment/emp/oecdindicatorsofemploymentprotection.htm] • Trends in immigration, in particular seasonal agricultural migration [national sources].
II.10. Education and skills policy		
Purpose	Questions	Indicators
<p>Education policy affects innovation in at least three ways: a high level of general and scientific education facilitates acceptance of technological innovation by society at large; innovation systems require well-educated researchers, teachers, extension officers, and producers to develop relevant innovations; it is generally easier for farmers and business operators with higher education and skills to adopt some technological innovations. Continuous skills development (training, re-training) is essential to improve the matching of skills demand, in an evolving agri-food sector, which needs to adopt productivity and resilient and environmentally enhancing technologies and practices.</p>	<ul style="list-style-type: none"> • What are the characteristics of the education and training system? What is the place of science in formal education? Are there programmes to promote life-long skills development and re-training? Are they successful (performance levels)? • Is agricultural education available? Is it adapted to labour market needs? Do graduates remain in the agricultural and related sectors? • Are there specific measures to address evolving labour market needs in the food and agriculture sector? • Are there specific education and training programmes dedicated to natural resources, efficiency of resource use, and environmental pressure (sustainable farm practices), and climate change (adaptation and mitigation)? Which public do they target (students, farmers, agri-food managers and workers)? 	<ul style="list-style-type: none"> • Public expenditure on education as a % of GDP and per student [OECD, <i>Education at a Glance</i>]. • Trends in enrolments and graduates in agriculture programmes [OECD, <i>Education at a Glance</i>]. • Higher education and training index [WEF GCI, http://reports.weforum.org/global-competitiveness-report-2018/].

Policies III. Agricultural policies

III.1. Agricultural policy framework and broad-based domestic measures		
Purpose	Questions	Indicators
<p>Domestic agricultural and associated trade measures affect farm investments and practices through a variety of instruments, with different intended and unintended impacts on structural change, natural resource use and innovation.</p> <p>A policy instrument will affect business decisions by changing the relative prices of inputs and outputs. For example, investment support lowers the price of land and capital and could thus facilitate structural change and investment in new technologies (Table 1). The path of productivity growth, sustainability and resilience outcomes will then depend on both market and other policy incentives and disincentives.</p> <p>Sustainability outcomes are linked to the way natural capital, which is the source of service flows entering the production process, or ecosystem services, is being priced and used. In cases where public policy is deficient to address these market failures in pricing natural assets, which often have common pool, externality or public good characteristics, there is a risk that innovation systems and productivity growth in agriculture follow a non-sustainable pathway, leading to progressive depletion of natural assets, which may not be substituted by other forms of capital or by labour. In such cases, there would be a trade-off between productivity growth in the short-run and in the long-run.</p>	<ul style="list-style-type: none"> • What is the main policy framework? • What are current programmes and funding mechanisms? • Is the impact of agricultural measures on the adoption of innovation, structural change, and the state and sustainable use of resources at farm and industry level included in the evaluation of agricultural policy measures? If yes, what are the results of recent evaluations? 	<ul style="list-style-type: none"> • Trends in overall budget expenditures [national sources]. • Selection of indicators on the support to agriculture, e.g. Total Support Estimate (TSE) and its composition and as a % of GDP [OECD, <i>Producer and Consumer Support Estimates database</i>, http://dx.doi.org/10.1787/agr-pcse-data-en].
<p>Measures that distort markets, such as border protection, supply controls, output-based payments reduce producers' incentives to use production factors more productively. As such, they hinder structural adjustment and discourage producers from innovating and becoming in this way more competitive. These distorting measures can maintain resources in the sector that would otherwise be reallocated to more productive uses; they can encourage more intensive production, sometimes on marginal or fragile land; and they can encourage production practises that do not always take adequate consideration of longer term environmental sustainability. By rising production costs for domestic food, processors may stimulate innovation in processes and products.</p>	<ul style="list-style-type: none"> • What instruments are used to support prices and income? • What are implementation parameters? e.g. eligibility, support rate, conditions attached to the granting of income support? • What is the share of support in farm receipts? 	<ul style="list-style-type: none"> • Selection of indicators on the support to agriculture, e.g. Most distorting transfers as a % of PSE or GFR [OECD, <i>Producer and Consumer Support Estimates database</i>, http://dx.doi.org/10.1787/agr-pcse-data-en].

