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Building agricultural resilience to drought in Italy

Drought has become a particular concern in Italy over the past decade and will continue to threaten the country's agricultural sector under climate change. As a result, better management of water resources and improved agricultural resilience will be required to confront more frequent and severe droughts. This chapter explores recent initiatives that are positioning Italy for improved resilience to droughts and other natural hazards, and identifies opportunities to further strengthen how natural hazard risks are managed by the sector.

Key messages

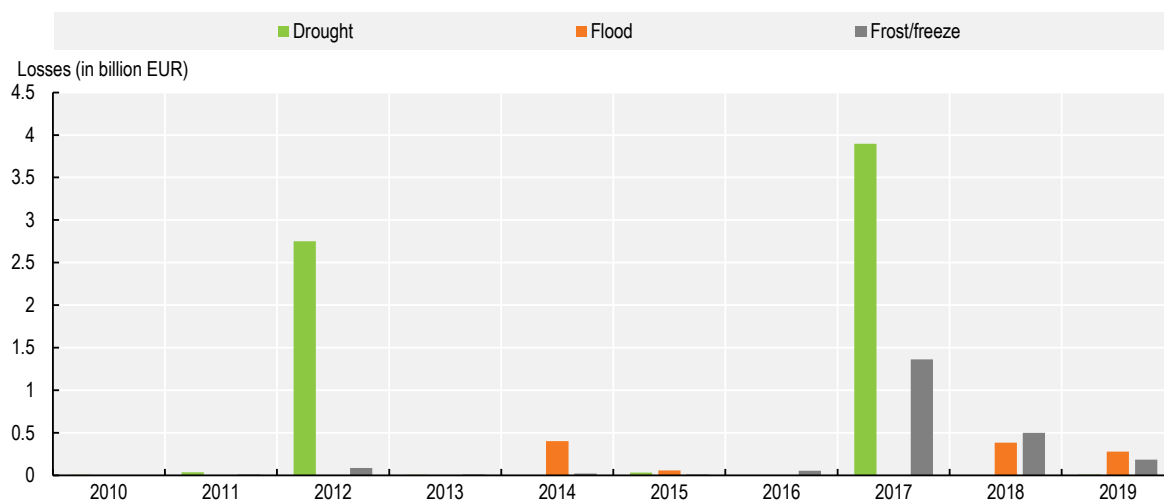
- Drought has become a particular concern in Italy over the past decade, and will continue to threaten the country's agricultural sector under climate change. Better management of water resources and improved agricultural resilience will be required to confront more frequent and more severe droughts.
- Recent initiatives are positioning Italy for improved resilience to natural hazards. In particular, awareness of the risk environment is increasing, stakeholders are improving data collection on water resources and agricultural damage and loss from natural hazards, policymakers recognise the advantages of moving towards prevention and *ex ante* approaches, and response processes increasingly prioritise business continuity.
- Progress could be further strengthened by developing a holistic, long-term sectoral risk management strategy, ensuring the effectiveness of existing reforms, re-evaluating the trade-offs between spending on risk coping tools versus increasing investments in risk prevention and preparedness, and taking baseline farmer demographics and capacities into account in policy design.

6.1. Italy's agricultural sector faces the challenge of building its resilience to more frequent drought and water scarcity events

Italy is exposed to many natural hazards, which can have significant impacts on the agricultural sector.¹ In particular, drought, the focus of this case study, is an increasing challenge for Italy's agricultural sector, posing a problem for the country's major export industries, as well as smaller farmers. Droughts have become more frequent and costly in Italy over the past two decades, and are increasingly affecting new areas of the country (Figure 6.1) (AGEA, 2020^[1]; CPD, 2018^[2]). Moreover, climate change projections indicate that droughts are likely to become more frequent and severe in the future. On top of weather and climate conditions, water shortages are also exacerbated by the state of the country's water distribution network and management, although recent advances in water governance and infrastructure investments are addressing these needs.

