



Food and Agriculture
Organization of the
United Nations



THE GLOBAL
MECHANISM
United Nations Convention
to Combat Desertification

BRIEFING
NOTE

VULNERABILITY
TO FOOD
INSECURITY IN
MOUNTAIN REGIONS

LAND DEGRADATION AND OTHER STRESSORS



Vulnerability to food insecurity in mountain regions: land degradation and other stressors

© FAO and UNCCD, 2019. All rights reserved.

Author: Fabio Grita

Contributing organisations: Food and Agriculture Organization of the United Nations (FAO), Mountain Partnership Secretariat, Global Mechanism of the United Nations to Combat Desertification (UNCCD).

Contributing authors: Rosalaura Romeo (MPS/FAO), Sven Walter (FAO), Giuseppina Cinardi (FAO), Yasmeen Telwala (Global Mechanism-UNCCD), Aasha Subedi (Global Mechanism-UNCCD), Laura Russo (MPS/FAO), Fabio Parisi (MPS/FAO), Christiana Oragbade (Global Mechanism-UNCCD), Paola Codipietro (Independent Consultant).

Suggested citation:

FAO and UNCCD. 2019. Vulnerability to food insecurity in mountain regions: land degradation and other stressors. Bonn, Germany.

This publication was made possible with the financial support of the Global Environment Facility (GEF) through the International Union for the Conservation of Nature (IUCN); the Italian Development Cooperation – Ministry of Foreign Affairs and International Cooperation (MAECI); and the Federal Office for Agriculture of the Swiss Confederation.

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) or United Nations Convention to Combat Desertification (UNCCD), concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO or UNCCD in preference to others of a similar nature that are not mentioned.

The designations employed and the presentation of material in the map(s) do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal or constitutional status of any country, territory or sea area, or concerning the delimitation of frontiers.

The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of FAO or UNCCD.

ISBN FAO: 978-92-5-131786-0



Some rights reserved. This work is made available under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 IGO licence (CC BY-NC-SA 3.0 IGO; <https://creativecommons.org/licenses/by-nc-sa/3.0/igo/legalcode>).

Under the terms of this licence, this work may be copied, redistributed and adapted for non-commercial purposes, provided that the work is appropriately cited. In any use of this work, there should be no suggestion that FAO and UNCCD endorse any specific organization, products or services. The use of the FAO logo is not permitted. If the work is adapted, then it must be licensed under the same or equivalent Creative Commons license. If a translation of this work is created, it must include the following disclaimer along with the required citation: “This translation was not created by the Food and Agriculture Organization of the United Nations (FAO). FAO is not responsible for the content or accuracy of this translation. The original English edition shall be the authoritative edition.”

Disputes arising under the licence that cannot be settled amicably will be resolved by mediation and arbitration as described in Article 8 of the licence except as otherwise provided herein. The applicable mediation rules will be the mediation rules of the World Intellectual Property Organization <http://www.wipo.int/amc/en/mediation/rules> and any arbitration will be in accordance with the Arbitration Rules of the United Nations Commission on International Trade Law (UNCITRAL).

Third-party materials. Users wishing to reuse material from this work that is attributed to a third party, such as tables, figures or images, are responsible for determining whether permission is needed for that reuse and for obtaining permission from the copyright holder. The risk of claims resulting from infringement of any third-party-owned component in the work rests solely with the user.

Sales, rights and licensing. FAO information products are available on the FAO website (www.fao.org/publications) and can be purchased through publications-sales@fao.org. Requests for commercial use should be submitted via: www.fao.org/contact-us/licence-request. Queries regarding rights and licensing should be submitted to: copyright@fao.org.

This publication is available for download at <https://www.unccd.int/publications>

Cover photos: ©UNCCD/Salvacion Angtuaco,
©Shutterstock/Asada Nami
©Shutterstock/anand

Back photo: ©Shutterstock/ckchiu
Design and layout: QUO Global

VULNERABILITY
TO FOOD
INSECURITY IN
MOUNTAIN REGIONS
**LAND DEGRADATION
AND OTHER
STRESSORS**

CONTENTS

Key messages	v
Background	1
Methodology	3
Findings and results	5
Conclusions and way forward	9
Recommendations	11
Figures	13
Country case studies	20
Annex: Countries with voluntary LDN targets	25



KEY MESSAGES

The study's findings highlight that government actions to combat land degradation, adapt to climate change, strengthen agricultural value chains and promote economic development are fundamental to reducing vulnerability to food insecurity in mountain regions.

The international support given to governments to improve peoples' livelihoods, generate new opportunities and protect mountain ecosystems came in the form of knowledge sharing, technical assistance, legal support and governance advice. In this context, the newly-declared UN Decade on Ecosystem Restoration (2021-2030) could be an important opportunity to simultaneously address environmental degradation and vulnerability to food insecurity.

The key messages transcribe the main findings of this study and highlight areas where the actions of governments and international partners to reduce peoples' vulnerability to food insecurity and address land degradation could converge. The following key messages relate only to the developing countries assessed in this study:

- ⊗ Between 2012 and 2017, the rural mountain population vulnerable to food insecurity increased from 307 to 346 million people (i.e., more than one person out of two), an increase of 12% within five years.
- ⊗ 50 million people currently live in remote rural mountain areas where their ability to access basic health, education, water, and supply services is limited, and their trading capacity constrained; 17 million of these people are also vulnerable to food insecurity.
- ⊗ 311 million people – approximately half of the mountain population in the developing countries – live in areas exposed to progressive land degradation, 178 million of whom are considered vulnerable to food insecurity (approximately 27% of the mountain population in 2017). Of this 178 million, 74 million live in areas registering important land degradation increases during the assessed period (46 million of whom live in croplands).
- ⊗ Africa, particularly Eastern Africa, has seen an alarming increase in vulnerability to food insecurity in rural mountain areas (23% from 2012 to 2017), especially where land is rapidly degrading, putting agricultural production and livelihoods at risk. The situation is further exacerbated by population pressure, with the population in Eastern Africa increasing by nearly 1.5% over a period of five years, a dramatic increase when compared to the global average.



- ⊙ High climate variability and extreme meteorological events disrupt agricultural activities in the assessed countries, affecting approximately 60 million people in mountain regions, 16 million of whom are vulnerable to food insecurity. Four million mountain people are located in areas at high risk from extreme climate events and with limited access to basic services, living approximately 3-4 hours' driving distance from the closest food market. The coping capacity of these communities is heavily compromised by the combined effects of adverse weather and isolation that endangers both their assets and livelihoods.
- ⊙ The analysis reveals critical situations in various parts of the world (especially in Eastern Africa and Central Asia), which require due consideration from both national and international partners. Without appropriate action, the increasing negative effects of mountain stressors on the environment and livelihoods risk degenerating into unrecoverable losses of resources, exacerbating poverty and forcing emigration.
- ⊙ Countries may benefit from the global call for Ecosystem Restoration, which will catalyze political/institutional support, scientific research and financial resources to improve the productivity and capacity of ecosystems, support mountain communities, and reduce vulnerabilities.

BACKGROUND

INTRODUCING THE KEY PLAYERS

The **Mountain Partnership** is a United Nations voluntary alliance that brings members together to work towards a common goal: improving the lives of mountain peoples and protecting mountain environments around the world. It currently has 370 members from governments, intergovernmental organizations, civil society and the private sector. Mountain Partnership members share a single vision: a world in which sustainable mountain development receives greater public and private sector attention, commitment, engagement and investments.

The **Food and Agriculture Organization of the United Nations (FAO)** hosts the Mountain Partnership Secretariat and is the custodian agency of SDG Indicator 15.4.2 (Mountain Green Cover Index), which reports on the status and evolution of vegetation in mountain areas.

The **Global Mechanism and the secretariat of the United Nations Convention to Combat Desertification (UNCCD)** support interested countries with their national LDN target setting process through the Land Degradation Neutrality Target Setting Programme, which includes setting national baselines, targets and associated measures to achieve LDN.

LDN is linked to SDG Target 15.3, for which the UNCCD is the custodian agency. It represents a paradigm shift in land management policies and practices, and is a unique approach that counterbalances the expected loss of productive land with the recovery of degraded areas.

Paragraph 33 of the 2030 Agenda for Sustainable Development highlights the importance of adopting sound conservation and the sustainable use of oceans, seas and freshwater resources, as well as forests, mountains and drylands, in order to protect biodiversity, ecosystems and wildlife. In this framework, mountains play an extremely important role by providing homes to more than one billion people and supplying 60-80% of the earth's freshwater. Half of humankind depends on mountain resources, reaffirming that mountain ecosystem services are among the most important contributors to both highland and lowland economies (such as in the Hindu Kush Himalayan region, which provides freshwater to 1.65 billion people). However, despite the importance of these high-value services, mountain communities are particularly vulnerable to food insecurity as they often live in isolated areas and fragile ecosystems characterized by poor soil quality and a high incidence of disasters.

Protecting mountain ecosystems, promoting the sustainable use of natural resources and ensuring food security are all global priorities. To this end, Sustainable Development Goal 15 aims to promote actions that ensure the sound and sustainable use of terrestrial ecosystems by promoting actions to control land degradation and maintain healthy vegetation cover. The impact of these actions are monitored through indicators 15.3.1 ("proportion of land that is degraded over total land area") and 15.4.2 ("mountain green cover index"), under the respective responsibility of the UNCCD and the FAO. Concrete actions to address mountain-related issues are undertaken by the Global Mechanism in line with the UNCCD 2018-2030 Strategic Framework and by the Mountain Partnership since its establishment in 2002 during the World Summit on Sustainable Development.

In 2011, the Global Mechanism and the Mountain Partnership collaborated to assess and document the role of dryland mountain regions in defining and implementing truly sustainable development. The collaboration highlighted the need to i) incorporate climate change adaptation measures in the formulation of sectoral policies and in the implementation of large investments; ii) involve intergovernmental organizations in preserving the ecological and cultural diversity of dryland mountain socio-ecosystems; and iii) ensure a more active role of governments in formulating regional policy frameworks for disaster prevention.

In 2015, the Mountain Partnership Secretariat (MPS) published a study on “Mapping the Vulnerability of Mountain Peoples to Food Insecurity,” which drew attention to the increasing number of food insecure people living in mountain areas from 2000 to 2012. One year later in 2016, the Global Mechanism of the UNCCD in cooperation with the UNCCD secretariat and 18 international partners launched the Land Degradation Neutrality (LDN) Target Setting Programme, which assists participating countries to formulate voluntary LDN targets and associated measures, some of which are particularly relevant for preserving mountain landscapes and supporting local populations.

In 2018, action was taken by the Global Mechanism and the MPS to expand knowledge on vulnerability in mountain regions, by undertaking a study to evaluate the actual and potential impacts of its underlying causes (also referred to as stressors). This ongoing collaboration has the objective of sensitizing international and national stakeholders on the risks associated with the increasing frequency and intensity of hazards, as well as on the lack of services and infrastructure in mountain area, which augment

vulnerability to food insecurity with serious repercussions on livelihoods and the environment. The detection of areas where the combined effects of these stressors are particularly intense is expected to help governments to set priorities and develop policies to control land degradation in critical areas, preserve mountain ecosystems, improve infrastructures and services, and support local people’s livelihoods. In this context, the information provided by the LDN Target Setting Programme, through the national LDN target setting reports (see Annex) are key resources in verifying the accuracy of the results, showing the linkages between vulnerability and land degradation, and encouraging governments to continue and further intensify research and actions to achieve LDN and support mountain populations.

