

Aligning incentives for innovation and environmental sustainability

A framework for sustainable productivity growth in agriculture

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Global trends and pressures on food systems

POPULATION DYNAMICS

9.7 billion

2/3 living in urban areas



CHANGING DEMANDS

Healthier

Environmental awareness



CLIMATE CHANGE

Increasing extreme weather events

Agriculture pressuring the environment

TECHNOLOGICAL CHANGES

Digitalisation

Associated changes in skills

Innovation



INCLUSIVENESS

Migration, gender

Improve income earning

Opportunities in rural areas

OECD countries face a triple challenge

Ensuring **food security and nutrition** for a growing global population

Addressing **environmental** challenges

Providing **opportunities for livelihoods for all farmers**



Sustainable productivity growth

- **What is Sustainable Productivity Growth (SPG) in the context of this work?**

Agricultural productivity growth that advances social, environmental, and economic development objectives to meet the food and nutrition needs of current and future generations

It implies using innovative technologies and practices that increase productivity, while also reducing pressures on the environment

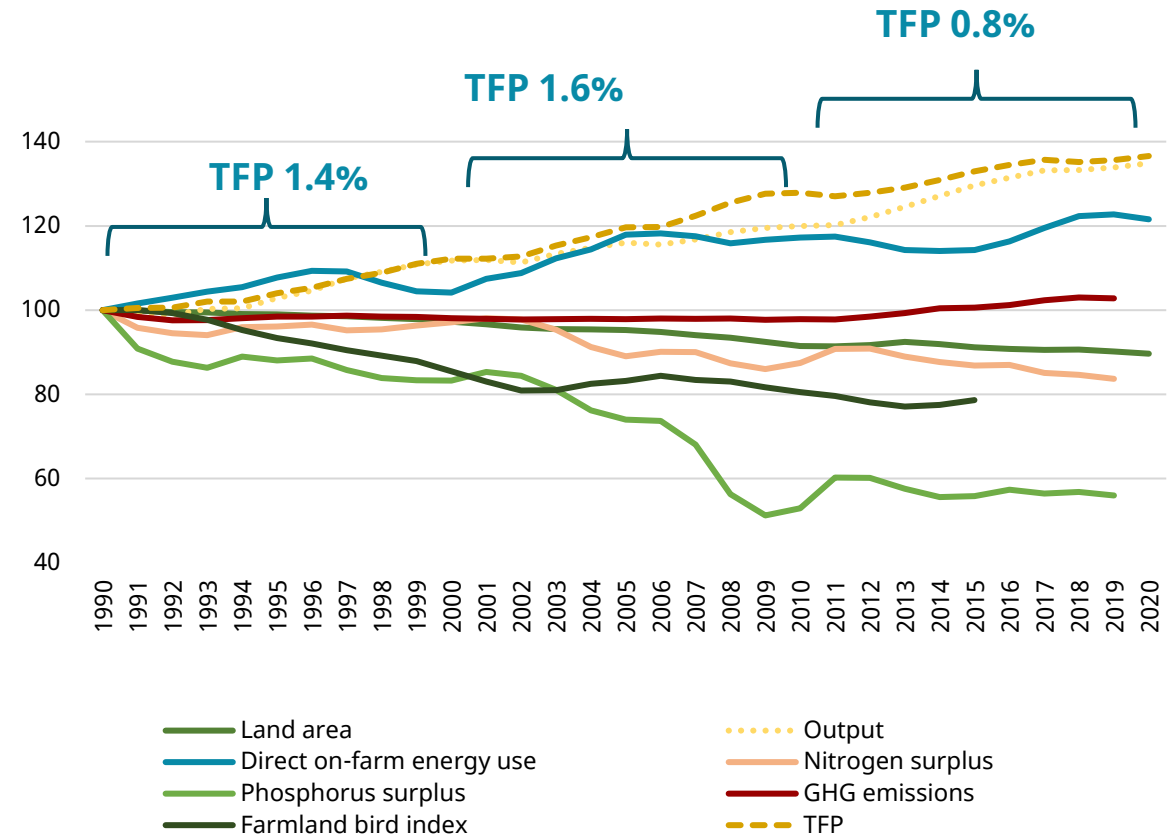
- **Innovation** is central, but not enough





Productivity and sustainability: a trade-off?