Broad-based income support decoupled from commodity production is more effective in transferring income to producers and thus increasing their capacity to invest and innovate. It also leaves more flexibility to producers to undertake new activities and switch to new products. However, even if decoupled from production choices and targeted, income support slows structural adjustment needed to facilitate economies of scale, attract new entrants and thus foster innovation and productivity growth. If conditional on the adoption of environmentally-friendly practices, this support can improve sustainable resource use.

Policies related with the Bio-economy, the use of renewable biomass and the integration of biotechnology. Biofuel policies generate incentives in the food system that has an impact on both sustainability and the direction of innovation

- Are there specific policies on biofuels, including bending requirements and payments?
- Are there bio-economy related strategies in the country?

- Share of biofuels in transport fuels. (national and international data sources)

Some measures are based on input use (variable inputs, capital and services). They include risk management measures, investment support, or support to (advisory, technical) services to producers. As illustrated in Table 1, investment support can support adjustment by facilitating investment in modern technology or additional inputs needed to increase economies of scale, and thus productivities. It can be targeted to the purchase of innovative or more sustainable technologies, but even if it is not, other market and policy incentives can guide investment in these areas.

- What instruments are used to support variable input use, investment and services to producers?
- What are implementation parameters? E.g. eligibility, support rate, conditions attached to the granting of support?
- What support do they generate?

- Selection of indicators on the support to agriculture, e.g. Use and composition of **support based on area, animal numbers, receipts and income** as % of GFR [OECD, *Producer and Consumer Support Estimates database*, <http://dx.doi.org/10.1787/agr-pcse-data-en>].

III.2. Trade-related measures and market policies

Purpose	Questions	Indicators
Among the measures that distort markets, border protection, supply controls and market interventions particularly hinder structural adjustment and discourage producers to innovate to become more competitive. Trade measures that restrict market access for foreign inputs and commodities, and subsidise commodity exports restrict foreign competition and affect domestic market. They contribute to maintaining domestic price support and to hindering access to agricultural inputs and services or raising their costs. They may restrict access to innovative technologies and inputs.	<ul style="list-style-type: none"> • To what extent do obstacles to trade affect the agri-food sector? Is foreign competition limited by tariff and non-tariff market access barriers? Do existing tariff and non-tariff barriers to trade contribute to hindering access to agricultural inputs and services or raising their costs? • What price transfers do they generate? • What is being done to reduce trade-related obstacles to innovation? 	<ul style="list-style-type: none"> • Agricultural tariff profile across commodities [World Trade Organization (WTO), http://tariffdata.wto.org/]. • Non-tariff measures for agriculture: Technical barriers to trade (TBT) and Sanitary and phytosanitary (SPS) measures [World Trade Organization (WTO), <i>Technical Barriers to Trade (TBT) and Sanitary and Phytosanitary (SPS) Information Management System</i>, http://tbtims.wto.org/ and http://spsims.wto.org/, http://i-tip.wto.org/goods/]. • Selection of indicators on the support to agriculture, e.g. Producer Nominal Assistance Coefficient (NAC) [OECD, <i>Producer and Consumer Support Estimates database</i>, http://dx.doi.org/10.1787/agr-pcse-data-en].

