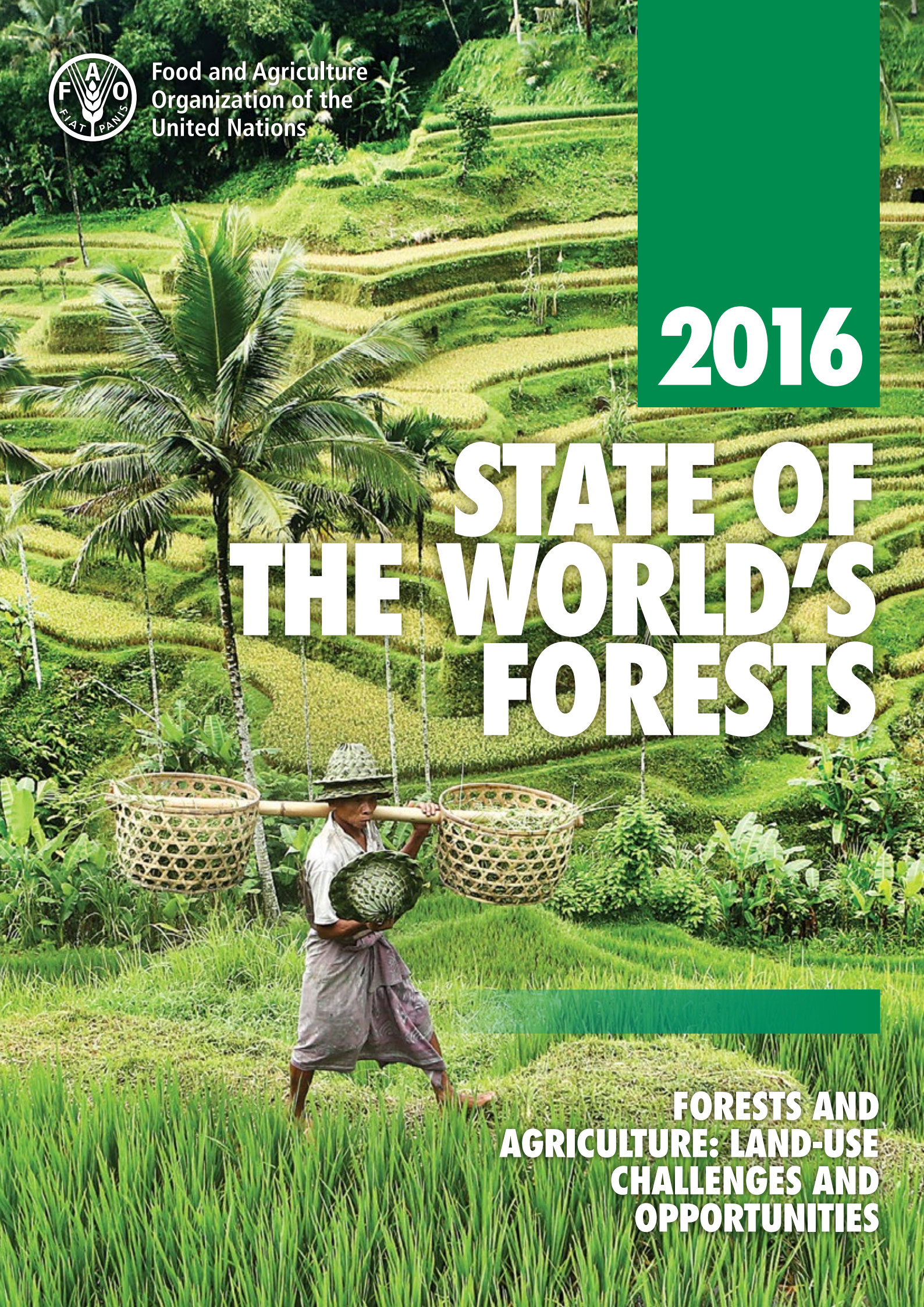
Food and Agriculture
Organization of the
United Nations
2016
STATE OF
THE WORLD'S
FORESTS
FORESTS AND
AGRICULTURE: LAND-USE
CHALLENGES AND
OPPORTUNITIES

COVER PHOTO ©FAO/Adi Wiratmo

INDONESIA. Terraced rice fields on the island of Bali. In order to make the most of the land and prevent erosion, this terracing system maintains the ecosystem while providing a livelihood for local farmers.

