Land resources – soil, water and biodiversity – supply humanity with essential goods and services, producing more than 95 percent of the food we eat. They are under enormous pressure, reaching the point where productivity of key agricultural systems is compromised and livelihoods are threatened. Ensuring food security and livelihoods of a growing world population increasingly needs the provision of ecosystem services. This process is placing further pressure on the world’s water, land and soil resources. Current agrifood systems fail to make safe, affordable and healthy diets accessible to everyone; contribute to substantial biodiversity loss, increased land degradation and water scarcity; and are linked directly to 37 percent of human greenhouse gases (GHG) emissions.

Estimates indicate that human-induced land degradation occurs in almost 2 billion hectares worldwide, affecting 34 percent of the world’s agricultural lands and 40 percent of the world’s population.

Sustainable agricultural practices can lead to direct improvements in the state of land, soil and water, generate ecosystem benefits and reduce emissions from land, contributing positively to climate and achieving the Sustainable Development Goals (SDGs). Accomplishing all these requires accurate information and a major change in how we manage resources. It also requires complementing efforts from outside the natural resources management domain to maximize synergies and manage trade-offs.

This document presents the key findings of the State of the World’s Land and Water Resources for Food and Agriculture – Systems at a breaking point (SOLAW21) report, to be launched in May 2022. The report provides new information on the status of land, soil and water resources, as well as evidence of the changing and alarming trends in resource use, highlighting the risks, listing the identified hotspots, and informing on related opportunities and challenges. The report reveals a situation that has much deteriorated in the last decade, when the first SOLAW 2011 report highlighted that many of the productive land and water ecosystems were at risk. Land and water ecosystems are currently under intense pressure, and many are stressed to a critical point.

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1 The synthesis report of SOLAW21 has been launched in December 2021 (https://www.fao.org/land-water/solaw2021/en/)

Documents can be consulted at www.fao.org

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Suggested action by the Committee

The Committee is invited to:

- recognize the importance of the much-needed paradigm shift towards sustainable agrifood systems to meet the growing demand for food, while conserving biodiversity and safeguarding land, soil and water resources for food security and achievement of the SDGs;
- commend FAO’s efforts to provide updates on the state of land and water resources, in particular, through the State of the World's Land and Water Resources for Food and Agriculture (SOLAW21), and recommend FAO to consider the report as a FAO flagship publication; and
- encourage Members to widely disseminate SOLAW21, and to strengthen cooperation to use SOLAW21 assessments to enhance the sustainable management of land and water resources for better production, better nutrition, a better environment and a better life.

Queries on the substantive content of the document may be addressed to:

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I. Introduction

1. Land resources – soil, water and biodiversity – supply humanity with essential goods and services, producing more than 95 percent of the food we eat, but are under enormous pressures that have built to the point where productivity of key agricultural systems is compromised and livelihoods are threatened.

2. Human use of land and water for agriculture has not yet peaked, but all evidence points to slowing growth in agricultural productivity, rapid exhaustion of productive capacity and generation of environmental harm. Scaling up environmentally responsible and climate-smart production can reverse degradation trends of land and water resources and promote inclusive and sustainable development. This aligns with the aspirations of the FAO Strategic Framework 2022-31 for better production, better nutrition, a better environment and a better life for all, leaving no one behind.

3. The past decade has seen the advent of several important global policy frameworks, including dedicated Sustainable Development Goals (SDGs) for water and land, and targets for soil health. These frameworks are accompanied by global assessments of natural resources, including soils, forests, biodiversity, desertification and climate.

4. SOLAW21 aims to take stock of the implications for agriculture and recommend solutions for transforming the combined role of land and water in global agrifood systems.

5. Climate change and the complex feedback loops between climate and land present agriculture with amplified levels of risk that need to be managed. A global view points to a convergence of factors that are putting unprecedented pressure on land, soil and water resources, leading to a set of impacts and shocks in the supply of agricultural products. SOLAW21 argues that a sense of urgency needs to prevail over a hitherto neglected area of public policy and human welfare, that of caring for the long-term future of land, soil and water.

6. Shocks, such as severe floods, droughts and the COVID-19 pandemic, tend to divert attention from development priorities. International finance institutions warn of the widening fault lines between developed and developing countries in meeting global goals while facing resurgent infections and rising death tolls from COVID-19. Recovery programmes offer opportunities to address emergencies in an integrated way and kick-start the process of change, including in land and water management.

7. Land, soil and water form the basis of FAO’s commitment to the changes promoted in the United Nations Food Systems Summit 2021. However, recognition and actions are needed to redirect the focus on land, which is fundamental for world’s food security. Taking care of land, water and particularly the long-term health of soils is essential to securing food in an ever-demanding food chain, guaranteeing sustainable production, advancing equitable livelihoods, and building resilience to shocks and stresses arising from natural disasters and pandemics. The latter point starts from land and water access and governance. Sustainable land, soil and water management also underpins nutritious, diverse and healthy diets and resource-efficient value chains in the shift to sustainable consumption patterns.