Far from being inclusive of all environmental, social and economic issues contributing to the vulnerability of mountain peoples, the outcome of the data analysis carried out under this joint work contributes to increasing knowledge on vulnerability dynamics and is a step forward in understanding the impacts of mountain stressors.



METHODOLOGY

The MPS/FAO-Global Mechanism joint work is designed to directly contribute to achieving SDG 2 (end hunger, achieve food security, improve nutrition and promote sustainable agriculture) and SDG 15 (protect, restore and promote the sustainable use of terrestrial ecosystems). It is based on the FAO definition of food security: “a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.” People become vulnerable to food insecurity when the above conditions are not met. In order to assess where vulnerability to food insecurity occurs in mountain regions, the study analyzes key environmental and socio-economic factors that may cause an acute decline in food access, or consumption levels, below minimum survival needs.

Vulnerability to food insecurity is determined by an analysis of crop production and animal husbandry (both representing the availability of staple food commodities consumed by mountain people), their assumed redistribution through local trade mechanisms and the average nutritional requirements of local populations. The vulnerability results are then matched with estimates of the actual and potential threats, determined through an analysis of the occurrence and intensity of the following food security-related stressors:

- Climate variability;
- Land degradation changes;
- Natural hazards; and
- Conflicts.

Combined with structural constraints, such as:

- Distance to food markets; and
- Access to town facilities and infrastructure, including 12 variables such as education, health, amenities, food services, non-food shops, access to water and sanitation, technology and communication, electricity, hotels, etc.

The analysis of the geographical distribution and intensity of these stressors in mountain regions is key to understanding their potential impact on agricultural productivity and the decline of environmental services, and ultimately to assessing the status and possible evolution of vulnerability to food insecurity.

The outcome of the study consists of three deliverables:

- a) Updated information on the status of vulnerability to food insecurity in mountain areas for the period 2012-2017, which complements the data provided by FAO in the 2015 publication “Mapping the vulnerability of mountain peoples to food insecurity,” which refers to the period 2000-2012;
- b) An assessment of the geographical distribution and intensity of the single stressors and constraints; and
- c) The identification of areas where the combined effects of the above-mentioned stressors/constraints may jeopardize the livelihood of vulnerable mountain populations.

The detailed analysis, described in the technical report that accompanies this briefing note, examines the distribution of vulnerability and associated stressors in different mountain habitats, determined by altitude, slope steepness and local elevation range (LER). The definition of mountains adopted by this study is the one developed by the World Conservation Monitoring Centre (WCMC) and the UN Environment Programme (UNEP), with contribution from the Swiss Agency for Development and Cooperation (SDC). The key features of the mountain classification are listed in Box 1.

BOX 1: MOUNTAIN AREAS DEFINITION

The UNEP-WCMC classification of mountain areas indicates seven elevation classes of mountains according to the following scheme:

- Class 1: elevation $\geq 4,500$ m
- Class 2: elevation 3,500–4,500 m
- Class 3: elevation 2,500–3,500 m
- Class 4: elevation 1,500–2,500 m and slope $\geq 2^\circ$
- Class 5: elevation 1,000–1,500 m and slope $\geq 5^\circ$ or LER > 300 m
- Class 6: elevation 300–1,000 m and LER > 300 m
- Class 7: inner isolated areas (≤ 25 sq.km in size) that do not meet the above criteria but are surrounded by mountains



In this study, particular emphasis is given to changes in land degradation versus the increase/decrease in vulnerable people. For this purpose, the results obtained from the data analysis are compared with the information provided by the LDN Target Setting Programme through the completed national LDN target setting reports of those countries participating in the programme. Particularly useful for this scope are the “hotspots” located in the mountains and cited in the national reports as depleted areas to be monitored during LDN implementation. The hotspots were used to randomly verify the correspondence between their description and the land degradation changes estimated by this study, as well as to gather information on the underlying drivers of land degradation operating in each hotspot.

Overall, the ultimate objective of the MPS/FAO-Global Mechanism joint work is to provide evidence-based information to FAO member countries and to the UNCCD’s country Parties to strengthen their capacities in streamlining policy development and planning interventions to alleviate poverty, reduce food insecurity and protect natural resources. In order to facilitate country-level implementation of the vulnerability assessment, both methodology and approach are designed to be scalable (applicable at national level), modular (flexible enough to adapt to various types and numbers of stressors and constraints) and replicable (based on internationally-available data). It makes large use of GIS and remotely-sensed data, which are both key resources for global and regional analyses. Complementing these data with national information would help to make the analytical results suitable for sub-national-level estimates.

FINDINGS AND RESULTS

The most relevant information emerging from this study is the increase in the number of rural mountain inhabitants living in developing countries that are vulnerable to food insecurity. The 2017 estimates show an increase from 307 to 346 million people over a five-year period, 2012 to 2017 (see Figure 1). Overall, the population exposed to food insecurity in mountain areas has increased by 12.5% over five years, surpassing the rate of increase of non-vulnerable peoples (12.2%).

The observed vulnerability trends at regional level (see Figure 2) show different dynamics among continents and sub-regions. Africa and Asia register the largest increases in both population growth and vulnerability. In these areas, natural and human-induced threats, such as droughts and conflicts, endanger long-term food security by challenging the ability of farmers to maintain their agricultural production and inhibiting their capacity to sell products at the most convenient markets and prices. Furthermore, inadequate infrastructure, such as poor road conditions, limits access to markets and other destinations, hampering the economic opportunities of small-scale farmers.

Africa

African mountain regions, especially in Eastern Africa (the Great Rift Valley range), present the highest population growth rate and increase in vulnerability to food insecurity in the five years to 2017 (22.8%), affecting 132 million people, 24 million more than in 2012. People living in the Great Rift Valley are the most vulnerable on the continent (see Figure 3). Communities in Eastern Africa have transformed natural land cover into farmlands, grazing lands, human settlements and urban centers at the expense of natural vegetation. These transformations are responsible for deforestation, biodiversity loss and

land degradation. As croplands expand, soil fertility and moisture drop, and soils are more easily eroded. On the other hand, although pastoralists maintain native plant and animal species more effectively than in the cultivation of crops, progressive land degradation and alarming climate-related events, especially drought, threaten their livelihoods, causing, in extreme cases, the loss of their assets. These situations, combined with increasing population pressure and other constraints such as poor transportation infrastructure, limited telecommunications and inadequate access to basic supplies, make the living conditions of rural mountain populations strenuous and critically threaten their long-term sustainability.

The mountain regions of Eastern and Southern Africa suffer from over-exploitation of land and water resources, drought, flooding, landslides and water scarcity, particularly in the highlands of Ethiopia and Eritrea, which are heavily cultivated with small-scale farmers using very traditional land management methods.¹ Crop productivity here is low, with water becoming a scarce resource in a region where the socio-ecological system is highly vulnerable to changing climatic patterns.

Figure 4 shows that the number of mountain people vulnerable to food insecurity and those living on degraded land are related, i.e., the incremental depletion of natural resources is behind the potential increase in food insecurity. This seems to highlight peoples' overall dependency on land resources and a lack of sustainable land management practices able to stem land degradation. Between 2012 and 2017, out of the 132 million mountain people vulnerable to food insecurity, 86 million lived in areas characterized by limited to very extensive land degradation changes, and 27 million of those lived in areas where the rate of land depletion was moderate to very high.

¹ Kassawmar, K. *et al* (2018). A synoptic land change assessment of Ethiopia's rainfed agricultural area for evidence-based agricultural ecosystem management.

Asia

Between 2012 and 2017, the Asian mountain population increased from 535 to 579 million (8.1%) while the number of people vulnerable to food insecurity registered a decline in growth, settling at 7.5% against the 26% increase registered from 2000 to 2012. Despite this progress, Asia remains the world's most populated continent with the highest increase in the number of vulnerable people (at 44 million; see Figure 6). In several Asian countries, the livelihoods and food security of mountain communities depend heavily on local resources, the main sources of which are agriculture, livestock and horticulture, with livestock in particular becoming more important than arable farming at higher elevations. Land degradation, climate change and socioeconomic factors have considerable impacts on food security and on the depletion of natural resources, with consequential declines in food productivity. The reduced productivity affects food security and increases the overall vulnerability of mountain peoples, forcing them to become more dependent on food from outside and exposing them to market fluctuations. Climate change is also adding new challenges in water availability and changing temperature conditions.

Asian countries show mixed trends, with both increases and decreases of vulnerability occurring when land degradation change intensifies (see Figure 5). In the Indian mountains for example, the number of vulnerable people in 2017 was approximately 30 million (12% increase from 2012), 13 million of whom were living on land that had progressively degraded over the same period. In comparison, Myanmar showed an opposite trend, where vulnerability increased more than land degradation. In Myanmar's mountains between 2012 and 2017, the number of vulnerable people increased to nearly four million, while less

than two million people were living on land that had degraded, showing that land degradation is not the only stressor causing vulnerability. In Asian middle-income countries, vulnerability to food insecurity may remain low because of the large availability of local food commodities.

Agriculture benefits from technology and inputs such as irrigations, chemical fertilizers and pesticides, which enable good crop yields despite the worsening of soil and water conditions. However, the intensive use of technology might also be accelerating land degradation when not used sustainably. For example, excessive water withdrawals for irrigation might cause water tables to fall and reduce runoff, and the intensive exploitation of groundwater resources, especially in dry areas, can increase soil and water salinization, with negative to devastating long-term consequences for agriculture and the environment.

For these and other reasons, the geographical distribution of vulnerability to food insecurity in Asian mountains is generally uneven, as seen in the Himalayan mountains where there are pockets of vulnerability with higher concentrations in the western part of the chain (see Figure 5). Himalayan populations face serious problems of remoteness and accessibility, socioeconomic inequality, and a high dependency on natural resources, the depletion of which are the main determinants of poverty and vulnerability. The Hindu Kush, for example, hosts millions of indigenous peoples who are economically, socially and politically marginalized and who have poor to difficult access to markets and basic facilities. Adequate infrastructure facilities, such as easily accessible food distribution centers and markets, are of critical importance to ensure access to food, especially during monsoon and winter seasons.



Latin America and the Caribbean

The Latin America and Caribbean region was the world's fastest-growing source of international migrants from 1990 to 2010. According to institutes such as the World Bank and UN Population Fund (UNFPA),² the complex macroeconomic crises and political uncertainty that hit the largest countries in the region created the conditions for a very modest population growth rate. Vulnerability to food insecurity follows the same path, showing a very modest increase of less than 2%. According to IFAD, many small-scale farmers live in poverty and are food insecure, with limited access to markets and services. This study confirms the presence of isolated pockets of vulnerable populations distributed along the Andes and Caribbean islands (see Figure 8) affected by intense climate variability and land degradation.

Caribbean countries face challenges because of the scarcity of economically exploitable and arable land, the occurrence of disasters due to extreme climate events, and their dependence on other countries for food and energy. Islands present an additional natural constraint that makes access to market services particularly difficult. Inhabitants are therefore forced into small-scale economies due to small-size businesses, high infrastructure costs, and a heavy dependence on limited commodities and overseas markets. They also face high transport costs which limit opportunities for economic diversification.

The Andes, the most densely-populated area in South America, are particularly exposed to sudden onsets of extreme weather events, although the number of people vulnerable to food insecurity is not high. Vulnerability affects small communities who are often difficult to reach due to high altitudes, steep slopes and poor road infrastructure. Arable land is also limited, and several rural communities live on local production, the only resource for their subsistence. For these communities, land degradation and the effects of climate variability (such as landslides and intensive soil erosion) combined with the above-mentioned constraints pose real challenges.

