



Upscaling innovative rainwater management in rainfed agriculture

Rainfed agriculture is key to achieving Zero Hunger but is challenged by water shortages

Rainfed production dominates agriculture, covering about 80 percent of total cropland and accounting for more than half of the world's food production. It is thus central to ensuring access to safe, nutritious and sufficient food for all people all year round, and to eradicating all forms of malnutrition (Sustainable Development Goal 2 Targets 2.1 and 2.2). Globally, there are about 1.2 billion hectares of rainfed cropland, of which 128 million hectares are experiencing high to very high drought frequency. As water shortages increase and population and economic growth continues, there will be growing pressure on all agricultural systems, especially rainfed ones, to use water more productively.

In many locations around the world, rainfed farming has evolved over the past decades through, *inter alia*, the increased use of improved water-harvesting and -conservation techniques, supplemental irrigation and better information, supported by improved governance. This, in turn, expanded production capacity and farmers' incomes and addressed environmental challenges. Yet, as illustrated in Figure 1, 45 percent of global rainfed cropland is still under low-input production (i.e. uses traditional varieties and mainly manual labour, without, or with little, application of nutrients or chemicals for pest and disease control). The challenge of addressing water shortages affects both low- and high-input rainfed production, but the capacity to address it is vastly different. Farmers in high-input systems, such as in Europe and Northern America, can more easily invest in improved water management and agronomic practices to ensure the most efficient use of scarce rainfall.

In low-input rainfed systems – concentrated in lower-income countries – changing weather, temperatures and rainfall patterns, combined with poor soil and water management, limit production capacity, negatively affecting farmers' incomes and food security and nutrition. This also contributes to loss of ecosystem services, including regulation of water runoff,

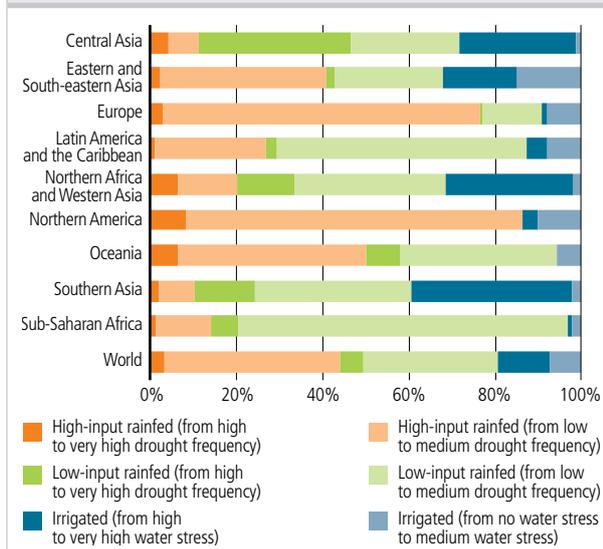


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KEY MESSAGES

- ▶ Rainfed agriculture accounts for more than half of the world's food production: achieving zero hunger will require improving rainwater management to increase rainfed productivity.
- ▶ Low-input rainfed agriculture, concentrated in lower-income countries, needs improved water management, including water harvesting, water conservation technologies and soil and water management practices.
- ▶ Improved water management practices must be combined with best agronomic practices and supported by public investment and assistance to farmers as well as by the expanding and digitizing of extension services.

FIGURE 1. Share of cropland by production system and level of water shortages and scarcity, by region



Source: FAO. 2020. *The State of Food and Agriculture 2020. Overcoming water challenges in agriculture*. Rome.

sediment transport and retention of soil organic matter. Growing water shortages further exacerbate import dependency, particularly in Northern Africa and parts of Asia, where the frequency of severe drought is high, but also in some higher-income regions of Europe, where yield gaps remain large. Five years into the 2030 Agenda for Sustainable Development, ensuring food security and nutrition and a sustainable environment is still possible, but only if the rainwater on which rainfed agriculture depends is managed more actively and creatively.

Making better use of rainfall for improved rainfed crop productivity

Unlocking the vast potential of rainfed agriculture requires the implementation of new and improved agricultural water management practices. For maximum effectiveness, these must be combined with best agronomic practices. There are two broad strategies for increasing yields in rainfed agriculture through better use of rainfall: (i) water harvesting – collecting or harvesting more water, infiltrating it into the root zone; and (ii) through soil and water conserving techniques that increase plant uptake capacity and/or reduce root-zone evaporation and drainage losses.

Combining water conservation and harvesting can be highly effective. In India, a combination of water-conservation and water-harvesting practices – including the modernization of traditional water harvesting systems – coupled with soil nutrient management, increased crop yields by 30–50 percent and cropping intensities by 80–150 percent, while helping mitigate the impacts of drought. In Ethiopia, where land degradation and the need to retain rainfall is critical, national initiatives introduced integrated land and water management practices (e.g. reforestation and minimum tillage), which brought benefits in terms of ecosystem services, and reduced erosion and surface runoff. Rainfed yields also improved, partly due to the increased use of fertilizer and improved seeds, as well as of better crop management practices. Globally, it has been estimated that, when combined, water conservation and harvesting can increase crop production by almost 20 percent. Almost 20 percent of global cropland is suitable for water harvesting and conservation strategies, with hotspots in large parts of Eastern Africa and South-eastern Asia.

What can policy makers do to realize the potential of rainfed agriculture?

Not all the problems related to water shortages can be addressed by farmers alone or depend exclusively on farmers' decisions. Some will rely on public-sector intervention, partnerships and initiatives, for example in the form of investments, as well as information and support to farmers to overcome constraints to adoption. This will be particularly important for small-scale farmers operating under

low-input rainfed production, for whom access to irrigation equipment, mechanization, and improved seed and fertilizer is lacking, along with the skills and technology to retain water in the soil. The following policy recommendations highlight important areas of focus.

- ▲ **Strengthen governance and institutional arrangements to create conditions for sustainable water management in rainfed systems.** So far, policy and governance for water resources management in agriculture have remained focused on irrigation, limiting investments and innovations in rainfed areas. Efforts are needed to promote investment in water management in both rainfed and irrigated agriculture. Water resources planning at the watershed and river basin scale must also consider rainwater management.
- ▲ **Consider rainfall and soils in a coordinated way.** The potential gains from rainfed agriculture are greatest when the investments and management practices for both rainfall and soils are considered in a coordinated way and combined with other production practices, such as improved or high-yielding crop varieties. Governments can eliminate barriers to investment through credit, crop insurance and safety nets. Scaling up and digitizing extension services is key to accelerate the adoption of improved management practices by small-scale farmers.
- ▲ **Adopt an inclusive, participatory and consultative approach.** Realizing maximum benefits from interventions depends on involving farmers in developing technologies within their local community and possibly at the river-basin level. Adopting new technologies and practices also calls for the active inclusion of research capacities for co-production of new knowledge and innovation, and for building the capacity of farmers and providing extension services. In Central America, research partnerships provided new tools and data collection approaches for implementing water-smart initiatives. These helped identify soil health constraints and thereby improve nutrient management of rainfed areas.
- ▲ **Develop drought preparedness programmes.** Drought policies should not simply be a response to disaster but a permanent concern for governments and society. A drought policy should have three pillars: (i) monitoring, forecasting and early warning systems; (ii) vulnerability and impact assessment; and (iii) drought preparedness, mitigation and response.
- ▲ **Perform water accounting and auditing.** Water harvesting can negatively affect water-related ecosystems and, consequently, the food security and nutrition of those who depend on them. Investment decisions must therefore be preceded by detailed water accounting and auditing, which provides an assessment of available water resources and their use, placing them in the broader institutional and governance context.

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