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STATE OF THE WORLD'S FORESTS

FORESTS AND AGRICULTURE: LAND-USE CHALLENGES AND OPPORTUNITIES

Food and Agriculture Organization of the United Nations
Rome, 2016

CONTENTS

TABLES, FIGURES & BOXES

TABLES

FIGURES

BOXES

FOREWORD

State of the World's Forests 2016 could not be better timed, as FAO is gearing up to fulfil its key role in helping countries develop national plans, policies and programmes to achieve the Sustainable Development Goals (SDGs). The 2030 Agenda recognizes that we can no longer look at food, livelihoods and the management of natural resources separately. It calls for a coherent and integrated approach to sustainability across all agricultural sectors and food systems.

This report explores the challenges and opportunities represented by the complex interrelationship between forests, agriculture and sustainable development. It demonstrates that the sustainable management of both forests and agriculture, and their integration in land-use plans, is essential for achieving the SDGs, ensuring food security and tackling climate change.

We know that forests and trees support sustainable agriculture by, for example, stabilizing soils and climate, regulating water flows, giving shade and shelter, and providing a habitat for pollinators and the natural predators of agricultural pests. When integrated judiciously into agricultural landscapes, forests and trees can therefore increase agricultural productivity. Forests and trees also help ensure the food security of hundreds of millions of people, for whom they are important sources of food, energy and income, including in hard times.

However, agriculture is still the major driver of deforestation globally, and agricultural, forestry and land policies are often at odds.

State of the World's Forests 2016 shows that some countries have been able to reconcile the aspirations of the different sectors, increasing the agricultural productivity and food security of their populations while also halting and even reversing deforestation. The report presents case studies for seven such countries, and others have made similar transitions. The challenge today is to encourage such positive trends in countries – especially low-income countries – in which food insecurity is still rife and where forests are still being lost.

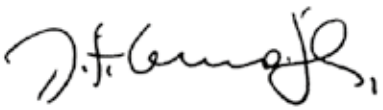
Integrated land-use planning provides an essential strategic framework for balancing land uses. Importantly, such planning processes must be participatory – because it is farmers and other rural people who must ultimately put the plans into practice, and will do so only if they meet their needs and interests.

FAO strives to act as a neutral forum where countries can access objective information and come together to discuss openly the options available for intensifying agriculture sustainably. This report serves to inform that dialogue. *State of the World's Forests 2016*

makes several recommendations for approaches that countries can adopt, assisted by the international community, to better integrate forests and agriculture while increasing food security and reducing forest loss. Inevitably, in some countries, forests will still make way for agricultural lands. However, if carried out in a planned, integrated way, changing land use from forests to agriculture will be less damaging to the environment and will produce better economic and social outcomes.

Forests and agriculture have an enormous role in achieving the 2030 Agenda's historic commitment to rid the world of the twin scourges of poverty and hunger. However, this urgently requires closer collaboration and partnerships, cross-sectorally and at all scales.

I trust that this report will encourage the forest and agriculture sectors, and other important sectors such as energy, water and rural development, to work together for achieving the Sustainable Development Goals.



José Graziano da Silva

FAO Director-General

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ACRONYMS AND ABBREVIATIONS

CGF
Consumer Goods Forum

FAO
Food and Agriculture Organization of the United Nations

FAPDA
Food and Agriculture Policy Decisions Analysis

FLEGT
Forest Law Enforcement, Governance and Trade [European Union initiative]

GDP
gross domestic product

GNI
gross national income

INDC
Intended Nationally Determined Contribution

INT$
international dollar

NOU
number of people undernourished

ODA
official development assistance

PES
payments for environmental services

POU
prevalence of undernourishment

PPCDAM
Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (Brazil)

PPP
purchasing power parity

REDD+
reducing emissions from deforestation and forest degradation, including the role of conservation, sustainable management of forests and enhancement of forest carbon stocks

SDG
Sustainable Development Goal

SINAC
National System of Conservation Areas (Costa Rica)