Oceania

Vulnerability to food insecurity in Oceania is generally low. However, a study conducted by the Asian Development Bank and IFPRI reports that Fiji, Papua New Guinea and the Solomon Islands need to invest in the agriculture and fisheries sectors to improve their ability to combat the detrimental effects of climate change on food security and poverty, considering that climate change is expected to have significant negative impacts on agricultural output in these countries. Climate change will also negatively impact food consumption levels, calorie availability and the severity of child malnutrition. The poor will be the most adversely affected by these changes, with potential increases in the number of people vulnerable to food insecurity (see Figure 7).

The Pacific islands, on average, are more heavily affected by natural hazards relative to other small states in other regions. The Pacific has experienced about 2,400 tropical cyclones in the last 60 years (World Bank) and their occurrence has increased over time, in-line with global trends. For example, the probability of natural hazards occurring in Papua New Guinea is about 20% a year, based on historical frequency. According to the World Risk Index (a composite measure of a country's exposure to natural hazards and of its ability to cope with them), Pacific islands have the highest risk of suffering a disaster, causing annual damage and losses of about 2.3% of their respective GDPs. Disasters are more frequent in Papua New Guinea and Fiji, but because the intensity of natural hazards and resilience to these events vary across countries, damage and losses are higher in Samoa and Vanuatu.

Climate change threatens agricultural income in Papua New Guinea and the Solomon Islands, as it increases water salinity in rural areas. Sea levels are already rising and recent studies suggest they will rise further (ADB, IPCC), between 1 and 1.7 meters in some cases, affecting important portions of land. Climate change affects the Pacific islands to varying degrees, causing an increase in vulnerability to food insecurity, mostly related to the rising temperature that increases the intensity of, and risks associated with, natural hazards.

² <https://www.unfpa.org/migration>

All mountain regions included in the study

In all mountain areas, the impact of human activities on the environment is revealed by the distribution of vulnerable populations by land cover types (see Figure 9). The vast majority of the populations in rural areas of developing countries vulnerable to food insecurity reside in croplands (249 million, 72% of the entire vulnerable population), where arable farming is likely to be the dominant economic activity. Widespread vulnerability in agricultural areas may indicate poor land management and soil impoverishment, which calls for actions to boost production, improve agricultural practices, develop sustainable land use, increase infrastructures and services in isolated mountain areas, and focus on investments, in order to fill the actual or potential gap in food supply. Vulnerability in livestock-dominated landscapes (grassland, open forest and shrub land) is more modest, reaching 96 million in 2017, 28% of the total vulnerable population in rural areas.

In most developing countries, the impact of upland agriculture on land degradation is very high. Aggregated data by continent, land cover type and intensity of land degradation change show that agricultural expansion and management are the major contributors of environmental depletion, especially in Africa and Asia (see Figure 10). This is also confirmed by the analysis of the national LDN target setting reports, where Asian countries highlighted the remarkable decrease in the area of grassland, approximately 2% on average, when linked to the increase in cropland. Rapid population growth and the need to ensure food security for all citizens caused an expansion of agricultural land, mainly at the expense of non-forest areas. The decrease in forest area in Africa is mainly due to agricultural clearing and timber harvesting. Deforestation, human population pressure and poor agricultural practices are the three most frequently mentioned causes of land degradation in Africa, and countries are far more concerned with the impact of human activities than natural events.³

This situation urges greater emphasis on improved and sustainable land management practices in order to reduce vulnerability to food insecurity. Agroecology, conservation agriculture, land resource conservation and LDN are key measures to mitigate the negative impacts of land degradation and other mountain stressors, and to develop a harmonious balance between the use and protection of land resources.

Access to food markets, services and infrastructure are also important factors in reducing vulnerability. Roads can provide quick access to supply relief aid to affected communities, but if roads are destroyed or poorly maintained, entire regions can be cut off from support (World Risk Report 2016, UN University). Moreover, the development and maintenance of critical infrastructure is a core component of disaster risk reduction, particularly in emerging economies and developing countries where infrastructure is frequently of insufficient quality. This contributes to vulnerability and limits peoples' capacity to cope with natural hazards.

In some areas, vulnerability to food insecurity is exacerbated by the presence of frequent or occasional conflicts between countries or communities. The distribution of local conflicts shows that a higher intensity and frequency of armed conflicts and fights occurred in sub-Saharan Africa, Central Asia, the southern border of the Hindu Kush, some parts of Southeast Asia and in the northern part of the Andes. Local conflicts and fights may dramatically impact the ability of dwellers to regularly do business, maintain and invest in their assets and access essential items and services.

This study's approach to vulnerability relates the shortage of local food supply with the effects of mountain stressors and accessibility to infrastructure and town facilities and services (see Figures 11 and 12). Vast mountain regions are affected by the combined effect of prominent stressors and by limited accessibility to food supplies and services. The results of the analysis show that large areas of the world are threatened by adverse climate conditions that may be particularly challenging during the winter or rainy seasons, with most of the land covered by snow or at risk of flooding. Land degradation is very seriously impacting agriculture, endangering the sustainability of crop and animal husbandry, especially in areas where land degradation is rapidly progressing. The analysis of the infrastructural constraints and remoteness highlights that access to food and basic services is a challenge for several communities living in mountain regions. As a result of these factors, 32 million mountain people in developing countries are vulnerable to food insecurity and live in areas where the combined effect of stressors is most intense (medium to high levels) and where accessibility to markets, infrastructure and basic services is scarce. This makes them particularly exposed to food insecurity because of low resilience and their poor adaptive capacities.

³ See also Global Mechanism/UNCCD, 2019 on the analysis of the LDN target setting process.

CONCLUSIONS AND WAY FORWARD

This study is the first step towards attempts to quantitatively estimate vulnerability to food insecurity in combination with an assessment of the impacts of relevant stressors in mountain areas. Despite the study's inevitable limitations due to data availability, precision, resolution, accuracy and completeness, the results of the analysis provide key information on the distribution and trends of vulnerability in mountain areas.

This information is meant to motivate government and international partners to strengthen their support to vulnerable mountain populations and preserve, and possibly increase, ecosystem services and biodiversity. It complements current knowledge and can be used as a resource to raise awareness of the need to plan and implement structural changes at national level to reduce vulnerability to food insecurity. The technical report complementing this briefing note provides more detail on the actual and potential impact of the single stressors on people's livelihoods, which governments may use as first-level information to develop plans on where and how to intervene.

There is evidence that the management of natural resources and agricultural practices in some parts of the world have been inadequate in maintaining a balance between subsistence, profit and environmental conservation, leading to an acceleration of land degradation. This is partly the result of uneven capacities to maximize production and meet food demand combined with actions neglecting the minimum requirements for preserving fragile mountain ecosystems. In other words, unsustainable land management has reduced natural resources and their productive capacities. This situation is worsened by the struggle to ensure reliable market access to all in order to boost productivity, increase incomes and strengthen food security. In such circumstances, programmes aiming to recover soil organic carbon stock losses and support mountain ecosystems are essential to maintain biological diversity, halt degradation and guarantee the sustenance of local populations.

It is hoped that improved awareness of where the effects of mountain stressors and poor coping capacity are most intense, combined with the knowledge of which populations are affected, may induce governments to conduct more in-depth investigations and take adequate actions to reduce vulnerability. In this context, the results of the study clearly highlight that mountain, indigenous and marginalized communities need more support because they are the most affected by threats from climate change, accelerated land degradation and remoteness. For this reason, they require new forms of social protection which envisage multidimensional measures addressing deprivations in education, health and living standards.

However, ecological and economic sustainability cannot be achieved without taking into consideration the fact that women are often the most vulnerable because they have a high degree of dependency on the natural environment in order to perform their daily household maintenance tasks. Women are usually the ones engaged in household subsistence activities and the collection of water and fodder and herbs for medicinal purposes, as well as wood for fuel, construction, tools, baskets and other materials.

Women are also generally involved in the management, maintenance and conservation of these resources for collective and community consumption, and often have a more detailed knowledge of their local environment. Any change in land use patterns can seriously undermine women's customary and statutory rights as well as their access to resources necessary for household subsistence. When the decline of soil fertility or crop production results in the clearing of new land, women's access to fertile land or forest resources may be constrained, and as environmental degradation increases, more labour is needed for basic subsistence production. This has a detrimental effect on both girls and women's educational and economic opportunities. Generally, there is little recognition of women's knowledge and roles in environmental management, and despite international



acknowledgement of the need to involve both women and men in environmental management, women remain largely absent at all levels of policy formulation and decision-making in natural resource and environmental management. Therefore, securing women's rights to land and resources is important in order to reduce vulnerability to food insecurity.

Emphasis should also be placed on regular/systematic collection, collation and sharing of (gender-disaggregated) data among countries. The availability of such data can help in designing poverty reduction policies and environmental conservation programmes appropriate for the specific geographic contexts.

Finally, the aspiration of MPS/FAO and the Global Mechanism is that the outcomes of this study enhance the capacity of local and international stakeholders to anticipate critical changes, assess the magnitude of their impacts and address problems without delay as a means to enhance adaptation and resilience.

In this scenario, the Global Mechanism and MPS/FAO have a lot to offer in providing guidance, assistance, documents, data and metadata to governments; helping them to raise their voice on this subject matter in international fora and to connect governments to the relevant network of development partners for financing associated programmes and obtaining political and technical support.

RECOMMENDATIONS

I. STRENGTHEN VULNERABILITY ASSESSMENT PROCESSES AND NETWORK

- Encourage Mountain Partnership and UNCCD member countries to integrate the processes for estimating vulnerability to food insecurity in mountain regions into UNCCD national action plans (NAP) and Voluntary National Reviews (VNR). This would require revising and adapting indicators, thresholds and variables used by the global study for national-level use through appropriate expert consultation mechanisms.
- With the support of international partners, encourage countries to develop national and regional-level partnerships to build consensus on ways in which to monitor vulnerability and document the impact of mountain stressors. This would require strong government commitment and investments to i) improve data collection and ii) extend the scope of surveys to include specific environmental and socio-economic indicators.
- The outcomes of the analysis on mountain stressors may encourage governments and international organizations to design joint programmes to address vulnerabilities using frameworks embedding the already identified LDN implementation strategies and targets. Linking the LDN process to vulnerability analysis at the national level could assist governments in improving assessments on the impacts of land degradation on food security and help them plan/implement necessary actions. For this purpose, inter-governmental task forces and working groups could be established to build an institutional and technical structure to facilitate collaboration.
- Formulate a comprehensive capacity development programme covering key technical, institutional and legal elements to scale-up the vulnerability estimation process at national and regional levels. Encourage countries to develop education programmes for the formation of mountain experts, improve national capacities in remote sensing and GIS data analysis, take actions to facilitate cross-country learning and build synergies with relevant national commitments, including the SDG monitoring and reporting systems.

II. SEEK FINANCIAL SUPPORT

- Encourage countries, with assistance from the Global Mechanism and Mountain Partnership, to develop a financial mechanism to capitalize on obtained results. Funds should be used to involve governments and partners in consolidating further developing and operationalizing the vulnerability estimation process and to ensure routine reporting and feedback. With such a system, countries might find it advantageous to strengthen the links between the vulnerability estimates and the SDG reporting process for related indicators.
- Countries may also take advantage of international expertise and opportunities offered by financial resources mobilized within the framework of the SDG implementation process in order to address mountain vulnerability to food insecurity. Government actions and national policies and plans to support mountain ecosystems and mountain peoples' livelihoods should be strengthened in order to achieve Sustainable Development Goals 1 (no poverty), 2 (zero hunger), 13 (climate action) and 15 (life on land).