- Innovation historically focused on productivity
- Productivity gains are slowing while environmental pressures persist
- We need innovation directed toward Sustainable Productivity Growth (SPG)
- The challenge is no longer simply increasing productivity, but fostering innovation that simultaneously improves productivity and environmental sustainability





Innovation is necessary but not sufficient

- The Netherlands: strong innovation system but more focused on productivity than environmental sustainability outcomes
- Innovation is key for SPG
 - Priority
 - Clear aims and directionality
 - Aligned incentives
 - Cooperation and coordination
 - Enabling conditions



Inducing innovation for SPG in agriculture





Aligning innovation with sustainability

- An analytical framework guiding innovation for sustainability and productivity in the AKIS
 - Types of innovation
 - Approaches
 - Roles of actors
 - Incentives
 - Policy directionality and governance
- How can we measure and monitor progress?
(directionality)



What drives and shapes innovation in agriculture?

- Agricultural innovation operates within a complex and interdependent system shaped by multiple drivers
- Understanding how these drivers interact, and how policy can align and reinforce them is essential

Economic conditions and incentives

- Macroeconomic stability and investment climate
- Relative prices of inputs and outputs
- Market prices and factor scarcities
- R&D investments and subsidies
- Subsidies and taxation
- Trade policies
- Risk management
- Public procurement and green labelling
- Cost-benefit structures for adoption
- Behavioural drivers (norms, risk preferences, habits)

Institutions and governance

- Property rights and land tenure systems
- Environmental regulations and enforcement
- Innovation policy frameworks
- Governance of natural resources (water, biodiversity)
- Coordination mechanisms (crosssectoral, multilevel)
- Policy coherence and regulatory clarity
- Data and digital governance

Innovation for SPG

Skills, interactions, and networks

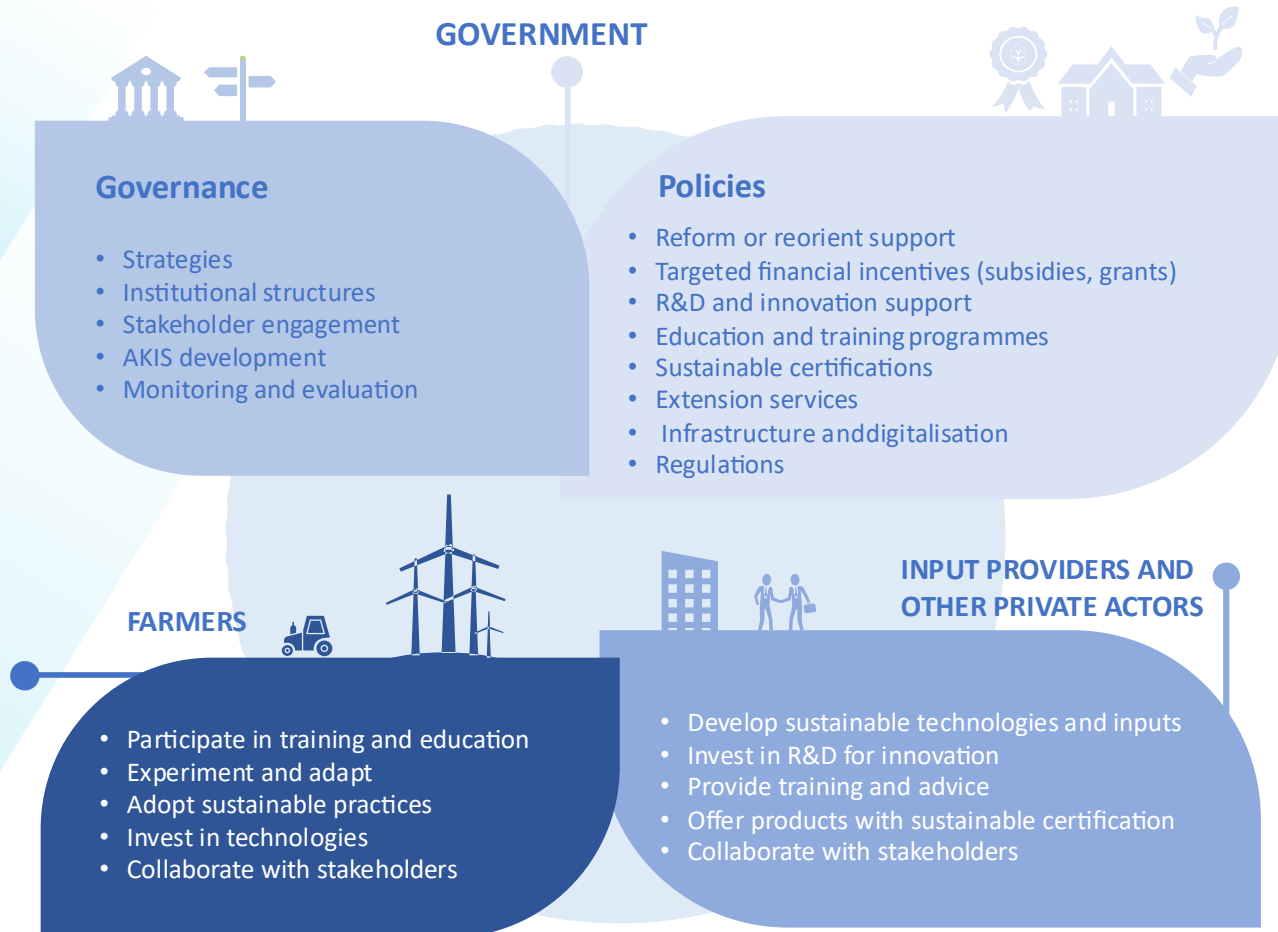
- Access to digital technologies and open data
- Knowledge co-creation and local knowledge
- Capacity-building in sustainability
- Extension services and advisory systems
- Data literacy
- Digital inclusion