UN
United Nations

UNCCD
United Nations Convention to Combat Desertification

UNFCCC
United Nations Framework Convention on Climate Change

US$
United States dollar

EXECUTIVE SUMMARY

CHAPTER 1 INTRODUCTION

CHAPTER 1 highlights the importance of achieving sustainable agriculture and food security, and of halting deforestation. These ambitions are integral to 2 of the 17 Sustainable Development Goals (SDGs) set out in *Transforming our world: the 2030 Agenda for Sustainable Development*, namely SDG 2 and SDG 15. In addition, forests have key roles to play in achieving other SDGs, such as those addressing poverty eradication, protecting and restoring water-related ecosystems, access to sustainable energy, and combating climate change. Action on agriculture, forests and other land uses will also be important for meeting the commitments made by countries in the Paris Agreement on climate change.

CHAPTER 2 TRENDS IN LAND-USE CHANGE

CHAPTER 2 analyses trends in land-use change, focusing on the loss of forests through conversion to agriculture and gains in forest area on land previously used for agriculture. A brief historical review shows that the relationship between population growth, increased demand for agricultural land, and forest loss dates back thousands of years and that forests have sometimes re-established naturally as deforestation pressures have eased. Deforestation was most prevalent in the temperate climatic domain until the late nineteenth century and is now greatest in the tropical climatic domain. Net forest area has increased in the temperate domain in recent years, and there has been relatively little recent change in forest area in the boreal and subtropical climatic domains.

There was a net forest loss of 7 million hectares per year in tropical countries in 2000–2010 and a net gain in agricultural land of 6 million hectares per year. The greatest net loss of forests and net gain in agricultural land over the period was in the low-income group of countries, where rural populations are growing. Large-scale commercial agriculture accounts for about 40 percent of deforestation in the tropics and subtropics, local subsistence agriculture for 33 percent, infrastructure for 10 percent, urban expansion for 10 percent and mining for 7 percent. There are significant regional variations, however: for example, commercial agriculture accounts for almost 70 percent of the deforestation in Latin America but for only one-third in Africa, where small-scale agriculture is a more significant driver of deforestation.

Underlying factors affecting forest conversion include population growth and changing food consumption patterns; agricultural developments, such as changing markets, technological improvements and active policy interventions; land-tenure security; and the governance of land-use change.

Forest losses in 2010–2015 (most of which was natural forest) were offset partially by a combination of natural expansion, often on abandoned agricultural land (2.2 million hectares per year), and the establishment of planted forests (3.1 million hectares per year).

CHAPTER 3 THE GOVERNANCE AND MANAGEMENT OF LAND-USE CHANGE

CHAPTER 3 canvasses the ways in which countries address land-use change from forest to agriculture, and vice versa, for example in national policies, legal frameworks, investments in agriculture and forestry, and institutional mechanisms. De facto rules often have a strong influence on policy outcomes, especially where formal policies fail to provide adequate guidance, are weakly implemented, or do not conform with legitimate stakeholder needs.

An analysis of the national policies of 35 countries revealed that just under half those countries explicitly addressed land-use change from forest to agriculture and vice versa in their main policy documents. There is an increasing need for countries to address land-use change in national policies, including in light of recent international agreements such as the 2030 Agenda on Sustainable Development and the Paris Agreement on climate change.

The forest policies of seven countries that experienced decreases in forest area and increases in agricultural area in the period 1990–2015 attributed those changes to: agricultural pressures, including shifting cultivation, encroachment, land grabbing and livestock grazing; exploitation for forest products, including woodfuel; and social factors, including population growth, poverty, and the development of human settlements and industry. In those agriculture policies that referred to forests, the most frequently cited forest benefits were the use of non-wood forest products for food and animal feed; protective measures for crops and soils; carbon sequestration; water-related benefits; and agroforestry.
Despite acknowledging the importance of a coordinated and consistent approach to land-use policies, few of the assessed policy documents gave details of how this was to be done, and only about one-quarter showed clear evidence of coordination between agriculture- and forest-related interests. Some policy documents, including on food security and national development, presented good examples of coordination measures.

An analysis of legal frameworks showed the importance of formally recognizing traditional rights based on customary tenure, especially for vulnerable and forest-dependent people. The analysis also provided information on legal provisions for the conversion of forest to agriculture, and implementation challenges.