III. INCLUDE GENDER ISSUES IN VULNERABILITY ASSESSMENT FRAMEWORKS

- Considering the important role women play in maintaining local ecological and economic sustainability, their vulnerable conditions, the value of their knowledge and the need to recognize their roles in environmental management, efforts should be made to mainstream gender in the development of mountain-related policies and plans aimed at reducing biological and environmental pressures and increasing economic sustainability of local populations. In particular, the essential role of women in the day-to-day management of natural resources, as well as their knowledge of the local environment, should be recognized, valued and included as a key resource.

- Encourage countries and other relevant national and international partners to include gender-disaggregated data in vulnerability assessments and analyses. This will also fulfil the requirements of the 2030 Agenda, which made gender issues not only a goal, but a means to achieve the SDGs as part of the effort to “leave no one behind.” Despite the commitment of countries to achieve the SDGs, the persistence of gender data gaps and the lack of quality, updated, reliable and comparable data are still serious constraints.

IV. IMPROVE DATA AND INFORMATION ACCESSIBILITY

- Promote data and information sharing among countries and international/regional partners, and encourage the use of common data standards to ensure data compatibility and integration. The Global Mechanism and Mountain Partnership are in an optimal position to facilitate extensive consultation among national and international data providers to reach agreements on data collection and sharing modalities, as well as on data licenses and terms of use.
- Information sharing and access to key data are essential for monitoring vulnerability to food insecurity. Considering the high costs and value of this data, and sometimes the unavailability of georeferenced data, governments are encouraged to collect and make public national georeferenced data through their portals and websites.
- It is advised to develop data and information dissemination portals that are inclusive of web mapping applications and analytical tools in order to disseminate data and the results of analyses and their routine updates. Web portals would be an excellent tool to enable on-the-fly

data analyses and queries to help inform the general public on the progress of activities and achievements and to provide a roadmap of ongoing initiatives on relevant vulnerabilities in order to improve knowledge and/or enable access to data on vulnerability.

V. MOVING ON WITH THE VULNERABILITY ASSESSMENT

- It is advised to capitalize on the outcomes of this study and plan for further actions to fill existing gaps and improve on methodologies and the quality of data.
- Based on the outcomes of the vulnerability analysis, engage governments, the UNCCD, the Mountain Partnership and other relevant international organizations and non-governmental organisations (NGOs) in an international forum to continue and improve the work done so far. In this context, the involvement of the Mountain Partnership and LDN target setting working groups and stakeholders’ networks would be a valuable addition in gathering expert advice on the next steps to be taken.
- Awareness should be raised in mountain communities of the need to adopt a livelihood diversification approach and to engage in different income-generating activities in-line with existing landscape and environmental management plans. This process should also bridge the gender gap and empower women with new knowledge and technology, recognizing that in mountain areas, women contribute enormously to agricultural growth and development through their involvement in crop production, animal husbandry and natural resource management.



FIGURES

Figure 1

Number of people vulnerable to food insecurity in rural mountain areas in developing countries, in 2012 and 2017

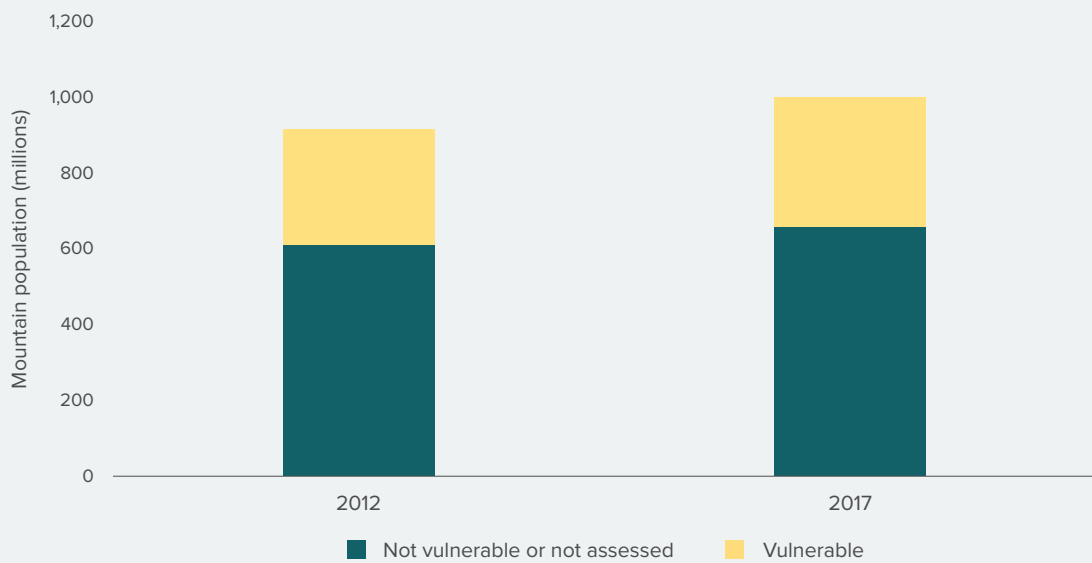


Figure 2

Number of people vulnerable to food insecurity in rural mountain areas in developing countries in 2012 and 2017, by continent

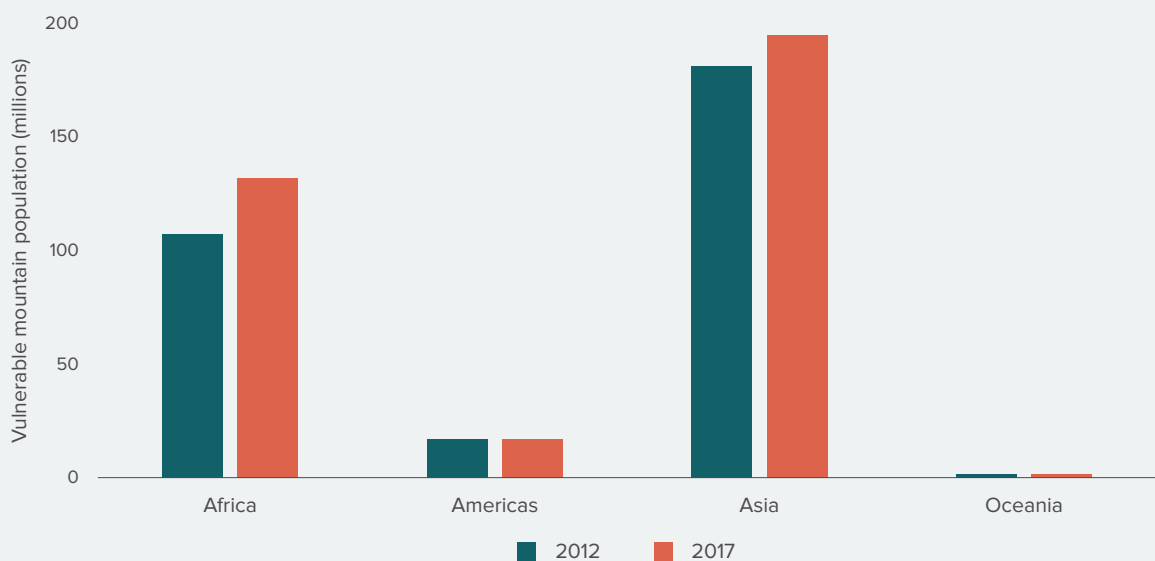


Figure 3

Geographic distribution of rural mountain people vulnerable to food insecurity in Africa (in red)

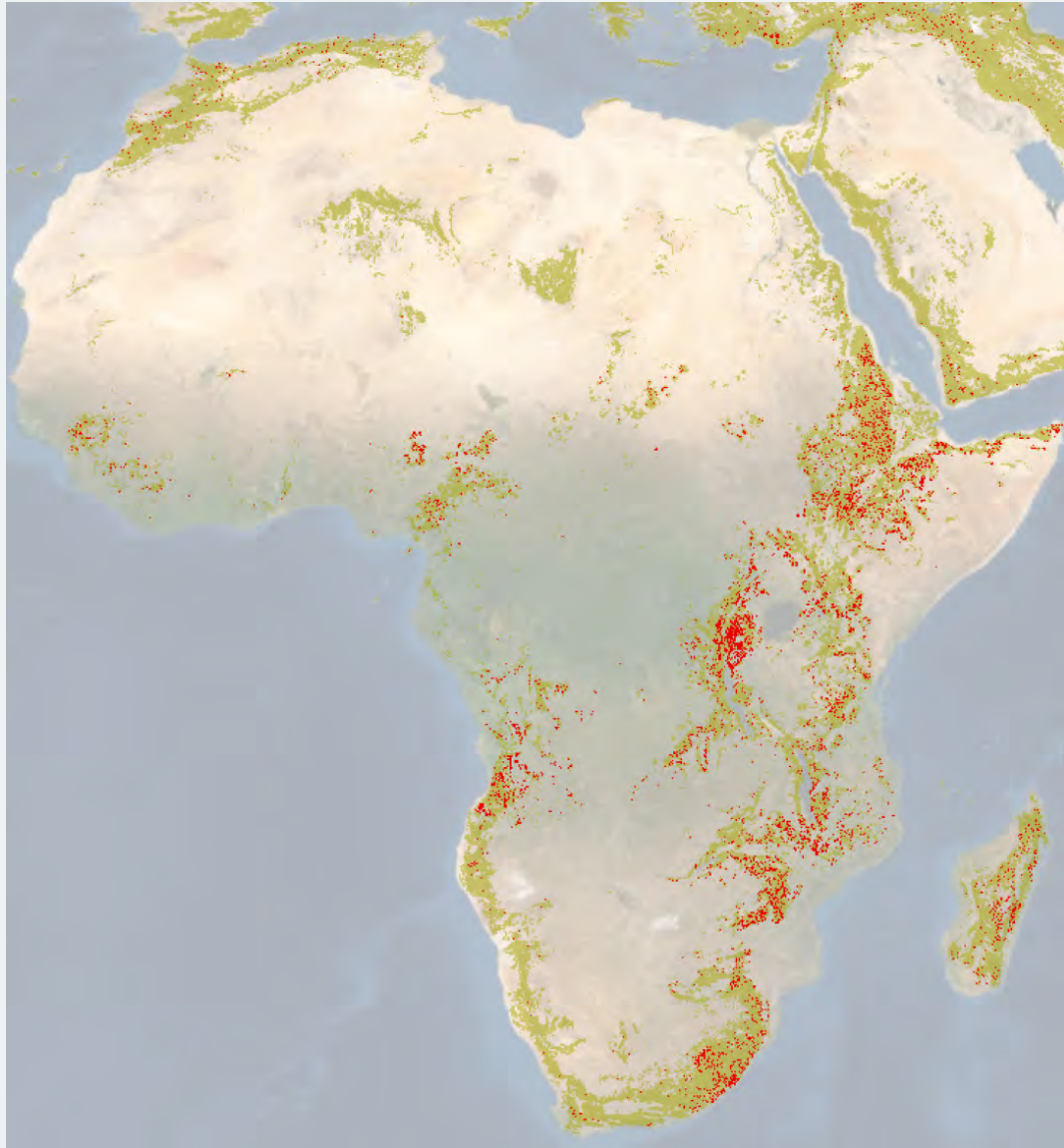


Figure 4

Relationship between people vulnerable to food insecurity and people living on increasingly degraded land in African mountain regions