III.3. Risk Management		
Purpose	Questions	Indicators
<p>Agricultural producers face risks, which result in variable outcomes. Support for risk management can be considered as reducing the cost of risk for farmers. Risk management is essential to improve adoption of innovation and more sustainable practices that could increase risk exposure. At the same time, excessive government protection against risks may hinder farmers' adaptation to Climate change and the resilience of the system.</p>	<ul style="list-style-type: none"> • How are the layers of responsibility on agricultural risk management defined? What is the governance of risks? • Are there government measures to facilitate access to information about prices, weather and diseases? • Is the government supporting risk management tools? How? • Are there specific provisions to help farmers deal with the consequences of natural disasters? Which ones? • How are ex ante adaptation measures being promoted? 	<ul style="list-style-type: none"> • Support to risk management programmes: countercyclical/income stabilization programmes, insurance, disaster assistance, savings/tax measures, diversification and adaptation [<i>PSEs and national sources</i>]. • Support to animal and plant health inspection and information systems [<i>PSEs and national sources</i>].
III.4. Agri-environment policies		
Purpose	Questions	Indicators
<p>Agricultural policy instruments that support explicitly the adoption of more sustainable technologies or practices (agri-environmental measures) or measures to adapt and mitigate climate change, and are often associated with regulation and market-based mechanisms. They are likely to steer farmers towards innovative sustainable practices more effectively. In the long-term, they are also likely to guide the content of innovation in the direction of sustainability.</p> <p>Broad domestic support measures that are conditional on the adoption of environmentally friendly practices, can also improve sustainable resource use.</p>	<ul style="list-style-type: none"> • In complement with general regulation on natural resources and environmental protection, what are the specific environmental policy instruments (tax, subsidy, etc.) in agriculture (e.g. water, greenhouse gas, biodiversity)? • What are the characteristics of recent agri-environmental policy instruments: scope, coverage, tax or subsidy rate and formula (or cap for cap-and-trade systems); Allocation of collected revenue (if any). • Is support conditional on environmental practices? • What is the degree of stringency of these environmental policies? • On which basis is the rate of environmental payment rates determined? • What are the characteristics of policies for adaptation of agriculture to climate change? 	<ul style="list-style-type: none"> • Selection of indicators on the support to agriculture, e.g. Budgetary support conditional on the adoption of specific production practices (e.g. payments with voluntary agri-environmental constraints) as a % of GFR [<i>OECD, Producer and Consumer Support Estimates database, http://dx.doi.org/10.1787/agr-pcse-data-en</i>]. • Instruments used for environmental policy and natural resources management [<i>OECD, Policy Instruments for the Environment database, https://pinedatabase.oecd.org/</i>].

III.5. General services and public goods		
Purpose	Questions	Indicators
<p>Agricultural measures that support innovation directly are likely to create stronger incentives and capacity for innovation among agricultural producers and will help structural change. Providing farmers with the skills and tools to better manage economic and environmental risks is also very important to promote the adoption of innovation, but care should be taken that risk management measures do not delay adaptation.</p> <p>Some agricultural policy measures aim to facilitate resource allocation within the sector and across sectors. They include early retirement schemes, and investment assistance for new entrant, for farm enlargement or for diversification of activities.</p>	<ul style="list-style-type: none"> • Are there specific measures to improve adoption of innovation, e.g. credit for investment in farm-level or firm-level innovation, incentives to adopt specific (e.g. green) technologies and practices, support to diversification of activities, risk management? • Are there specific measures to facilitate structural adjustment in the food and agricultural sector? 	<ul style="list-style-type: none"> • Support to investment, general and for specific purpose (innovation, animal welfare, sustainability, climate change) [OECD and national sources] • Support to advisory services [national sources].

Policies IV. Agricultural innovation system

IV.1. Actors, institutions and governance		
Purpose	Questions	Indicators
<p>The economy-wide environment for science, technology, and innovation determines the underlying incentives and dis-incentives in all sectors. Agricultural innovation systems (AIS) are increasingly driven in particular by economy-wide process and organizational innovations, new developments in ICT, and the bio-economy. A thriving innovation profile will ensure that general knowledge and specific knowledge in other fields (needed to develop and implement agriculture innovation) are available, and that economic actors and society in general share an innovation culture (OECD, 2014^[12]).</p> <p>A well-functioning AIS can help ensure good use of public funds, improved collaboration between public and private participants, including across national borders, and a more demand driven system that is responsive to the needs of 'innovation consumers'.</p>	<ul style="list-style-type: none"> • What is the general innovation profile of the country? What is the nature and scope of innovation policy across the economy? What are the main institutions involved? • How is society reacting to the ever more rapid developments in science and technology? How does the government communicate with citizens on science? • What are the main actors (government, private sector, academia, non-profit organisations, producer organisations) and institutions (ministries, universities, research centres) in the AIS and their respective roles (priority setting, funding, performing, educating, facilitating, adopting, influencing, informing)? • What is the governance structure (umbrella ministries, co-ordination, funding, performing, monitoring and evaluation agencies - in the form of a flow chart) • How is agriculture integrated into the general innovation system? • How are priorities established and communicated? How are market and system failures identified? 	<ul style="list-style-type: none"> • Country Science and Innovation Profile https://stip.oecd.org/stip.html.