An examination of investments in agriculture and forestry and their impacts on land use illuminated relationships between changes in forest cover, investments in agriculture and forests, and poverty. In general, forest losses are greater in low-income countries when investments in agriculture and forests are relatively low. Direct public investment is increasingly focused on environmental and social protection programmes and other public goods (such as research and development), and there is increasing emphasis on creating enabling environments for private-sector investment. Social and environmental safeguards should be in place in any scheme aiming to incentivize investments.

The analysis demonstrated the importance of integrated land-use planning and participatory approaches using tools such as land capability assessments and taking the views of stakeholders fully into account. The institutional framework should include civil-society and private-sector organizations, as well as government bodies. Such

inclusion helps legitimize national policies, improve the governance and management of land-use change, and stimulate partnerships that increase the effectiveness of implementation.

CHAPTER 4 MAKING ROOM FOR FORESTS AND FOOD SECURITY

CHAPTER 4 presents case studies from seven countries – Chile, Costa Rica, the Gambia, Georgia, Ghana, Tunisia and Viet Nam – that demonstrate the opportunities for improving food security while increasing or maintaining forest cover. All case-study countries except one achieved positive change in the period 1990–2015 in two food-security indicators – the prevalence of undernourishment and the number of undernourished people – as well as increases in forest area. They were also chosen to provide examples from different regions and income levels. Following relaxation of the original selection criteria, the sample included one low-income country (the Gambia).

In each case study, information is presented on the economic and demographic context; trends in food security, agriculture and forest condition; the policy, legal and institutional frameworks; and key factors contributing to positive trends in food security and forest area.

All the case-study countries have experienced favourable economic growth, in some cases associated with structural economic reforms. Most case studies demonstrated links between poverty and food insecurity and the importance of including poverty eradication and the reduction of inequality as key national economic policy objectives. A number of case studies demonstrate the value of a balanced approach to the agriculture and forest sectors when developing policies and policy instruments aimed at achieving positive developments in the forest sector while also improving food security and agricultural productivity. They suggest that the development of market-oriented and open agricultural economies should feature complementary social and environmental safeguards, for example to protect vulnerable households from the impacts of global market fluctuations and to prevent environmental damage from more intensive agricultural production. Case-study countries have recognized the full economic, social and environmental benefits of forests, including their contributions to wider sustainable development, poverty reduction and climate-change programmes.

The case studies demonstrate the importance of using the right policy instruments to increase agricultural productivity and promote sustainable forest management; case-study countries have used various fiscal measures – such as incentives and tax breaks – and regulatory tools to achieve this. All the case studies showed the need for effective legal and institutional frameworks, with predictable and secure land tenure and measures to regulate land-use change, including requirements for environmental impact assessments and special protection for designated areas. They also showed the importance of adequate funding through public-sector investment in the agriculture sector, the forest sector and wider rural development programmes. Funding sources identified in the case studies included government budgets, payments for environmental services (PES) mechanisms, the

sale of products from publicly owned forests, royalties, licence fees, taxes on forest products, export levies, official development assistance and, potentially, REDD+.[1] Some case studies indicated that devolving forest management rights to local communities had helped improve livelihoods and strengthen local support for sustainable forest management. The respective roles and responsibilities of governments and local communities need clear definition when management rights are devolved.

The case studies demonstrated the importance of integrated land-use approaches at the national, landscape and local levels. Examples of such approaches include land-use master plans; collaboration between agricultural and forest research institutes and extension services; watershed management; and agroforestry systems.

CHAPTER 5 TOWARDS BETTER GOVERNANCE OF LAND USE FOR FORESTS AND AGRICULTURE

CHAPTER 5 summarizes the conclusions drawn in previous chapters and suggests policy implications for the better governance of land use for forests and agriculture.

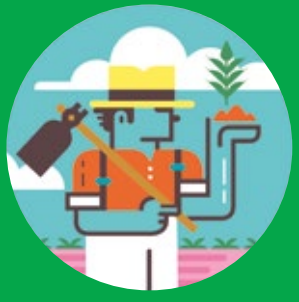
1 REDD+ = reducing emissions from deforestation and forest degradation, including the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.