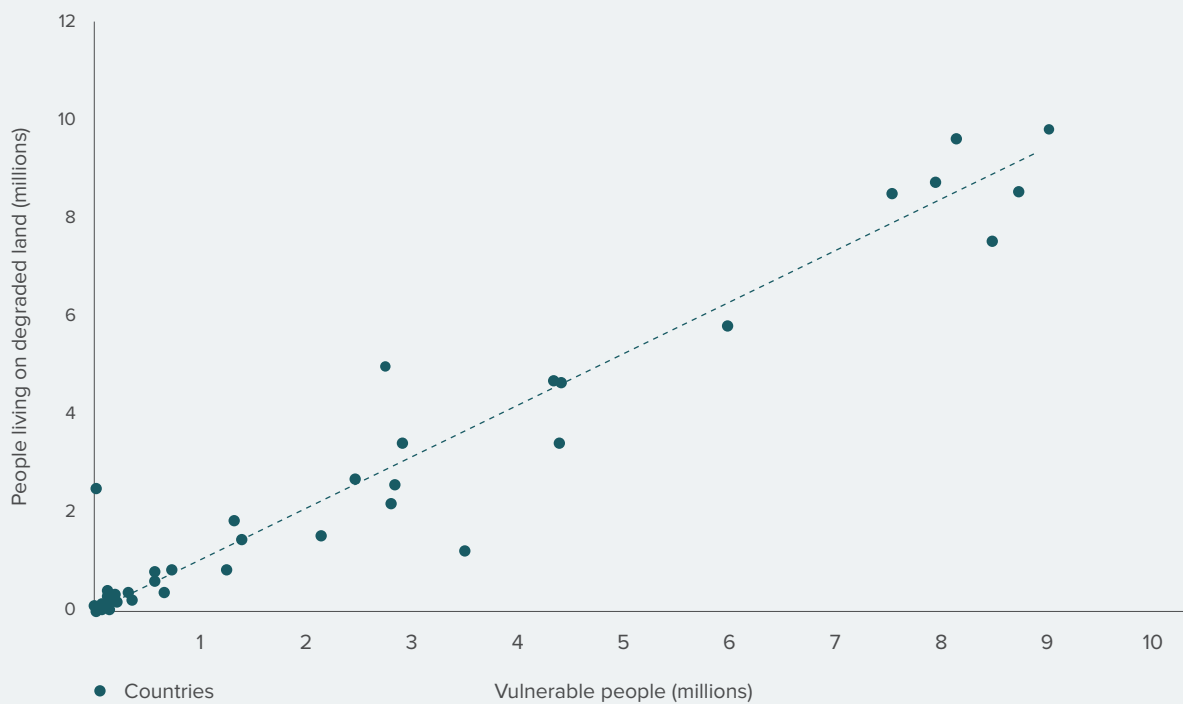


Figure 5

Relationship between vulnerability to food insecurity and people living on increasingly degraded land in Asian mountain regions

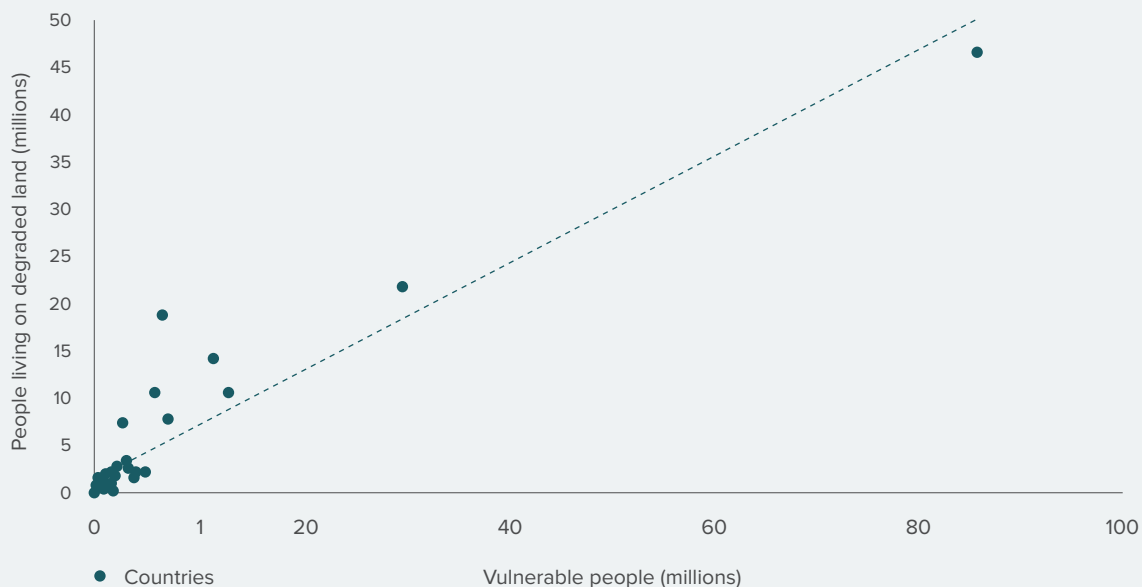


Figure 6

Geographic distribution of rural mountain people vulnerable to food insecurity in Asia
(in red)

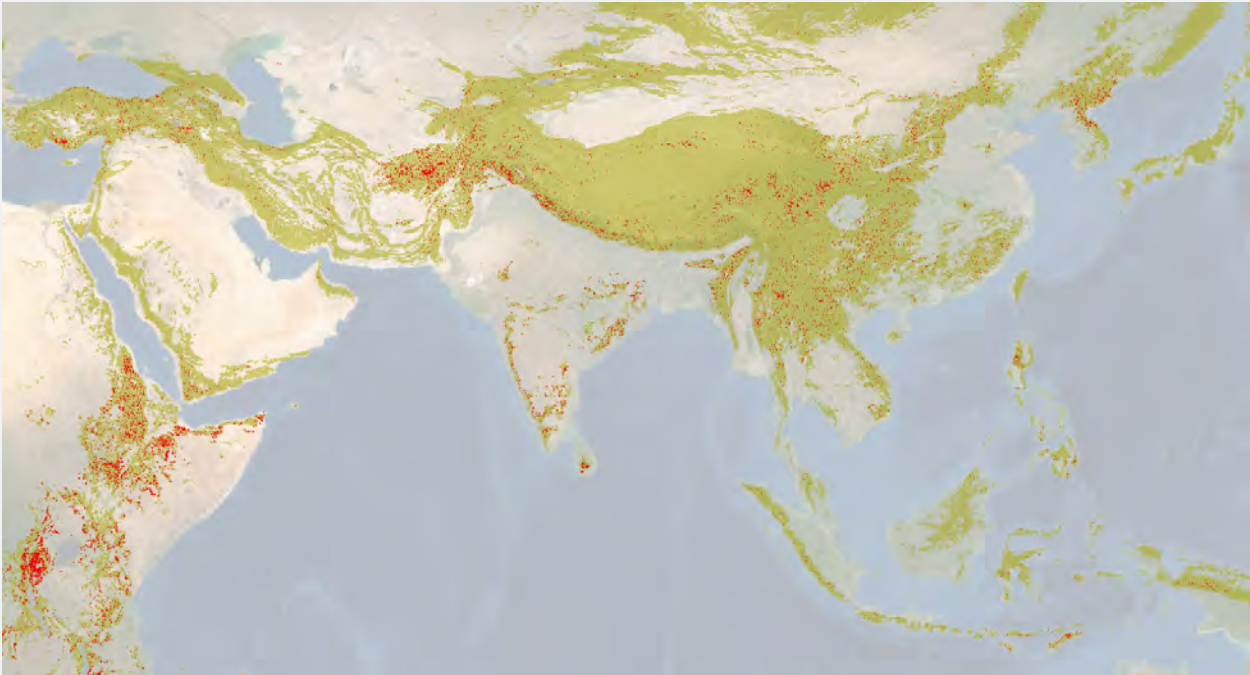


Figure 7

Geographic distribution of rural mountain people vulnerable to food insecurity in Oceania and the Pacific
(in red)

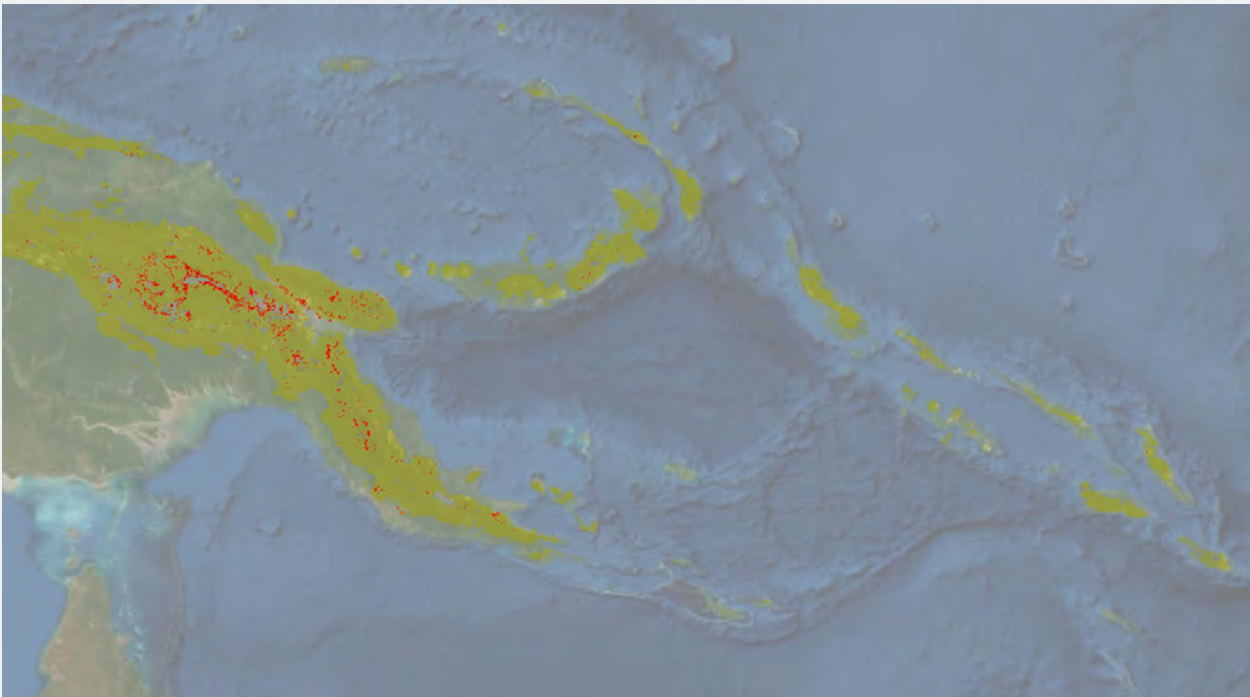


Figure 8

Geographic distribution of rural mountain people vulnerable to food insecurity in South America and the Caribbean (in red)