Knowledge flows and capacities

- Agricultural Knowledge and Innovation Systems (AKIS)
- Linkages between public research, private sector, extension services, and farmers
- Public-private partnerships
- Inclusion of women, youth, smallholders



What governments, farmers and other private actors can do for SPG?



Private sector

- Generates and adopts innovations

Governments

- Enabling environment: aligning incentives and engaging stakeholders
- Aims and directionality: clear priorities and strategic investments
- Policy tools



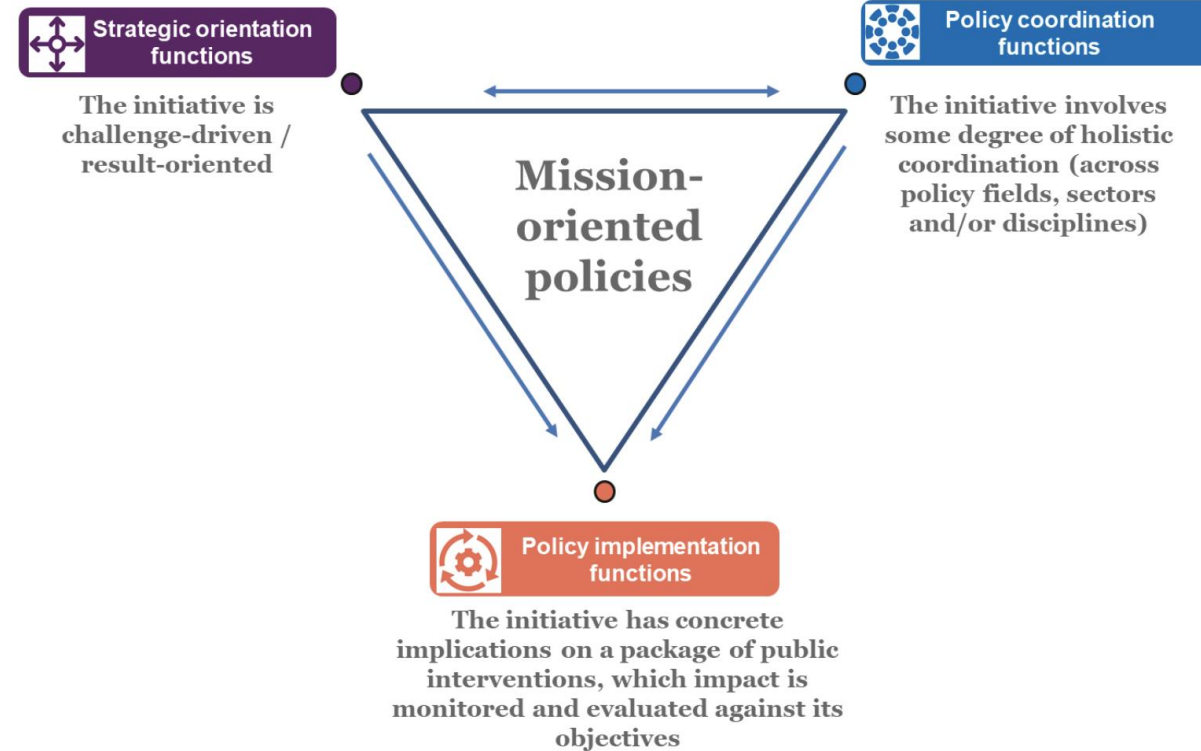
Directing innovation with MOIPs

Definition

- Co-ordinated packages of policy and regulatory measures designed to mobilise STI toward solving **well-defined societal challenges** within a **specific timeframe**
- Combine supply-push and demand-pull instruments across the full innovation cycle and multiple policy domains

Why they matter for SPG

- Enable system-level responses to climate change, soil degradation, biodiversity loss, and resilience challenges
- Support actor alignment, experimentation (e.g., living labs), technology uptake, and legitimacy-building through inclusive mission governance





Transformative policy mixes for SPG

What they are

- Co-ordinated and evolving combinations of policies that guide innovation toward sustainability transitions and SPG goals

Why they matter

- Single instruments are insufficient; transformation requires alignment across governance, incentives, knowledge, and markets

Core elements

- **Strategic direction and co-ordination** (long-term, stakeholder engagement)
- **Policy coherence** (avoid contradictory incentives)
- **Knowledge and capacity** (SPG-oriented R&D, extension, co-creation platforms)