Building the agricultural sector's resilience to drought will require effective short-term hazard management improvements, including improved management of increasingly unpredictable water resources, but also investments that will improve the sector's capacity to manage or adapt to these types of events in the long-term. Among other challenges, the government must find the most effective balance between investing in preparedness and prevention versus hazard response; more effectively manage water resources amongst competing uses; and incentivise improved farm-level capacity to manage drought and adapt to changing conditions. In doing so, stakeholders have an opportunity to reconceptualise how they perceive risk management in agriculture and ensure that policies are better-oriented toward the sector's long-term sustainability rather than solely the capacity to cope with single hazard events.

Moreover, to ensure that these efforts are effective, they must be carried out taking into account the needs, capacities and objectives of the country's farmers. Italian farms tend to be small and managed by older farmers, and a significant share of farmers are not well-integrated into commercial value chains (OECD, 2020^[3]). Accordingly, these farmers may be less inclined toward innovation or have limited drive to invest in building the resilience, productivity and long-term sustainability of their farms.

Figure 6.1. Losses to agriculture in Italy from three hazards

Note: Values represent the sum of indemnified insurance losses and loss declarations reported to the National Solidarity Fund.
Source: ISMEA (2020), "Perdite economiche per evento" Dataset.

6.2. Drought governance in Italy falls across several policy frameworks

The Italian agricultural sector's approach to managing natural hazards involves activities under a variety of governance frameworks – emergency management, agricultural risk management, agricultural policy and water governance – each with their own guiding policy documents and set of responsible actors. Different activities under each framework contribute to natural hazard risk management by helping producers to plan and prepare for, absorb the impact of, and recover from drought, as well as provide the incentives and plans for adapting and transforming in response to these events (Table 6.1).

Table 6.1. Disaster risk management governance in Italian agriculture

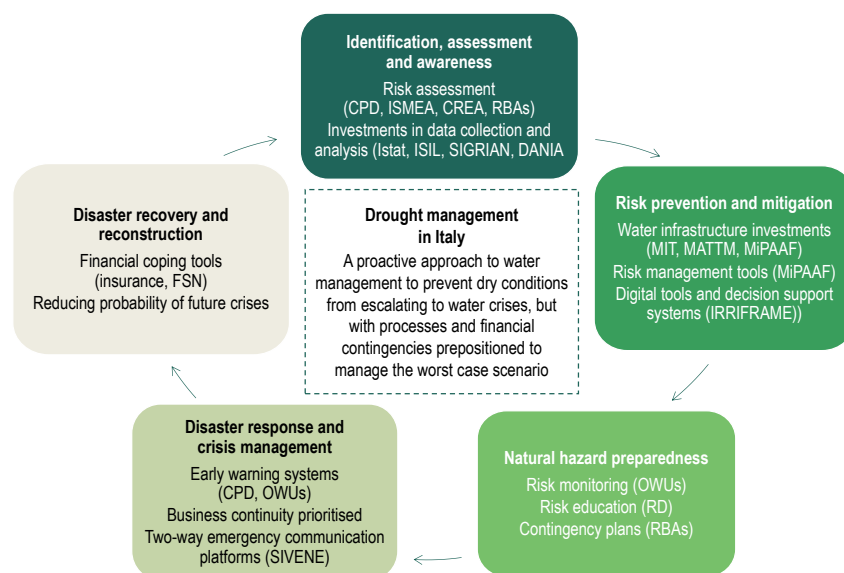
	Key governance frameworks				
	Disaster risk management	Agricultural risk management	Agricultural policy		Water governance
Primary responsibility	Civil protection (local, regional, national)	MiPAAF	National level: MiPAAF	Local level: Region	MATTM (coordinating role); River Basin Authorities; Regions
Main policy documents	Civil Protection Code	National Risk Management Plan	EU Common Agricultural Policy Pillar I National Rural Development Plan (Pillar II) Regional RDPs (Pillar II)		EU Water Framework Directive; EU Groundwater Directive; EU Floods Directive (and related national regulations)
Contributing Agencies/ government bodies	Other Ministries and agencies, as relevant IUVENE	ISMEA AGEA	ISMEA AGEA CREA		OWUs MiPAAF, MIT, CPD, CREA, ISPRA