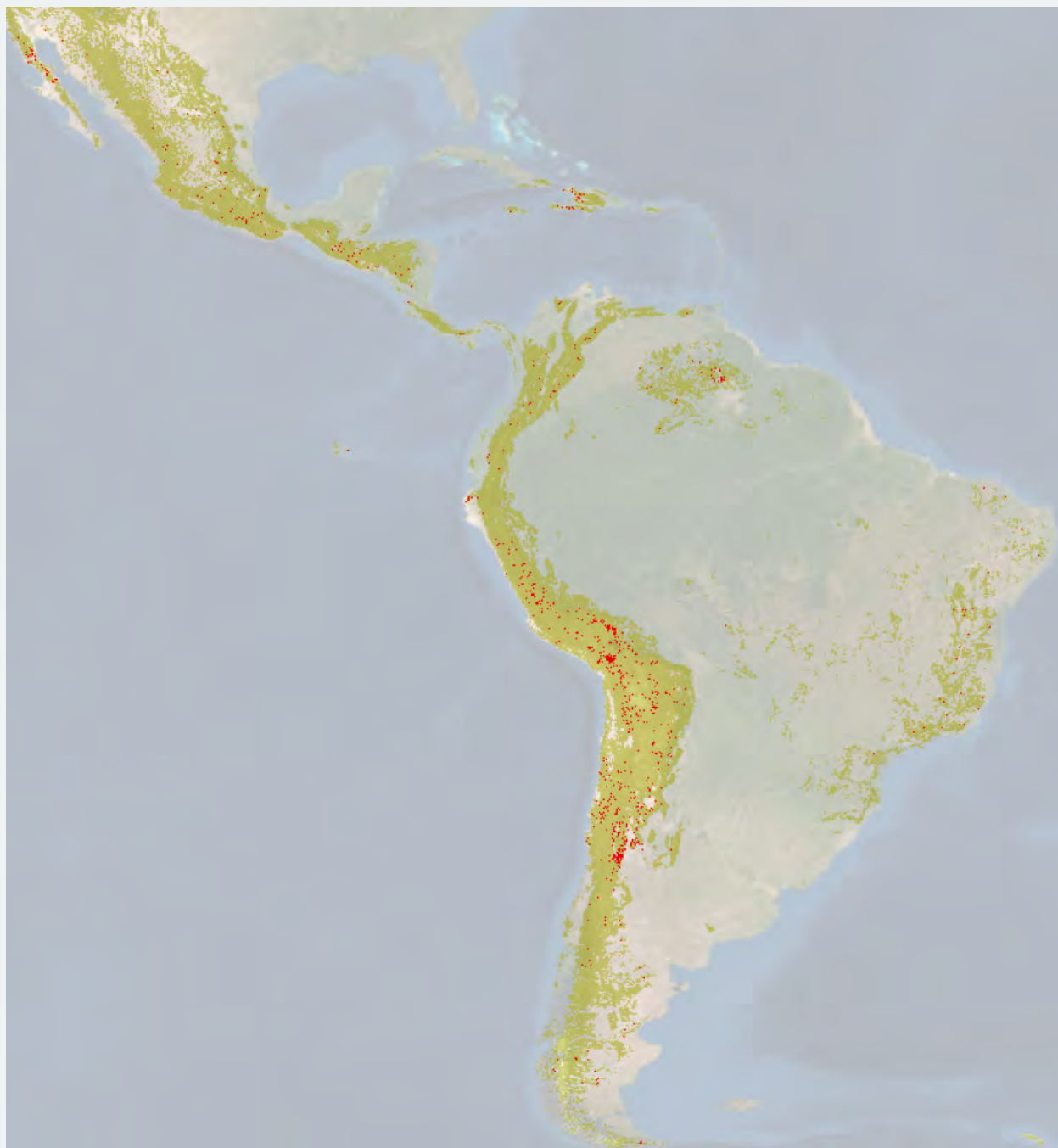


Figure 9

Number of rural mountain people vulnerable to food insecurity (by continent) living on different land cover types (context: developing countries; data for the year 2017)

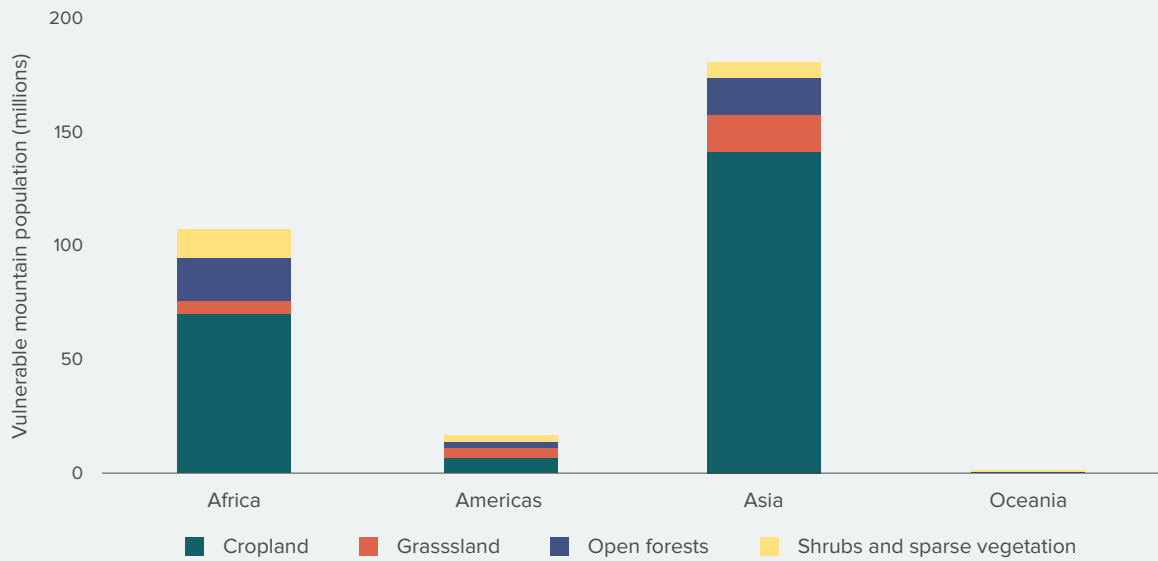
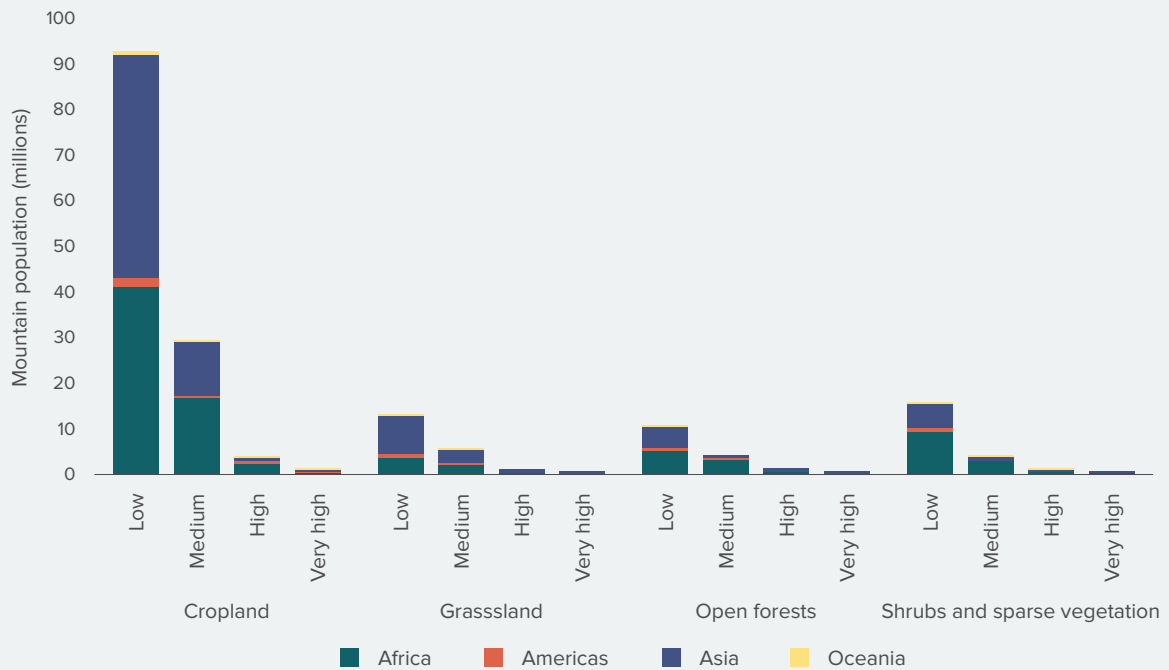


Figure 10

Number of rural mountain people vulnerable to food insecurity (by continent) living in areas affected by different levels of land degradation changes and types of land cover (context: developing countries; data for the year 2017)



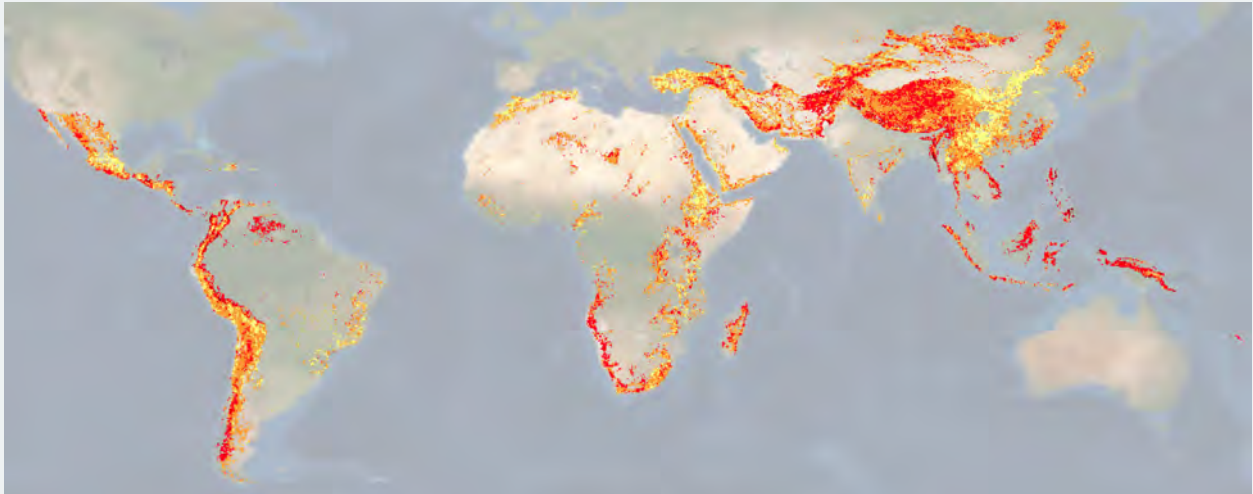
Classes of land degradation change

- 0 – 10% (Low)
- 10 – 20% (Medium)
- 20 – 35% (High)
- > 35% (Very high)

* values are percentages based on minimum-maximum values of all regions

Figure 11

Global scenario of the combined intensity of the stressors leading to vulnerability to food insecurity



Classes of the intensity of stressors in mountain regions

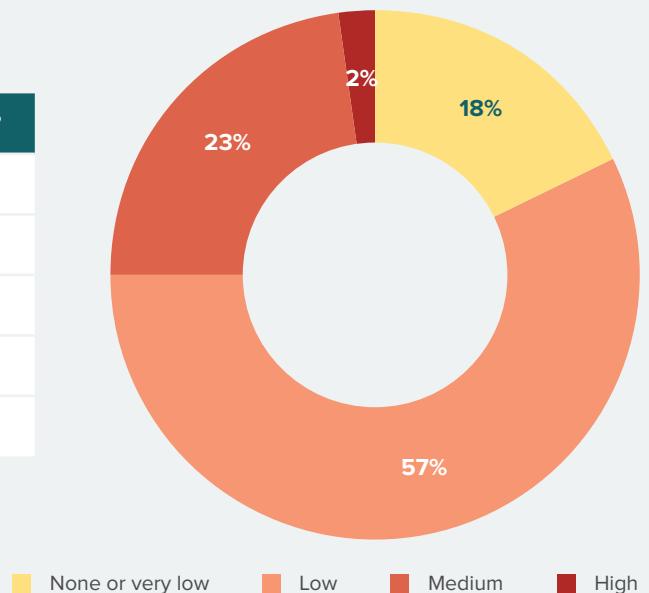
- 0 – 15% (None or negligible)
- 15 – 25% (Low)
- 25 – 40% (Medium)
- > 40% (High)

* values are percentages based on regional minimum-maximum values

Figure 12

Number of people in mountain regions in developing countries vulnerable to food insecurity, by combined intensity of the stressors leading to vulnerability

Stressor intensity	Vulnerable people in 000'
None or very low	62,356
Low	198,106
Medium	79,674
High	4,966
Total	345,102



COUNTRY CASE STUDIES

The country examples below are cases where vulnerability to food insecurity, mountain stressors and poor infrastructural constraints coexist. All four country case studies show evidence that, in many areas, vulnerability occurs where the combined effects of stressors/constraints are intense, as also documented by authoritative sources, some of which are reported in the examples.