- **Economic and regulatory tools** (reoriented support, eco-schemes, standards)
- **Investment and infrastructure** (risk-sharing, rural infrastructure, PPPs)



Measuring innovation and directionality matters for SPG

- Measuring the **pace** and **direction** of innovation for SPG is crucial to evaluate and benchmark the efforts, outputs and strengths of the AKIS
- Most existing indicators capture *how much* innovation occurs but not much about their *quality and its orientation*
- Embedding directionality helps assess:
 - What type of innovation is being promoted
 - Whether policies and AKIS actors are aligned with SPG
 - Correct the path when needed



Stocktaking of innovation indicators: benefits and limitations

Standard indicators

- Comparable, well-established metrics
- Miss informal innovation, limited farm/firm level coverage

Specific and qualitative indicators

- Capture broader, often qualitative dimensions and broader aspects
- Costly to collect, non-comparable data

Multidimensional indicators

- Holistic view, directionality focus, support cross-country benchmarking
- Complex, methodological challenges

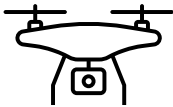
Novel indicators based on emerging methods

- Granular, real-time insights
- Data quality constraints, human expertise needed

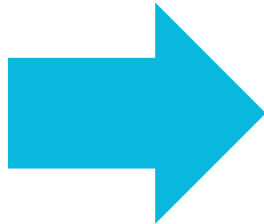


AI is a tool for understanding innovation

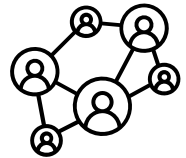
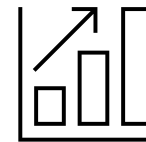
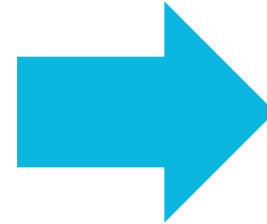
- Identify innovation inputs and outputs
- Track patent activity and technology diffusion
- Analyse and compare policy approaches
- Support evidence-based innovation policies aligned with sustainability goals