II. What is new in SOLAW21?

8. The synthesis report of SOLAW21, launched in December 2021, comes at a time when human pressures on land, soils and freshwater are intensifying, pushing them to their productive limits.

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2 SOLAW21 is a collaborative effort led by FAO’s Land and Water Division in collaboration with several units at FAO headquarters and Decentralized Offices, senior advisers, as well as contributions from key partners such as the Griffith University, the Australian Centre for International Agricultural Research (ACIAR), the French Agricultural Research Centre for International Development (CIRAD), the International Center for Tropical Agriculture (CIAT), the International Center for Agriculture Research in the Dry Areas (ICARDA), the Thünen Federal Research Institute, the German Development Institute (DIE), the Stockholm Environment Institute (IIASA), Environment Law Institute, Asian Soil Partnership, Future Earth, International Water Management Institute (IWMI), The Organisation for Economic Co-operation and Development (OECD), the Stockholm International Water Institute (SIWI), the World Overview of Conservation Approaches and Technologies (WOCAT), and the International Commission on Irrigation and Drainage (ICID), among others.
Rain-fed farming produces 60 percent of the world’s food on 80 percent of the cultivated land. Irrigated farming produces 40 percent on 20 percent of the land.

9. **SOLAW21** builds on the concepts and conclusions given in the previous **SOLAW 2011**. Much has happened in these 10 years. Recent assessments, projections and scenarios from the international community paint an alarming picture of the planet’s natural resources, highlighting overuse, misuse, degradation, pollution and increasing scarcity. Rising demands for food and energy, competing industrial, municipal and agricultural uses, and the need to conserve and enhance the integrity of the Earth’s ecosystems and their services, make the picture extremely complex and full of interlinkages and interdependencies.

10. **SOLAW21** adopts the driver-pressure-state-impact-response (DPSIR) approach, a well-established framework for analysing and reporting important and interlinked relationships among sustainable agricultural production, society and the environment. The DPSIR approach provides a structure to report on cause-effect relationships to arrive at key policy recommendations, and enable policymakers to assess the direction and nature of changes needed to advance sustainable management of land and water resources.

11. The drivers of demand for land and water resources are complex. By 2050, FAO estimates agriculture will need to produce almost 50 percent more food, livestock fodder and biofuel than in 2012 to satisfy global demand and keep being on track to achieve Zero Hunger by 2030. Progress made in reducing the number of undernourished people in the early part of the twenty-first century has recently been reversed. The number has risen from 604 million in 2014 to 768 million in 2020. While prospects for meeting the nutritional requirements of 9.7 billion people by 2050 at global level exist, problems with local patterns of production and consumption are expected to worsen, with increasing levels of undernourishment and obesity among the steadily growing and mobile population. The demand for more calories to satisfy population and income growth is constrained, as cropping extends into marginal lands and existing land suffers erosion and depletion of carbon, nutrients and soil biodiversity.

12. Options to expand cultivated land areas are limited. Prime agricultural land is being lost to urbanization. Irrigation already accounts for 70 percent of all freshwater withdrawals. Human-induced land degradation, water scarcity and climate change are increasing the levels of risk for agricultural production and ecosystem services at times and in places where economic growth is needed most.

13. Most pressures on the world’s land, soil and water resources derive from agriculture itself. The increase in use of chemical (non-organic) inputs, uptake of farm mechanization, and overall impact of increased monocropping and grazing intensities are concentrated on a diminishing stock of agricultural land. They produce a set of externalities that spill over into other sectors, degrading land and polluting surface water and groundwater resources.

14. The impacts from accumulating pressures on land and water are felt widely in rural communities, particularly where the resource base is limited and dependency is high, and to a certain extent in poor urban populations, where alternative sources of food are limited. Human-induced deterioration of land, soil and water resources reduces production potential, access to nutritious food and, more broadly, the biodiversity and environmental services that underpin healthy and resilient livelihoods.

15. A central challenge for agriculture is to reduce land degradation and carbon emissions and to prevent further pollution and loss of environmental services while sustaining production levels. Responses need to include climate-smart land management attuned to variations in soil and water processes. Management options are available to increase productivity and production levels if innovation in management and technology is taken to scale to facilitate transition to sustainable agrifood systems. However, none of these can advance without planning and managing land, soil and water resources through effective land and water governance.

16. Increasing land and water productivity is crucial for achieving food security, sustainable production and SDG targets. However, there is no one-size-fits-all solution. A “full package” of workable solutions is now available to enhance food production and tackle the main threats from land degradation, increasing water scarcity and declining water quality. **SOLAW21** indicates how
institutional and technical responses can be packaged to address the challenges of increasing water and food security within the land, soil and water domains, and, more widely, across agrifood systems. The report stresses the importance of integrated approaches in managing land and water resources. Sustainable land management (SLM), sustainable soil management and integrated water resources management (IWRM) are all examples of such approaches, which can be blended with technology innovation, data and policies to accelerate improvement in resource-use efficiency, raise productivity and align progress with SDGs.