Disaster risk management is under the charge of the Civil Protection Department (CPD), whose primary focus is the safety and well-being of humans, animals and property in emergency situations. A specific agricultural risk management framework is the responsibility of the Ministry of Agricultural, Food and Forestry Policies (MiPAAF), and includes the portfolio of subsidised insurance policies and *ex post* assistance under the National Solidarity Fund. Other agricultural policies include programmes that help farmers to prevent or mitigate their natural hazard risk – mostly through rural development programming funded through the Common Agricultural Policy’s Pillar II, but also through national funds. Finally, water management frameworks have substantial implications for farmers who must share water with other users. Water governance in Italy has made important advances with the institution of the EU Water Framework Directive (WFD) under the coordination of the Ministry for Environment, Land and Sea Protection (MATTM), but opportunities remain. For example, there is a territorial mismatch between administrative and hydrological boundaries, as River Basin District Authorities (RBAs) are the primary planning authorities, but Regions are the main authorities issuing water abstraction licenses (WALs).

6.3. Italy’s agricultural disaster risk management system includes innovative approaches and good practices

While each of the governance frameworks has its own target objectives, actors and processes, farmers and sector stakeholders make their decisions taking into account the entire policy environment. Accordingly, activities under the four frameworks at each stage of the disaster risk management (DRM) cycle (risk identification, assessment and awareness; prevention and mitigation; preparedness; response and crisis management; and recovery and reconstruction) are considered holistically to better understand conditions, good practices, challenges and opportunities for Italy’s agricultural sector with respect to natural hazard risk management. In the context of drought, Italy’s DRM system focuses on mitigating impacts by improving water management – in particular, collecting and making use of more and better data, supporting improved farm-level management decisions, and increasing and better targeting investments in infrastructure (Figure 6.2).

Figure 6.2. Drought risk management in Italy across the DRM cycle



Risk identification, assessment and awareness

Managing natural hazard risk begins with an understanding of the risk environment, to encourage investments in risk prevention and to ensure that policies are in place for hazard management before an adverse event occurs. In Italy, CPD has carried out a National Risk Assessment covering major natural hazards, although the assessment contains little on the specific impacts to the agricultural sector (CPD, 2018^[2]). RBAs have also carried out water and drought management plans which assess current conditions and define medium-to-long-term action plans. A longer-term vulnerability assessment in the context of climate change was undertaken during the development of the National Adaptation Strategy (MATTM, 2015^[4]). Other work with a specific view toward understanding natural hazard risk for agriculture has been carried out by the Italian Institute of Services for the Agricultural Food Market (ISMEA) and the public Research Center for Agricultural Policies and Bioeconomy of the Council for Agricultural Research and Economics (CREA-PB), including defining specific drought indicators that can be used to support policy decisions (CREA-PB, 2020^[5]; Zaccarini Bonelli and Lasorsa, 2020^[6]).

Italian stakeholders recognise the importance of using data to inform better risk management decision-making, and several initiatives are emerging to develop data sources that could demonstrate the costs and benefits of *ex ante* interventions, including:

- The Italian statistical agency (Istat) is working on a methodology to report on agricultural losses due to hazardous events, which will be useful to inform new policies and investments.
- The linked National Information System for Agriculture Water Management (SIGRIAN) and National Database of Investment for Irrigation and Environment (DANIA) – both managed by CREA-PB. SIGRIAN serves as the national reference repository for data on irrigation networks, water use, and groundwater abstraction at water user level, while DANIA is a decision support tool for planning risk reducing investments in irrigation and water management infrastructure for agriculture. Among other uses, these databases can be used to support economic evaluations of proposed interventions to help avoid losses due to natural hazards (Zucaro et al., 2017^[7]; Ferrigno, 2020^[8]).
- The Lombardy Irrigation Systems Survey (ISIL) project (Gandolfi, Olivotti and Roverato, 2019^[9]).