KEY MESSAGES

1 Meeting the world's increasing demand for food and other land-based products will require **HIGHLY PRODUCTIVE LANDSCAPES** that are managed sustainably.

2 Forests play key roles in the **WATER CYCLE, SOIL CONSERVATION, CARBON SEQUESTRATION,** and **HABITAT PROTECTION,** including for pollinators. Their sustainable management is crucial for sustainable agriculture and food security.

3 Agriculture remains the most significant driver of global deforestation, and there is an urgent need to promote more **POSITIVE INTERACTIONS** between agriculture and forestry.



4 The 17 Sustainable Development Goals (SDGs) agreed by countries in 2015 are **"INTEGRATED AND INDIVISIBLE".** Progress towards sustainable agriculture, food security and sustainable forest management, core elements of the SDGs, should be made simultaneously.

5 IMPROVED COORDINATION is required between policies on forests, agriculture, food, land use, and rural development. Equally important are clear legal frameworks governing land-use change, including secure land-tenure systems that recognize traditional customary rights to use land and forest products.

6 Where large-scale commercial agriculture is the principal driver of land-use change, effective **REGULATION OF CHANGE**, with appropriate social and environmental safeguards, is needed. Private governance initiatives, such as voluntary certification schemes and commitments to zero deforestation, also have a positive impact.

7 Where local subsistence agriculture is the principal driver of land-use change, wider **POVERTY ALLEVIATION** and **RURAL DEVELOPMENT** measures should be implemented alongside actions to improve local agricultural, agroforestry and other land-use practices.

8 INTEGRATED LAND-USE PLANNING provides a strategic framework for balancing land uses at the national, subnational and landscape scales. This should include meaningful stakeholder participation to ensure the legitimacy of land-use plans and obtain stakeholder buy-in for their implementation and monitoring.

9 Food security can be achieved through **AGRICULTURAL INTENSIFICATION** and other measures such as social protection, rather than through expansion of agricultural areas at the expense of forests.

CHAPTER 1
INTRODUCTION

MONGOLIA
Volunteer Forest Ranger and member of the local Forest User Group, on an outing with her horse.
©FAO/Sean Gallagher

CHAPTER 1

INTRODUCTION

Transforming our world: the 2030 Agenda for Sustainable Development (UN, 2015a), which was agreed by world leaders at the United Nations (UN) Summit on Sustainable Development in September 2015, is a plan of action for people, the planet and prosperity. It stresses the need for bold and transformative steps to move the world onto a sustainable and resilient path, and it features 17 Sustainable Development Goals (SDGs) that demonstrate the scale and ambition of the plan. The 2030 Agenda for Sustainable Development emphasizes the integrated nature of the SDGs and the crucial importance of their interlinkages.

The significant role of forests in achieving the SDGs was highlighted at the XIV World Forestry Congress, held in Durban in September 2015, which was attended by nearly 4 000 participants from 138 countries. In its Durban Declaration (World Forestry Congress, 2015), the Congress set out a vision for the contribution of forests to achieving the 2030 Agenda for Sustainable Development, emphasizing that:

- Forests are more than trees and are fundamental for food security and improved livelihoods. The forests of the future will increase the resilience of communities by: providing food, wood energy, shelter, fodder and fibre; generating income and employment to allow communities and societies to prosper; and harbouring biodiversity. They will support sustainable agriculture and human well-being by stabilizing soils and climate, and regulating water flows.
- Integrated approaches to land use provide a way forward for improving policies and practices to: address the drivers of deforestation and conflicts over land use; capitalize on the full range of economic, social and environmental benefits of integrating forests with agriculture; and maintain multiple forest services in the landscape context.
- Forests are essential for climate-change adaptation and mitigation. Sustainably managed forests will increase the resilience of ecosystems and societies and optimize the role of forests and trees in absorbing and storing carbon while also providing other environmental services.