- How are environmental and sustainable natural resources concerns included in the decision-making process regarding AIS priorities?
- How is performance measured and evaluated? At which levels (project, programme, system) and how frequently? What criteria are used? What input and output indicators are available? What tools are used for benchmarking?
- Are the economic, environmental and social impacts of innovation evaluated? How (methods) and how frequently? How are evaluation results used in priority setting and decision making?
- Is public trust in institutions or in science measurably falling?
- Does government-citizen dialogue on the food system exist?

IV.2. Public and private investment in innovation

Purpose	Questions	Indicators
<p>The public sector continues to be the main source of funding for agriculture R&D, whether performed in public or private organisations. A wide variety of funding mechanisms are used from direct spending on research projects, including for Public-Private Partnerships (PPPs) and “pull mechanisms”, to various forms of tax incentives.</p> <p>Business investment in R&D is normally driven by market demand, but governments also provide different kinds of incentives. Some, like R&D tax rebates, apply to the economy in general, while others are agriculture specific. In many countries, producer organisations and other non-governmental organisations also provide R&D funding.</p> <p>Knowledge infrastructure is a public good that can enable innovation; it includes ICT infrastructure and general purpose technologies as well as specific knowledge infrastructure such as databases and institutions.</p>	<ul style="list-style-type: none"> • What are priority areas for public research in agriculture? Are the issues of sustainable natural resources use, environmental protection and climate change integrated in agricultural innovation policy? What are the research priorities in these areas? • How are public funding decisions made? • What are the trends in public expenditures on agricultural R&D? What is the share of institutional versus project- or programme-based funding? What is the share of basic versus applied R&D? What is the share of public R&D funding dedicated to sustainable technologies and practices? • What is the source of public R&D funding? Has the composition of resources changed over time? • How is knowledge infrastructure supported? What are trends in funding and structure of knowledge institutions? • Are there funding mechanisms to encourage increased collaboration between public and private researchers? What is the share of public support to agricultural R&D funding PPPs? In which areas? What lessons from recent experience? • What are the trends in private expenditures on R&D? • Are there public incentives to private investment in agricultural R&D? What is their target? 	<ul style="list-style-type: none"> • Trends in public expenditures on agriculture R&D (GBARD: Government budget allocation for R&D): growth rate and as a % of agricultural value added [e.g. <i>OECD, Research and Development Statistics (database)</i>, https://stats.oecd.org/; <i>International Food Policy Research Institute (IFPRI), Agricultural Science and Technology Indicators (ASTI) database</i>, http://www.asti.cgiar.org/]. • Share of expenditure performed by government and higher education institutions in total gross domestic expenditure on agriculture and veterinary sciences R&D (GERD) [e.g. <i>OECD, Research and Development Statistics (database)</i>, https://stats.oecd.org/; <i>USDA, Agricultural Research Funding in the Public and Private Sectors</i>, https://www.ers.usda.gov/data-products/agricultural-research-funding-in-the-public-and-private-sectors/]. • Private expenditures on R&D (BERD: Business Expenditure on R&D) for agriculture, food and beverages industry, and in general, as a % of sector's value added or GDP [e.g. <i>OECD, Research and Development Statistics (database)</i>, https://stats.oecd.org/; <i>OECD, MSTI Main Science and Technology Indicators (database)</i>, https://stats.oecd.org/].

- To which extent are public procurement and other ‘pull mechanisms’ used to fund research? What priority areas are targeted through this type of support? Why?
- Do producers associations, industry, private sector or NGOs employ any unique mechanisms to raise funds for R&D and innovation?