Potential database



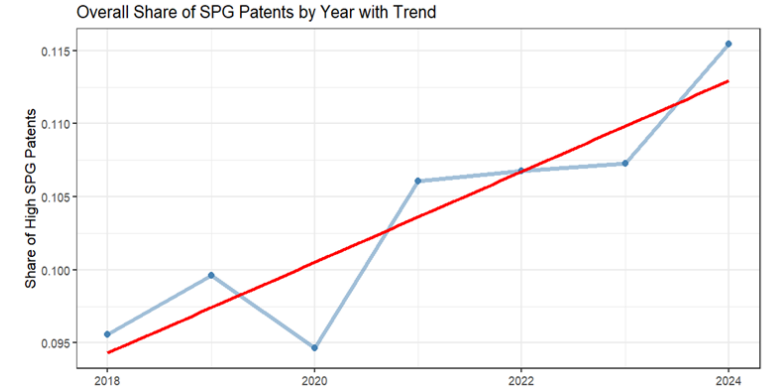
Machine learning classification



Characterisation and interpretation of the results



- Identify trends in innovation policy documents and the SPG direction



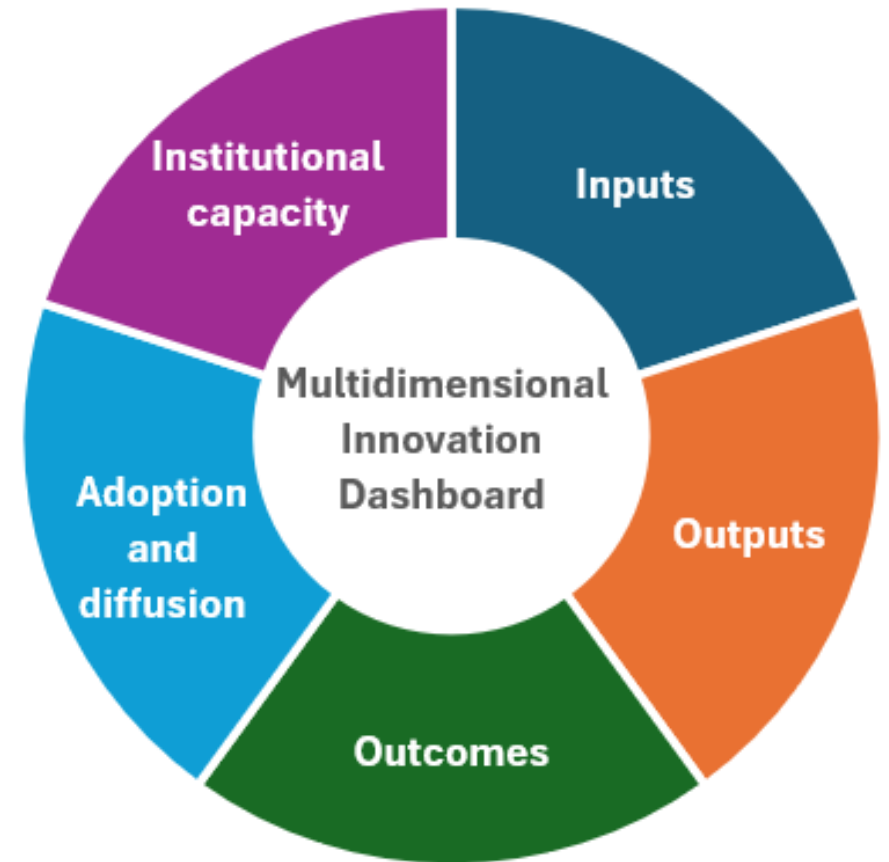
Towards a refined framework for policy and measurement

Policy approaches to guide innovation

- MOIPS and transformative policy mixes steer innovation towards SPG
- Align incentives across the AKIS
- Embed SPG in research agendas, investments priorities, regulations and policies

Measuring and monitoring innovation

- Combine traditional indicators with AI-based
- Assess strength (intensity, resources) and directionality (alignment with SPG)
- Develop a Multidimensional Innovation Dashboard





Key messages

- Innovation is essential but must be strategically directed
- SPG requires co-ordinated governance, incentives alignment, and measurement
- Countries need
 - clear policy directionality
 - robust metrics, and
 - strong AKIS interactions

Thank you!

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