State of the World's Forests 2016 examines in more detail how this vision can be realized, focusing on the conversion of forests to agriculture and the conversion of agricultural land to forest.[2] Agriculture is still the most significant driver of global deforestation; given the importance to the planet's future of both agriculture and forests, there is an urgent need to promote positive interactions between these two land uses. The challenge of feeding a global population projected to increase from more than 7 billion people today to more than 9 billion by 2050 is made more difficult by the threats of climate change, growing water and land scarcity, and soil and land degradation. In addition to helping mitigate climate change and protect soils and water, forests hold more than 75 percent of the world's terrestrial biodiversity, provide many products and services that contribute to socioeconomic development, and are particularly important for hundreds of millions of people in rural areas, including many of the world's poorest people (FAO, 2014a). Poor rural women are especially dependent on forest resources for their subsistence (World Bank, FAO and International Fund for Agricultural Development, 2009).

The achievement of food security and the sustainable management of the world's forests are central to the following two SDGs:

2 This paper does not address forest degradation or other gradual changes in forest cover that do not constitute land-use change.

- SDG 2 – "End hunger, achieve food security and improved nutrition and promote sustainable agriculture"; and
- SDG 15 – "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss".

Given their multifunctionality, forests also have roles to play in achieving several other SDGs, including SDG 1, on ending poverty; SDG 6, on protecting and restoring water-related ecosystems; SDG 7, on access to sustainable energy for all; and SDG 13 on combating climate change and its impacts. Box 1.1 summarizes the SDG targets that refer explicitly to agriculture and forests, including SDG 15.2, which calls for deforestation to be halted by 2020. Sustainable forest management will also contribute significantly to other SDG 15 targets, including: SDG 15.3, on combating desertification and restoring degraded land and soil; SDG 15.4, on the conservation of mountain ecosystems; and SDG 15.5, on reducing the degradation of natural habitats, halting the loss of biodiversity, and preventing the extinction of threatened species. These interactions highlight the importance of integrated approaches to policy development, planning, and the management of natural resources.

Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks (known as REDD+) will be vital for global efforts to combat climate change. In the December 2015 Paris Agreement (UNFCCC, 2015), countries agreed to conserve and enhance sinks and reservoirs of greenhouse gases, including forests. Accordingly, many of the Intended Nationally Determined Contributions (INDCs), in which countries set out their responses to climate change, will require action related to agriculture, forests and other land uses.

To achieve the relevant SDGs and to implement the actions required to combat climate change, there is an urgent need to understand the drivers behind the conversion of forest to agriculture and the conversion of agricultural land to forest.[3] The challenge of achieving SDG 2 without compromising SDG 15 or the other SDGs involving forests lies at the heart of *State of the World's Forests 2016*; the challenge can be met through a more integrated approach to land-use and natural-resource policies, planning and management. The President of the World Farmers' Organisation, Dr Evelyn Nguleka, speaking at the XIV World Forestry Congress, signalled a turning point in approaches to land use:

"It is time for a change in consciousness – it is a fact that agriculture and forestry can no longer be treated in isolation. Linking the two is imperative for socioeconomic development in the 21st century".

Various conceptual models help explain the dynamics of land-use change from forests to agriculture, and vice versa. In such models, indirect drivers of forest conversion may include population growth; economic development; income distribution; agricultural demand for land; new technologies; market expansion; insecure land tenure; and weak governance. For example, a model sometimes referred to as the "environmental Kuznets curve" suggests that, when per capita income is low, economic growth tends to exacerbate environmental problems, such as deforestation, but that the opposite occurs beyond a certain income threshold. The

3 As explained in the Annex, agricultural land includes cropland and land used for grazing.

"forest transition" model suggests that, following the clearance of forest land for agriculture, less productive land may eventually be abandoned for farming purposes and will revert to forest, either through natural regeneration or tree planting, while more productive land is more likely to remain in agricultural use. This process may take place over centuries or may be more rapid; historical evidence is available from a number of regions and countries, such as northern Europe, China, India, the United States of America and Viet Nam, supporting the forest transition model. A third model, known as the "Borlaug hypothesis", is based on the assumption that, other things being equal, an increase in agricultural productivity reduces the area of land required for agricultural production and so reduces pressure to convert forest land to agriculture.