Box 6.1. Lombardy Irrigation Systems Survey (ISIL) project

Italy's Lombardy region is one of the most intensively irrigated areas in Europe, and climate change is altering the region's water supply. To improve the knowledge base on how water in the region's network is currently used, the ISIL project compiled a comprehensive survey of Lombardy's canals in a collaboration between the Italian Water Boards Association (ANBI), regional authorities, and academics. The data was organised into a geospatial database, which, combined with other data, allows simulations to be carried out to analyse how changes in water management would affect the entire system. The database has demonstrated the importance of feedbacks and consideration of groundwater recharge, and that better data and water management capacity can generate substantial benefits.

Risk prevention and mitigation

Ex ante investments in measures to prevent or mitigate natural disaster risk can reduce the cost of disaster response and recovery by addressing underlying vulnerabilities and mitigating impacts. Government policies and programmes can also encourage stakeholders to identify disaster risks to their own assets and address gaps in their resilience levels. Risk prevention and mitigation efforts in Italy related to drought

management focus on water resource planning and water usage efficiency, but also include policies, initiatives and research to help mitigate the impacts of natural hazards on farms, such as efforts to improve soil health and support the uptake of financial risk mitigation tools.

- *Water resource planning:* These include a variety of initiatives, such as construction of major water-related infrastructure, investments in greater water use efficiency, improvements to WAL planning, moving towards applying full cost recovery in agricultural water use, and using participatory governance models (in the form of permanent observatories on water use, or OWUs) to monitor water availability and use and recommend appropriate actions to mitigate negative impacts (Mariani et al., 2020^[10]; Manganiello, 2020^[11]).
- *Other initiatives to prevent or mitigate the impacts of drought, including research:* Various soil health and other farm risk prevention initiatives are funded through rural development. A variety of public and private actors also carry out research that looks to improve prevention or mitigation of drought.
- *Financial mitigation tools:* Various tools are available under the National Risk Management Plan, but subsidised insurance policies delivered by private companies are the most widely-utilised tool (ISMEA, 2020^[12]).
- *Digital tools increasingly available:* New digital tools and decision support systems are helping farmers to mitigate the impact of adverse events and optimise their decision-making, including the IRRIFRAME real-time irrigation decision support software (Battilani, 2020^[13]).

Box 6.2. IRRIFRAME

IRRIFRAME helps farmers maximise water productivity by providing tailored, free advice to farmers for irrigation at field scale in 16 Italian regions. The system sets irrigation schedules based on a daily water balance model and considers economic costs and returns for 50 crops. The software also provides a real-time planning resource for water managers, as farmers confirm their irrigation volumes in the software, and then that data is aggregated and integrated into WUA water management systems. IRRIFRAME resulted in estimated water withdrawal savings of 350 million m³ per year in 2017.

Risk preparedness

Disaster preparedness and planning are crucial for effective crisis management – by public and private stakeholders with a role in disaster response, and on farms. Risk preparedness efforts for drought are heavily focused on risk monitoring systems, but risk education and planning also play a role. Risk monitoring is generally housed within CPD, who undertake a number of forecast and surveillance activities. At the same time, the RBA-centred OWUs carry out periodic assessments of a variety of water-related indicators in a collaborative setting that includes government authorities and water users.

Risk education activities are carried out under rural development. Nine regions devote financial resources to knowledge transfer, information actions, and advisory services specific to farm risk prevention and management. While some innovative programming was identified (including the Acqua Campus irrigation technology experimentation and demonstration site in Emilia Romagna), because these activities occur in the context of regional rural development plans, activities are at present fragmented.