The four countries have also finalized their national LDN target setting reports and submitted them to the Global Mechanism, and these reports were used to verify the correspondence between the analytical results on land degradation changes and national information.



RWANDA

According to the US Agency for International Development (USAID), agriculture in Rwanda employs 70 percent of the labor force, with an annual agricultural growth rate of 6% since 2007. Despite the gains, agricultural productivity remains low and 89% of rural households practice small-scale farming (WFP Rwanda Country Brief, June 2019). Poor rainfall, drought, floods and the limited amount of land suitable for agriculture, alongside pests and diseases, continue to pose challenges to food security.

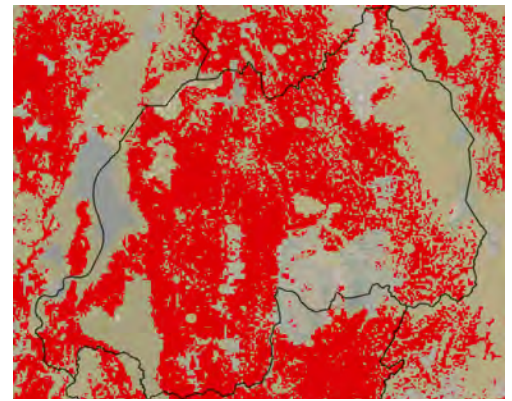
38.2 percent of the population continues to live below the poverty line and almost one-fifth is food insecure. Levels of stunting among young children remain very high, at 35 percent. The situation is further aggravated by the presence of over 175,000 Congolese and Burundian refugees, mainly residing in refugee camps (ibid).

The 2018 Comprehensive Food Security and Vulnerability Analysis (CFSVA) highlighted that, despite positive trends of the last few years, food access, food consumption, and chronic malnutrition remain issues that still need to be tackled, along with poverty. Moreover, household resilience to weather-related hazards needs to be raised, as climate-related shocks increasingly contribute to chronic food access problems.

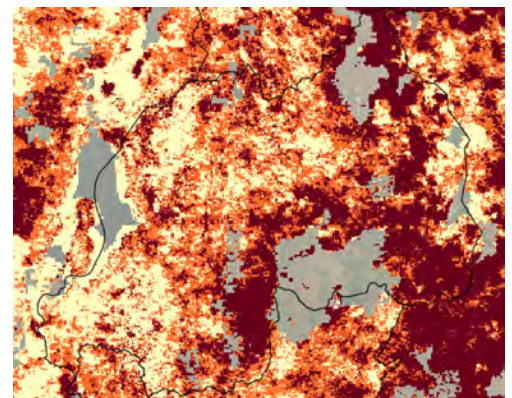
In the mountains, vulnerability to food insecurity remains high, approaching 80% of the rural population. The situation is particularly serious in the southern part of the country, where vulnerability is diffuse, and the effects of the stressors are high.

Rwanda's LDN target setting report revealed that land degradation is increasing in the southern central plateau region due to the transition from natural land cover and cropland to settlements, with the removal of natural vegetation for domestic use. This causes physical soil deterioration and erosion. Other factors such as population pressure, coupled with poverty and a lack of farm activities, also contribute to the increased rate of deforestation and the over-exploitation of soil, leading to reduced land productivity and loss of soil organic carbon content. In other areas, such as the eastern savannah, land degradation is mainly due to deforestation, over-grazing and expansion of artificial areas that lead to the conversion of savannah to grassland, cropland or artificial surfaces, with negative effects on land productivity and soil organic content.

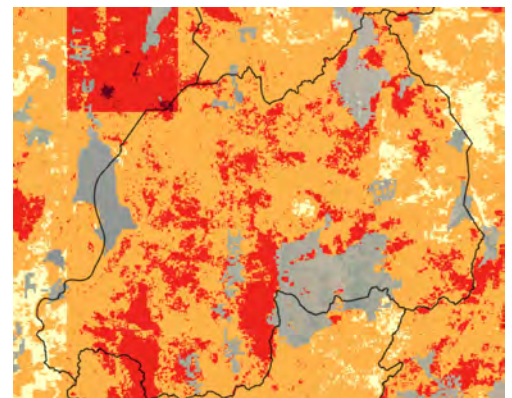
The country's LDN target setting report confirms the results of the land degradation trends analysis, which marks negative changes in the southern part of the country. However, despite the physical constraints due to the steep slope landscape, access to markets and towns is facilitated by a relatively well-developed road network, maintained in good status by the government. Consequently, the impact of the combined effects of the stressors is localized, except for in the southern part of the country.



Vulnerability – 2017 (in red)



Land degradation increase 2012-2017 (yellow to dark red)



Stressors intensity – very low (yellow) to high (dark red)

NEPAL

The International Centre for Integrated Mountain Development (ICIMOD) reports that in the Hindu-Kush Himalayan region one third to one half of all children (under five years of age) suffer from stunting, with the incidence of wasting and under-weight also being very high.⁴ The prevalence of stunting, wasting and under-weight in children is particularly high in some mountain areas such as the western mountains and far-western hills of Nepal. The nature and causes of under-nutrition and malnutrition in mountain areas are due to the difficult topography, poor accessibility, poor market access, and inadequate public health systems. Factors such as high poverty and low dietary energy intake, a lack of hygienic environments, inadequate nutritional knowledge, climate change and environmental degradation also influence food and nutrition security in the region.

As reported by Future Directions International (FDI), Nepal's mountain people suffer from food poverty. Unequal economic development has created divisions in Nepali society, so that access to food, water and services is uneven. The growing urban population is also contributing to the deterioration of food and water security in mountain communities. The data analysis estimates that around 35% of the 14 million people living in Nepal's mountainous regions are vulnerable to food insecurity.

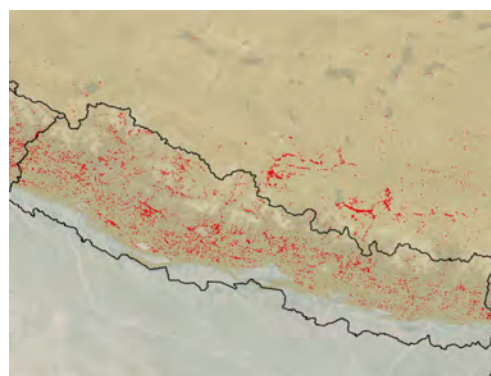
Slow economic progress is also a major contributing factor to rural food insecurity in Nepal. Historically, mountainous areas have experienced a lack of developmental progress when compared to the rest of the country. Moreover, the rough terrain of Nepal's northern areas exacerbates the problems faced by the population; access to services in health, education and government support are severely limited, hampering efforts at achieving rural food and water security.

Agriculture, employing two-thirds of the workforce, is the main driver of Nepal's economy, accounting for one-third of its GDP. Most people in Nepal's mountainous regions are largely dependent on agriculture for their survival, with most families growing their own food. However, urban population expansion and widespread inequality on ethnicity, caste and religion are preventing vulnerable people from achieving food security.

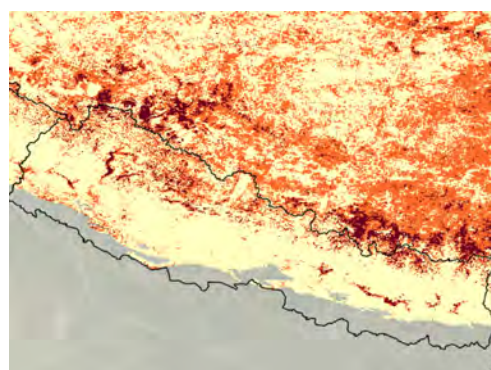
Government initiatives to address poverty in mountainous regions should be strengthened. Economic development strategies, as well as plans to combat the effects of climate change, should focus on improving access to services and infrastructure, as well as access to safe drinking water, improving road networks, and offering greater access to financial services and food markets.

Nepal's LDN target setting report specifies that 118 km² (0.08% of the total area of the country) of forest cover has been converted to other land uses from 2000 to 2010 and that 4% of the country is in a state of declining productivity. Land degradation is one of the major environmental problems the country faces, particularly soil erosion, landslides and flooding. Similarly, loss of vegetation due to deforestation, over-harvesting of forest products, unsustainable fuel wood extraction, shifting cultivation, encroachment into forestland, forest fires and over-grazing are mainly responsible for the degradation of forest lands.

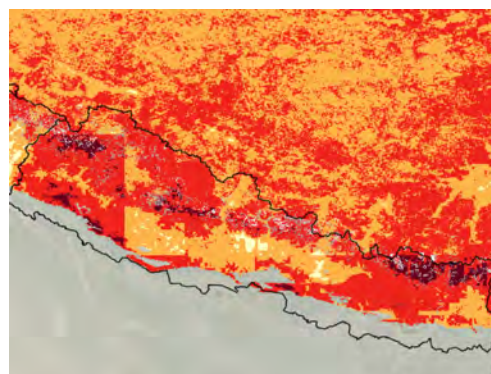
Most agriculture is on fragile mountain ecosystems and the land is managed without adopting proper conservation measures.



Vulnerability – 2017 (in red)



Land degradation increase 2012-2017 (yellow to dark red)



Stressors intensity – very low (yellow) to high (dark red)

⁴ Rasul G. *et al.* (2017). Food and nutrition security in the Hindu-Kush Himalayan region. *Journal of the Science of Food and Agriculture*

COLOMBIA

Vulnerability to food insecurity in the Colombian part of the Andes affects about one million people, 4% of the rural mountain population. Although not very high, pockets of vulnerable indigenous peoples are spread along the whole Andean region of Colombia. The main factors that affect food security in the region include poverty, climate change, environmental degradation, lack of access to land, social breakdown caused by violence and internal displacement, geographical isolation, and poor hygiene and health conditions.