Such models can provide useful explanatory narratives for the conversion of forests to agriculture, but the realities on the ground may be much more complex. For example, economic models designed to demonstrate the relationship between deforestation and technological change in agriculture have produced different results in different situations. Those seeking to explain behaviour in terms of the interactions between supply, demand and price show that: higher agricultural prices can create an economic incentive to clear forest land; trading opportunities can have a critical influence on the relationship between demand, supply and price; and expectations of revenues from the forest can affect the incentive, or lack of incentive, to retain land in forest use. Other important factors affecting land-use change may include underlying cultural norms and security of tenure, both of which may influence trade-offs between short-term gain and long-term loss. The dynamics of land-use change in industrialized countries can be different to those in developing countries.

The need to understand the context within which land-use change is taking place is demonstrated by the important distinction between large-scale commercial agriculture driven primarily by profit goals, and local subsistence agriculture driven by livelihood needs. Policies and related instruments also have an impact; for example, land grants have sometimes been used to encourage farmers to clear forest land when the expansion of agricultural land has been a policy priority.

State of the World's Forests 2016 provides a global overview of trends in land-use change and national policies, taking a closer look at the specific cases of seven countries. It concludes with recommendations for a more holistic approach to land-use planning, vital to achieve the SDGs and implement effective climate-change actions. ■

BOX 1.1

SDGS AND TARGETS THAT REFER EXPLICITLY TO AGRICULTURE AND FORESTS

SDG 2:

END HUNGER, ACHIEVE FOOD SECURITY AND IMPROVED NUTRITION AND PROMOTE SUSTAINABLE AGRICULTURE.

Targets include:

2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.

2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment

2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.

2.a Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries.

2.b Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round.

2.c Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility.

SDG 6:

ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL.

Targets include:

6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

SDG 15:

PROTECT, RESTORE AND PROMOTE SUSTAINABLE USE OF TERRESTRIAL ECOSYSTEMS, SUSTAINABLY MANAGE FORESTS, COMBAT DESERTIFICATION, AND HALT AND REVERSE LAND DEGRADATION AND HALT BIODIVERSITY LOSS.

Targets include:

15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.

15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.

15.b Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation.

CHAPTER 2
TRENDS IN LAND-USE CHANGE

NIGER
Animals sheltering from the hot sun under a shade tree on their journey from Niamey to Tera.

KEY MESSAGES

1 Humankind has converted forest land to agricultural use for thousands of years as part of the process of **ECONOMIC DEVELOPMENT**. Deforestation was most prevalent in the temperate climatic domain until the late 19th century and is now greatest in the tropical climatic domain.

2 **IN THE TROPICAL DOMAIN**, net annual **LOSS OF FOREST** area from 2000 to 2010 was about **7 MILLION HECTARES**, and net annual **INCREASE IN AGRICULTURAL LAND** area was more than **6 MILLION HECTARES**. There were significant regional variations: Central and South America, sub-Saharan Africa and South and Southeast Asia all had net losses of forest and net gains in agricultural land.

3 There were **NET GAINS IN FOREST AND NET LOSSES IN AGRICULTURAL AREA** in **EUROPE, NORTH AMERICA AND NORTHEAST ASIA**. Factors contributing to net increases in forest area included reduced pressure on forests as a result of economic growth, declining rural populations or improved agricultural productivity; and effective policies aimed at expanding forest area.

CHAPTER 2

4 The **LARGEST NET LOSS OF FOREST** area and the **LARGEST NET GAIN IN AGRICULTURAL AREA** in 2000–2010 was in the **LOW-INCOME** group of countries, with net forest loss associated with increasing rural populations.

5 In **TROPICAL AND SUBTROPICAL** countries, large-scale commercial agriculture and subsistence **AGRICULTURE ACCOUNTED FOR 73 PERCENT OF DEFORESTATION**, with significant regional variations. For example, commercial agriculture accounted for almost 70 percent of deforestation in Latin America but for only one-third in Africa, where small-scale agriculture is a more significant driver.

6 **GLOBAL DEMAND FOR AGRICULTURAL PRODUCTION WILL CONTINUE TO RISE.** Technological improvements can increase global supply by increasing productivity, but there is a clear need for a strategic, integrated approach to agriculture, forestry and other natural-resource policies.