Contingency planning also supports preparedness. These are in place in Italy for RBAs thanks to requirements of the WFD, and the National Climate Change Adaptation Strategy has renewed focus on the importance of long-term planning to confront likely future conditions.

Box 6.3. Permanent observatories on water use

In 2016, MATTM established seven observatories on water use (OWUs) – one for each river basin district – to strengthen coordination between relevant government institutions, research bodies, irrigation consortia, water utilities and associations of utilities in managing common surface water resources. OWUs act as a control room for the management of water resources in times of drought and water scarcity. They also develop technical tools to support the planning of water balances at basin scale. The OWUs facilitate the development of common strategies to ensure that all users have adequate water availability during stress situations, based on the principle of solidarity. Through their activity, which focuses on suggesting the most appropriate measures for mitigating the impacts of drought, the OWUs support participatory approaches to defining actions for prevention and mitigation, working closely with utilities and industry associations responsible for water use.

Disaster response and crisis management

Effective crisis management and response hinge on all actors knowing their responsibilities in the event of an emergency and communicating effectively, with the public sector taking a leadership role when the private sector is unable to cope. When a natural hazard occurs, Italy's emergency response frameworks are engaged. These begin with early warning systems, including notices issued through CPD or, in the case of drought, alerts issued by OWUs for individual RBAs. After a natural hazard has struck, response efforts through CPD (particularly in rural areas) have prioritised business continuity, recognising that helping producers return to "normal" business operations as soon as possible greatly speeds recovery.

Box 6.4. Prioritising business continuity: The Central Italian earthquakes of 2016-17

In 2016 and 2017, a series of earthquakes affected four regions in central Italy, with impacts on the agricultural sector. In response, an interregional technical co-ordination centre was established to ensure food safety, business continuity and animal welfare. This co-ordinating structure and approach allowed stakeholders to identify the specific needs of farming communities within the framework of the existing emergency response system, such as by providing temporary housing for livestock producers and ensuring continuity of milk collection and delivery with drinkable water for the cleaning of milk tanks. Preliminary data indicate that no substantial differences were reported in milk deliveries or farm closures in affected areas as compared to the previous year.

Response is also aided by innovative tools or practices, such as the SIVENE tool – a new sector-specific platform developed by national veterinary authorities for emergencies impacting animal health. The tool allows for two-way communication between stakeholders and responders, which helps to target response efforts (Possenti et al., 2020^[14]).

Box 6.5. Using the SIVENE tool to improve response to veterinary emergencies

The Veterinary Information System for Non-Epidemic Emergencies (SIVENE) is a tool to facilitate emergency response. It collects, manages and visualises data related to animal health to support emergency management, incorporating various layers of geospatial data. SIVENE helps emergency responders identify where and what type of assistance is needed. It provides a unified portal that allows information on conditions at the farm level to be systematically collected and transmitted to competent authorities. SIVENE can be used for awareness raising purposes, to inform models and damage scenarios, and for risk mapping beyond veterinary institutions. In the future, SIVENE will be integrated into the National Information Platform managed by CPD.

In drought situations, OWUs use information on the level of water scarcity to inform their own management processes and actions. Irrigation agencies can restrict water withdrawals by farmers if their own allocations are reduced, but water prices play only a limited role in adjusting farmer behaviour during droughts, as they are typically set annually – thus limiting their effectiveness in signalling water availability.