IV.3. Knowledge flows (markets, networks and adoption)

Purpose	Questions	Indicators
<i>Knowledge markets and networks</i>		
<p>Intellectual property rights (IPRs), knowledge networks, and knowledge markets are of growing importance in fostering innovation.</p> <p>Reinforcing linkages across participants in the AIS (researchers, educators, extension services, farmers, industry, NGOs, consumers and others) can help match the supply of research to demand, facilitate technology transfer, and increase the impact of public and private investments. Partnerships can also facilitate multi-disciplinary approaches that can generate innovative solutions to some problems.</p>	<ul style="list-style-type: none"> • What is the policy regarding access to knowledge? Do government agencies make information useful for innovation (e.g. gene databanks) publically available for free? Are results of public R&D available for free, and shared internationally? • What are the rules governing IPRs? How does public research handle IPRs? • What mechanisms have been developed to encourage co-operation between actors, including farmers? • How can knowledge flows between AIS actors be further developed? • More specifically, how are farmers and local stakeholders associated in the priority setting, implementation and funding of research and advisory services? What are the main institutions or organisations involved (specific farmers’ associations, water user associations, cooperatives, contracts with public or private research institutes for field experiments)? What are their geographical coverage (whole country, some regions) and level of action (national, local)? Are there specific cooperation mechanisms or organisations to develop sustainable practices? Are they effective? 	<ul style="list-style-type: none"> • Intellectual Property Protection Index [WEF GCI, http://reports.weforum.org/global-competitiveness-report-2018/]. • Participation rate of researchers, farmers and representative organisations in networks, collaborative projects or consortia [national sources].

The adoption of innovation

Purpose	Questions	Indicators
<p>The potential benefits of innovations are only realised if effectively implemented. Policy incentives for the adoption of innovation include a wide range of regulatory and financial approaches, including business investment support, and support to public-private co-operation arrangements and participation in networks. In primary agriculture, training, extension and advisory services can facilitate the transfer and successful adoption of innovation (OECD, 2014^[12]). Given the very large number of often small farmers, extension services have a particularly important role to play. They are critical to facilitate farmers' access to technology and knowledge and contribute to facilitate farmers' effective participation in innovation networks and ability to formulate their specific demands. It is also important to support the diffusion of innovation in small agri-food firms.</p>	<ul style="list-style-type: none"> • What are the main policy incentives for the adoption of innovation in food and agriculture? • Are there specific programmes to promote on farm and firm adoption of innovations and knowledge transfer? Do they target specific types of innovations, such as environmentally friendly technologies and practices? • What are mechanisms for the commercialisation of innovation? • Are extension services widely available and used? Is there direct provision by the public sector? Is it targeted to specific groups of farmers, specific areas? Do farmers pay for the service? Are training programmes also provided? • Is access to private extension services supported? How? 	<ul style="list-style-type: none"> • Share of farmers undertaking training courses. Subsidies rate <i>[national sources]</i>. • Share of farmers using extension services: in general, for specific advice: environmental management, business management <i>[national sources]</i>. • Share of farms and food processing firms engaged in innovation activities <i>[e.g. Eurostat, Community Innovation Survey [inn_cis10_bas], http://ec.europa.eu/eurostat/data/database]</i>.
IV.4. International co-operation		
Purpose	Questions	Indicators
<p>International co-operation on agricultural research and development offers universal benefits. While this is generally true given the public good nature of many innovations in agriculture, it is particularly the case where global challenges are being confronted (as in the case of responding to climate change) and when initial investments are exceptionally high. The benefits of international co-operation for national systems stem from the specialisation it allows and from international spill-overs. In countries with limited research capacity, scarce resources could then focus on better taking into account local specificities.</p>	<ul style="list-style-type: none"> • What mechanisms are used to encourage cross-country, international collaboration? In which areas? • What policy efforts are there regarding exchange of staff, domestically or internationally? • Are there any barriers to the international flow of knowledge through private mechanisms? • Which international and regional networks is your country involved in? 	<ul style="list-style-type: none"> • Share of foreign staff in national R&D and education; number of national R&D staff abroad <i>[national sources]</i>. • Number of co-operation agreements; number of partners in cooperation agreements <i>[national sources]</i>. • Share of patents in agriculture and food sciences with foreign co-inventors <i>[OECD, STI Micro-data Lab: Intellectual Property Database, http://oe.cd/ipstats]</i>. • Share of publications in agriculture and food sciences with foreign co-authors <i>[OECD calculations based on Scopus Custom Data, Elsevier, Version 1.2018; and 2018 Scimago Journal Rank from the Scopus journal title list]</i>.