17. An important point to recognize is that many agents of change in the landscape remain excluded from the benefits of technical advances. This applies to disproportionately poorer and socially disadvantaged groups, mostly living in rural areas. While technical solutions to specific land and water challenges may be within grasp, much will depend on how land and water resources are allocated. Inclusive forms of land and water governance will be adopted at scale only when there is political will, adaptive policymaking and follow-through investment. A primary focus on land and water governance is essential in creating the transformative changes needed to achieve patterns of sustainable agriculture that can enhance income and sustain livelihoods while protecting and restoring the natural resource base.

18. Significant complementary efforts will also be needed in agrifood systems beyond the farm to maximize synergies and manage trade-offs in related sectors, particularly in energy production. For this to happen, changes in policy, institutional and technical domains that disrupt “business as usual” models may prove necessary.

19. Current trends in natural resource depletion indicate that production from rainfed and irrigated agriculture is operating at or over the limit of sustainability. Injecting a sense of urgency into making the necessary transformations at the core of the global agrifood system is essential.

III. Key findings of SOLAW21

20. SOLAW21 reveals a situation that has much deteriorated in the last decade, when the first SOLAW 2011 report was published. The pressures on land and water ecosystems are now intense, and many are stressed to a critical point. The report argues that achieving the SDGs under a changing climate, loss of biodiversity and land degradation will depend on how well the risks to the quality of our land and water ecosystems are managed, blending innovative technical and institutional solutions to meet local circumstances, and, above all, focusing on better systems of land and water governance.

Current patterns of agricultural intensification are not proving sustainable

21. Pressures on land and water resources have built to the point where productivity of key agricultural systems is compromised and livelihoods are threatened.

22. Farming systems are becoming polarized. Large commercial holdings now dominate agricultural land use, while fragmentation of smallholders concentrates subsistence farming on lands susceptible to degradation and water scarcity.

23. Estimates indicate that human-induced land degradation affects almost 2 billion hectares worldwide, impacting some 3.2 billion people, 40 percent of the world’s population.

24. Land degradation, drought and related water scarcity are compromising agricultural production and intensifying poverty and malnutrition in all regions.

Human-induced land degradation is affecting sustainable food production and agriculture, livelihoods and the fight against poverty

25. Land and water systems are just managing to meet the demand placed upon them by an increasingly complex global food system driven by unrelenting population growth and changing food habits. There is little room for expanding the area of productive land, yet more than 95 percent of global food production is derived from land. The environmental integrity of these systems needs to be safeguarded if they are to be kept in play.
The social challenges and environmental risks faced by agriculture continue to proliferate. Pressures on land and water resources arise largely within agriculture and the wider agrifood system, generating significant GHG emissions and aggressive soil and water pollutants. The slow-onset risks of human-induced land degradation, soil erosion, salinization and groundwater pollution may not be salient, yet they run deep and are persistent. The role of soil and water management in reducing agriculture’s GHG emissions will be pivotal.

Solutions exist but need to be scaled

Despite the level of pressure and above-described challenges, land and water degradation and depletion are reversible to some extent, but can only be successfully taken to scale by reforming land and water governance.

There is no doubt that agriculture’s “solution space” has expanded. Advances in agricultural research have broadened the technical palette for land and water management. Rapid improvements in information technology offer the prospect of digital democracy. However, to apply solutions at scale, land and water governance will need adjustment to make advances inclusive and to provide support to farmers for innovation.

Any advance in transforming agrifood systems to meet future demand will require a focus on land resource planning in which systemic analyses of land, soils and water are combined with poverty and food security monitoring. The tools for planning and management are available. Data collection and information dissemination need to improve. Monitoring the effects of climate change in relation to agroecological suitability will prove essential for planning along the entire food value and supply chains.

Implementation of plans through integrated multisectoral approaches need not be complex. They can be intuitive and may require only close collaboration across sectoral boundaries. However, farmers and resources managers need to be much more aware about risks and work together with planners in setting their responses and contingency planning.

The level of investment provided to agriculture will need to be redirected to bring long-term stability of agriculture’s natural resources base and the livelihoods of those who depend upon them. Planning a way out of the downward spiral of land degradation and water scarcity offers promise when combined with forward-looking incentives for climate adaptation and mitigation. There is now scope for progressive multiphased financing of agricultural projects that can be linked with redirected incentives to keep land and water systems in play.

Future agricultural production will depend upon managing the risks to land, soil and water, finding better synergy to keep systems in play. This is essential to maintain the required rates of agricultural growth without further compromising the generation of environmental services.

Land and water resources will need safeguarding. There is now only a narrow margin for reversing trends in resource deterioration and depletion, but the complexity and scale of the task should not be underestimated.

Land and water governance has to be more inclusive and adaptive. Inclusive governance is essential for allocating and managing natural resources. Technical solutions to mitigate land degradation and water scarcity are unlikely to succeed without it.

Integrated solutions need to be planned at all levels if they are to be taken to scale. Planning can define critical thresholds in natural resource systems, leading to the reversal of land degradation when wrapped up as packages or programmes of technical, institutional, governance and financial support.

Caring for neglected soils, addressing drought and coping with water scarcity can be addressed through the adoption of new technologies and management approaches.

Agricultural support and investment can be redirected towards social and environmental gains derived from land and water management.