Recovery, rehabilitation and reconstruction

Following a natural disaster, recovery and reconstruction efforts offer an opportunity for public and private stakeholders to “build back better”² by addressing underlying gaps in resilience, and building the capacities needed to manage natural hazards in the future. This requires all stakeholders – including producers – to learn from natural disasters in order to adjust DRM frameworks and measures with a view towards long-term resilience. Recovery and reconstruction activities for natural hazards range from large projects like repairing damaged infrastructure, to programmes that support the financial recovery of farmers. Financial coping tools like insurance indemnities or payouts from the FSN have helped farmers to absorb the impact of these events, but these tools have their drawbacks to the extent that they reduce incentives to undertake risk mitigation. Few farmers are currently insured, and most of these are not insured against drought. Regarding the FSN, payouts occur at a significant delay to the event and are contingent upon funding availability, making them unpredictable. In response to the limitations of available tools, Italy has advanced a proposal on a new mandatory mutual fund to help farmers better cope with the financial impact of catastrophic events.

Box 6.6. Proposing a mandatory mutual fund against catastrophic adversities

The MeteoCAT fund is a risk management tool proposed by MiPAAF in the context of the next CAP. The programme would be set up as a mandatory mutual fund: producer contributions to the fund would be subsidised by up to 70% through risk management instruments under Pillar II, while farmers would be responsible for contributing the remaining 30% by redirecting a small percentage (up to 5%) of their direct payment entitlements under Pillar I. The mutual fund would cover the three events responsible for most agricultural damages and losses in Italy – drought, flood and frost. Payouts would be triggered using a two-stage process – first, the event would trigger a pre-defined index threshold in a givegeographical area, and then farms within that area would be eligible to submit a claim if their damage exceeds 20% of the farmer’s historical average production. Concurrently with the introduction of the MeteoCAT fund, the FSN compensation tool would be ended, such that Italy would no longer have a mechanism for ad hoc assistance and all risk management tools would be defined *ex ante*.

Post-event evaluation and assessment help stakeholders better prepare for future events. These may take place within RBAs in the context of the OWUs, but it is not clear if or how these assessments have led to improved future processes.

6.4. Resilience successes and opportunities

In line with the four principles for resilience to natural hazard-induced disasters in agriculture, Italy's systems for natural hazard risk management – and drought management in particular – demonstrate a number of recent positive developments and good practices, as well as some challenges that provide opportunities for future improvement.

An inclusive, holistic and multi-hazards approach to natural hazard risk governance for resilience

- Agricultural risk management takes an all-hazards approach, but could benefit from a holistic long-term vision integrating the relevant governance frameworks. While the system incorporates inclusive processes and considers all hazards, it lacks a risk management framework with a long-term perspective that links together the different components of risk management in a cohesive way. There appear to be few concrete initiatives recognising that investing in risk prevention could be the most cost-effective approach to reduce *ex post* expenditures on response and recovery. At the same time, drought management is one of the few areas where preventative investments are prioritised.
- Risk governance in Italian agriculture could benefit from more explicit thresholds that define when natural hazards are too big for farmers to cope with. The criteria for when a government response will be triggered are poorly defined, providing no clear incentive for regions, provinces, or farmers to invest in risk reduction because of the likelihood that ad hoc public disaster assistance may be provided. Farmer responsibility to prevent, prepare for, and respond to risk is also unclear, as there is at present only limited interaction between agricultural stakeholders and emergency management authorities in the absence of a crisis.

A shared understanding of risk based on the identification, assessment and communication of hazards, vulnerability and resilience capacities

- *Italian actors are heavily investing in generating better data to inform planning and investment decisions related to agricultural risk management.* Italy has well-developed general public expertise in risk identification, assessment and communication, particularly when it comes to natural hazards that could result in the loss of life. A co-ordinated and systematic methodology to estimate the impact of adverse events specifically on agricultural production is being developed, which will lead to better information on which to base resource allocation decisions, including investments to strengthen on-farm resilience capacities and the development of preventative infrastructure. This data will complement other existing data collection efforts for water and disaster risk management, including SIRGRIAN, DANIA, ISIL and SIVENE.
- *There is an opportunity to ensure relevant data reaches farmers.* Weather alerts and information systems could provide more explicit implications of the forecast events on critical farm management decisions, including through digital tools. An analysis of existing digital tools could help identify where additional development of further technologies may be needed. Stakeholders should also note that more targeted risk outreach programmes may be needed for older farmers and farmers that are not well-integrated into value chains.