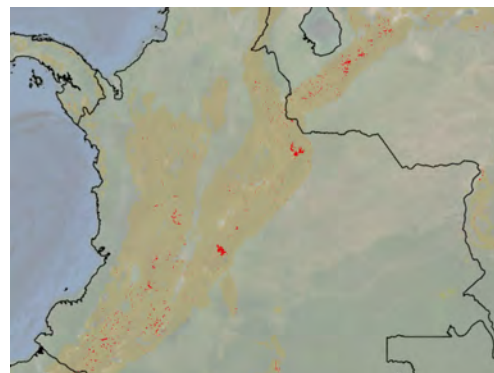
The main economic obstacles are the low productivity of the production units, the lag in transport infrastructure and the production, transformation and aggregation of agricultural value, low use of productive planning instruments (due to inaccessibility or low interest in the instruments available for the sector) and the incipient mitigation of agro-climate risks and access to productive land.⁵

Colombia's LDN target setting report specifies that the causes of land degradation in Colombia are mainly related to the misuse and mismanagement of soil and land. However, several stressors contribute to increased land degradation, which are also related to the complex socio-political situation. These include population pressure, land tenure and agrarian reforms, education, access to knowledge and support services, illegal crops, conflicts, displacements. Other indirect factors include poverty, scarce job opportunities, access to services and financial resources and inadequate infrastructure.

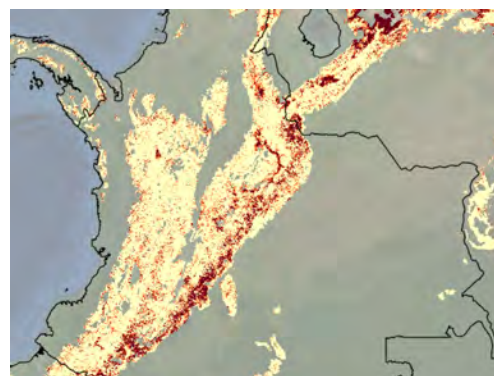
In South America, soil erosion is the main threat to land, and this problem affects 68 percent of land resources. Heavy rains and unsuitable agricultural practices on the slopes of hills and mountains are important causes in the loss of agricultural potential.⁶ Deforestation has caused the degradation of about 100 million hectares in South America, of which almost 70 million hectares is due to animal grazing. In the case of watersheds, deforestation is a key factor in the region. This process is very severe on the western slopes of the Andes, where it principally affects tropical forests, which extend from Colombia to Argentina.

Soil degradation in Colombia results from activities such as deforestation, mining, intensive and extensive cattle raising, unsustainable agricultural systems, inappropriate use of water resources, indiscriminate burnings, and illicit cocoa cultivation.

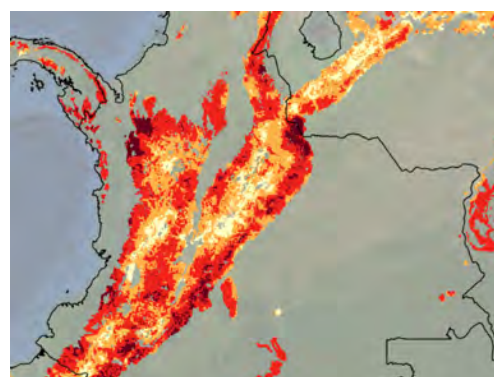
In Colombia, and in the Andes in general, the effects of climate change on agriculture go beyond reductions in yield and also influence how farmers make choices about the timing of planting, soil management, and the use and spatial distribution of particular crop varieties. Furthermore, household processing techniques to preserve native foods rely on key environmental and climate resources, which may be vulnerable to climatic shifts.



Vulnerability – 2017 (in red)



Land degradation increase 2012-2017 (yellow to dark red)



Stressors intensity – very low (yellow) to high (dark red)

⁵ Jiménez, M., P. Abbott and K. Foster (2018). Measurement and analysis of agricultural productivity in Colombia. *Ecological Economics* vol.22 no.47.

⁶ Hugo, G. (2006). Trends in land degradation in South America. Workshop of Agricultural Meteorology Programme (AgMP). World Meteorological Organization, Edited by R. Stefanski and P. Pasteris.

TIMOR-LESTE

In Timor-Leste, 65% of the mountain population is vulnerable to food insecurity and the World Food Programme (WFP) reports that 46% of children under five suffer from chronic malnutrition, the highest rates in the world. Food insecurity is common due to low crop yields, lack of income-generating activities, limited purchasing power, drought, lack of infrastructure, and underdeveloped markets. Over one-third of the population regularly experiences food shortages.⁷

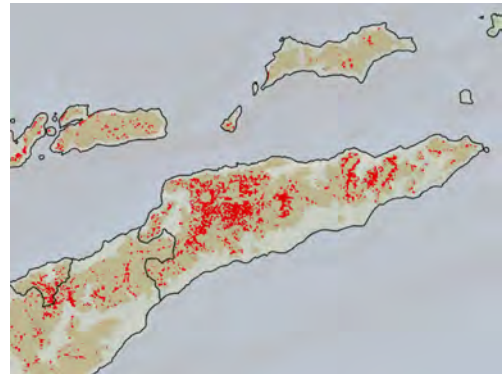
Timor-Leste relies on food imports to offset domestic production deficits, leaving the population vulnerable to global price changes. Poorer households, which spend a high proportion of disposable income on food, are the most vulnerable.

Over 80% of Timor-Leste's total population relies on subsistence farming. Rural farmers across the country are faced with considerable constraints, including poor climatic conditions, flooding and erosion, droughts, limited access to improved inputs and markets and limited knowledge of agricultural best practices. In addition, Timor-Leste suffers from rapid land degradation due to its mountainous topography, extreme and changing weather conditions, deforestation and other unsustainable practices that negatively affect the country's arable land.

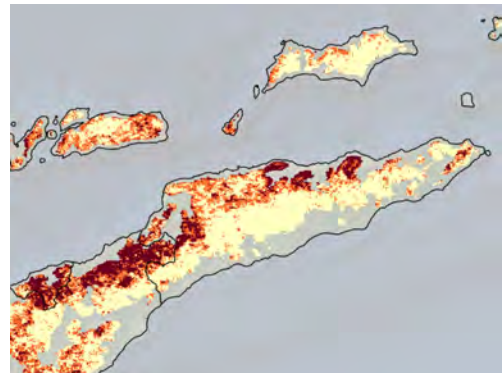
The country's LDN target setting report highlights that forest cover has declined from 73.8% of total land area in 2003 to 58% in 2012. This translates to an estimated annual rate of loss of 1.7% (National Forest Conservation Plan, 2013). The direct factors responsible for the progressive land degradation include deforestation, illegal logging and firewood collection, unsustainable agricultural practices (e.g., cultivation on steep slopes, slash-and-burn), uncontrolled grazing and recurring forest fires. Most of the forest loss and land cover changes are primarily caused by deforestation activities widely practiced by farmers in order to expand their crop production areas (NAP, 2017). Most farmers reside upland and engage in shifting cultivation (slash-and-burn) and uncontrolled livestock grazing in public rangelands. These practices cause leaching that, in turn, leads to water and wind erosion, excessive runoff, and ultimately land degradation. All these factors trigger soil erosion and the loss of soil fertility due to a deficiency of ground cover.

The indirect causes of land degradation include application of poor farming techniques, mainly due to unfavorable socio-economic conditions and poor tenure security. They are exacerbated by poverty, demographic pressure and ineffective law enforcement, according to Timor-Leste's NAP (2017).

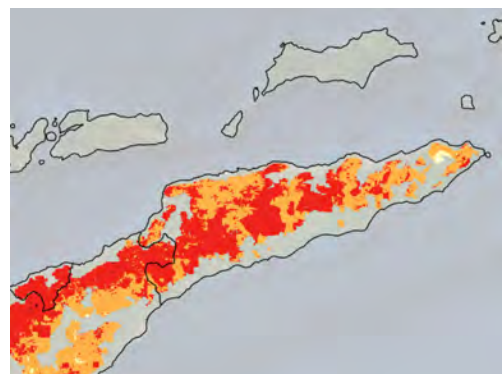
Farmers mostly have small land, no formal education and live in rural areas. They are also incapable of producing enough food and earning enough income to sustain their daily necessities, partly due to poor access to markets and poor road networks. This situation is worsened by a challenging socioeconomic situation, the post-conflict development context, complicated customary laws (NAP, 2017), inadequate land use planning, and lack of harmonization of responsible ministries.



Vulnerability – 2017 (in red)



Land degradation increase 2012-2017 (yellow to dark red)



Stressors intensity – very low (yellow) to high (dark red)

⁷ WFP (2006). Timor Leste: Comprehensive Food Security and Vulnerability Analysis (CFSVA), July 2006. Available at <https://documents.wfp.org/stellent/groups/public/documents/ena/wfp085650.pdf>

Annex: Countries with voluntary LDN targets

On the basis of the decisions taken at the twelfth session of the Conference of the Parties to the UNCCD (COP.12) in 2015, the secretariat and the Global Mechanism of the UNCCD, with other international partners, established the Land Degradation Neutrality Target Setting Programme to support interested countries to define LDN baselines and set voluntary LDN targets. The list of participating countries as of June 2019, by UNCCD annex, is reported below.

AFRICA

- Algeria
- Angola
- Benin
- Botswana
- Burkina Faso
- Burundi
- Cabo Verde
- Cameroon
- Central African Republic
- Chad
- Comoros
- Congo
- Côte d'Ivoire
- Democratic Republic of the Congo
- Egypt
- Equatorial Guinea
- Eritrea
- Eswatini
- Ethiopia
- Gabon
- Gambia
- Ghana
- Guinea
- Guinea-Bissau
- Kenya
- Lesotho
- Liberia
- Madagascar
- Malawi
- Mali
- Mauritania
- Mauritius
- Morocco
- Mozambique
- Namibia
- Niger
- Nigeria
- Rwanda
- Sao Tome and Principe
- Senegal
- Seychelles
- Sierra Leone
- Somalia
- South Africa
- South Sudan
- Sudan
- Togo
- Uganda
- United Republic of Tanzania
- Zambia
- Zimbabwe

ASIA

- Bangladesh
- Bhutan
- Cambodia
- China
- India
- Indonesia
- Iran (Islamic Republic of)
- Iraq
- Jordan
- Kazakhstan
- Kuwait
- Kyrgyzstan
- Lao People's Democratic Republic
- Lebanon
- Mongolia
- Myanmar
- Nepal
- Niue
- Pakistan
- Papua New Guinea
- Philippines
- Samoa
- Sri Lanka
- Syrian Arab Republic
- Thailand
- Timor-Leste
- Uzbekistan
- Viet Nam

LATIN AMERICA AND THE CARIBBEAN

- Antigua and Barbuda
- Argentina
- Belize
- Bolivia (Plurinational State of)
- Brazil
- Chile
- Colombia
- Costa Rica
- Cuba
- Dominica
- Dominican Republic
- Ecuador
- El Salvador
- Grenada
- Guatemala
- Guyana
- Haiti
- Jamaica
- Mexico
- Nicaragua
- Panama
- Paraguay
- Peru
- Saint Kitts and Nevis
- Saint Lucia
- Saint Vincent and the Grenadines
- Suriname
- Trinidad and Tobago
- Uruguay
- Venezuela, Bolivarian Republic of

NORTHERN MEDITERRANEAN

- Italy
- Turkey

CENTRAL AND EASTERN EUROPE

- Armenia
- Azerbaijan
- Belarus
- Bosnia and Herzegovina
- Georgia
- Moldova; Republic of
- Montenegro
- Republic of North Macedonia
- Russian Federation
- Serbia
- Ukraine

Global Mechanism of the UNCCD

Platz der Vereinten Nationen 1
D-53113 Bonn, Germany
Tel: +49 (0) 228 815 2873
www.unccd.int/about-us/global-mechanism

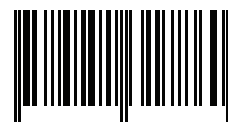


Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
Federal Office for Agriculture FOAG

ISBN 978-92-5-131786-0



9 789251 317860

CA6015EN/1/09.19