Drivers: Innovation, Structural Change, Natural Resources and Climate Change

Purpose	Questions	Indicators
<p><i>a) Innovation:</i> Overall progress in creating and adopting relevant innovations needs to be monitored. For that purpose, one might use proxy measures, such as the number of patents or bibliographic citations created in primary agriculture sector, as well as in upstream and downstream industries. A more complete picture can be drawn based on the country-specific surveys, providing information on the variety of innovators, quality of patents, innovations created by the public and private sectors, and adopted by farms and firms.</p>	<ul style="list-style-type: none"> • What are the main outcomes of research programmes? Including in the area of sustainable use of resources? • Is the impact of R&D on the sector in terms of income and productivity growth, and sustainability assessed? How 	<ul style="list-style-type: none"> • Trends in number of patents on agriculture, input and food processing industries [OECD, STI Micro-data Lab: Intellectual Property Database, http://oe.cd/ipstats]. • Number of outputs -patents, publications and bibliographic citations- on agriculture and food sciences (as a % of all national outputs – Agro-food specialization; as a % of world total outputs in agriculture and food sciences – Country's contribution to world agro-food science output) [OECD calculations based on OECD, STI Micro-data Lab: Intellectual Property Database, http://oe.cd/ipstats; and Scopus Custom Data, Elsevier, Version 1.2018; and 2018 Scimago Journal Rank from the Scopus journal title list].
<p><i>b) Structural Change:</i> Changes in the structural characteristics of farms and business in the agro-food sector can drive or be driven by the adoption of innovations and the adaptation to climate change. The economic development of other sectors in the agricultural producing areas can also drive innovation in the sector.</p>	<ul style="list-style-type: none"> • What are the main structural characteristics of farms and firms? • What is the economic performance and development dynamics in rural areas and regions producing agricultural products? 	<ul style="list-style-type: none"> • Number of farms and their size, income, net worth, etc. • Share of enterprises and turnover in the total food industry and average turnover by size class. • Rural / regional development indicators <p>[national and international data sources]</p>
<p><i>c) Natural resources and Climate Change:</i> Climate and environmental pressures determine the sector adaptation requirements. The pressures on natural resources define the priorities in terms of innovation and structural change.</p>	<ul style="list-style-type: none"> • What is the share of agriculture in the use of natural resources and in terms of pressures to the environment? • What are the medium to long-term projections regarding natural resources and climate change in the country and the projected impacts on future productivity growth? 	<ul style="list-style-type: none"> • Share of agriculture in the use of land and water [e.g. World Bank]. • Land use: arable land and forest (area and % of total land area) [e.g. FAO]. Selection of agri-environmental indicators, (OECD)

Outcomes: Productivity, Sustainability and Resilience

Purpose	Questions	Indicators
<p>Analysis of the outcomes in terms of productivity, sustainability and resilience.</p>	<ul style="list-style-type: none"> • What are the trends in agricultural productivity and sources of total factor productivity growth? • What are the trends in natural resource use and the state of the environment? What are the main issues regarding sustainable and efficient use of natural resources and other inputs affecting the environment? How are they measured and monitored (national/regional indicators)? • Is there evidence that farmers and the sector are becoming more capable to absorb, recover, adapt and transform in response to shocks and hazards? 	<ul style="list-style-type: none"> • Productivity growth indicators, e.g. Total Factor Productivity (TFP) growth in primary agriculture [e.g. <i>USDA, Economic Research Service, International Agricultural Productivity</i>, www.ers.usda.gov/dataproducts/international-agricultural-productivity.aspx]. • Selection of agri-environmental indicators, including environmental pressure ones, e.g. agricultural water withdrawal, nitrogen and phosphorus balances, direct on-farm energy consumption, agriculture GHG emissions, farmland birds index [e.g. <i>OECD and FAO</i>]. • <i>There is not a single internationally comparable indicators of resilience. National sources and indicators covering the different aspects of resilience (absorption, recovery, adaptation and transformation) will be explored if available.</i>

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