An ex ante approach to natural hazard-induced disaster risk management

- *Improving availability of water resources to mitigate the impact of drought is a priority.* Italy is making substantial investments in improving water infrastructure and improving data systems to inform water-related decision-making. But such improvements must be accompanied by strong water governance that prevents unsustainable use of water resources. While Italy allocates water using licenses, the system is inflexible, not allowing for trading, adjustment, or prioritisation as a means of responding to or mitigating drought impacts. Other more cost-effective strategies that could save water include investment in knowledge of water systems, improved management capacity, or planting less water-intensive crops.
- Risk management tools have been reoriented to prioritise tools that are defined *ex ante* rather than rely on *ex post* assistance. Current government support of risk management tools is largely devoted to *ex ante* instruments (such as subsidised crop insurance) instead of *ex post* initiatives (ISMEA, 2018^[15]). Nonetheless, few producers subscribe to these tools.
- Other policy initiatives support *ex ante* risk management strategies, but government stakeholders should note that the whole policy environment affects farm-level incentives to invest. Other public goods and programmes help producers to prepare, plan for, absorb, respond, recover from, and more successfully adapt or transform in response to hazards. These are typically funded through rural development expenditures, and include knowledge generation and technical assistance. At the same time, the whole policy environment – including direct payments under Pillar 1 – have an impact on farm-level incentives to take proactive risk management measures.

An approach emphasising preparedness and planning for effective crisis management, disaster response, and to “build back better” to increase resilience to future natural hazard-induced disasters

- *Business continuity is a priority for natural hazard response.* The prioritisation of business continuity in hazard response ensures that producers and their animals are not only safe, but also recover more quickly from adverse events by preventing cascading economic impacts.
- *Focus on “building back better” could be greater.* Drought recovery typically has little in the way of “building back,” but current structures, such as the OWUs that focus on addressing developing crises, could be more proactively leveraged to improve the long-term management of water resources in order to prevent future crises.

6.5. Strengthening risk management in Italy

While Italy’s disaster risk management systems for agricultural resilience exhibit a number of good practices, there are some concrete actions that would strengthen management of natural hazard risks for the sector.

- *Develop a holistic, long-term sectoral risk management strategy.* Such a strategy should explicitly recognise the need for investments in risk prevention and sectoral adaptation, and would enhance the capacity of the Italian agricultural sector to absorb, adapt and transform in response to natural hazards.
- *Ensure effectiveness of existing reforms:* Continued monitoring (and where necessary, adjustment) of recent policy initiatives is needed to ensure that they are achieving their aims. Additional investments in data analysis and improved management capacity to act on this data may be warranted.

- *Re-evaluate the current balance in favour of spending on risk coping tools to increase investments in risk prevention and preparedness:* Substantial resources continue to be directed toward risk coping tools that are not well-linked to other risk-mitigating activities and may actually weaken resilience to certain risks. Trade-offs and linkages should be explored, as spending on prevention typically results in future cost savings.
- *Take farmer demographics and capacities into account in policy design:* Policies and tools must recognise that some groups of farmers may need additional resources or efforts to reach similar levels of preparedness as others.

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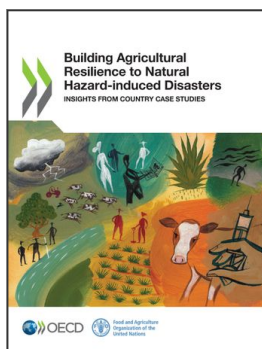
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Notes

¹ This chapter is based on Baldwin and Casalini (2021^[19]).

² Building back better is defined as using the recovery, rehabilitation and reconstruction phases after a disaster to increase the resilience of nations and communities through integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems, and into the revitalisation of livelihoods, economies and the environment (UNISDR, 2015^[16]).



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