CHAPTER 2

TRENDS IN LAND-USE CHANGE

2.1 INTRODUCTION

People began converting forests to other land uses – using fire, primitive tools and grazing – thousands of years ago to facilitate hunting and agriculture. Today, humankind has greater technological capacity than ever before to bring about rapid land-use change on a very large scale. This chapter examines trends in land-use change, focusing on the conversion of forests to other land uses, especially agriculture, and of agriculture to forest.

According to the *Global Forest Resources Assessment 2015* (FAO, 2015a), the global forest area fell by 129 million hectares (3.1 percent) in the period 1990–2015, to just under 4 billion hectares. Land-use change is not necessarily the same as land-cover change. Land cover is the observed biophysical cover of the earth's surface, but land use reflects the actions of people and their intentions.[4] An area newly planted with trees, for example, may not qualify as forest *cover*, even though the land *use* is "forest". It can be difficult to define the predominant land use, for example in the case of agroforestry systems, forest grazing and small-scale agriculture. There are large areas with mixed systems – such as forests and trees on agricultural land and agriculture on forest land. Agroforestry in its many forms, and trees outside forests, are crucial for food security and poverty alleviation; and off-farm forests can help support on-farm productive activity. These forms of integrated land use, which also include rotational shifting cultivation, have a long history in many parts of the world. The focus of this report, however, is on changes in land use – from agriculture to forest, and vice versa. In general, land-use statistics classify agroforestry systems as "other land with tree cover"; on the other hand, forest grazing lands are usually counted as part of the forest area unless the grazing is so intensive that the land is considered to be "other land with tree cover".

Forest loss can have both human and natural causes. The former is far more widespread than the latter, with deforestation occurring when people clear forests and use the land for other purposes, such as agriculture, infrastructure, human settlements and mining. Natural phenomena, in particular disasters, may lead to the conversion of forests to other land uses if the forest does not regenerate naturally and there is no reforestation by humans. On the other hand, forest gains occur through natural expansion or through planting or deliberate seeding on non-forested land, for example on abandoned agricultural land (afforestation). When an area of forest is cut down and replanted (reforestation) or forest grows back on its own within a relatively short period through natural regeneration, there is no change in land use. Forest gains and losses occur continuously, and it can be challenging to collect reliable data on these dynamics, even with high-resolution satellite imagery. ■

2.2 A GLOBAL HISTORY OF FOREST CONVERSION

Humankind has a long history of converting forest to other land uses. This section outlines factors that have influenced changes in forest area in past centuries.[5]

4 The annex includes definitions of land use, forest, other land with tree cover, agricultural land, cropland, other land, deforestation, afforestation, reforestation, natural expansion of forest, planted forest, forest degradation, and land-tenure system.

5 Much of the information in this section is derived from FAO (2012b) and Williams (2003).

From early history to 1900

Some estimates suggest that global forest area has decreased by around 1.8 billion hectares in the past 5 000 years (a decline equivalent to nearly 50 percent of the total forest area today). Archaeological and historical evidence indicates that much of this forest loss was associated with population increases and demand for land for crops and grazing, as well as with unsustainable levels of exploitation of forest resources.

Until the late nineteenth century, the highest rates of deforestation were in the world's temperate regions; for example, the area of forest in the Near East and around the Mediterranean Sea was much greater 5 000 years ago than it is today. Records from ancient civilizations and empires give insights into the exploitation of forests and their conversion to other uses: for example, Alexander the Great used Cyprus as a strategic site for shipbuilding because of its abundant oak forests. In western and central Europe, an estimated four-fifths of the land was covered with forests and swamps 1 500 years ago, but about half that forest was cleared in the subsequent 800 years (Williams, 2003). Severe disease in Europe about 650 years ago led to major population declines; an estimated one-quarter of arable land was abandoned, and forests regrew on at least some of that area. Renewed pressure on forests in Europe in later centuries led to concern in some countries about the depletion of forest resources and prompted the passing of laws aimed at preventing forest loss and promoting tree planting. The concept of forest sustainability emerged in Europe about 300 years ago with the publication of *Silvicultura Oeconomica* by Hans Carl von Carlowitz (1713).

Land conversion followed a similar pattern in Asia. Four thousand years ago, the population of China was about 1.4 million people, and forests covered more than 60 percent of the land area. By 1840, China's population had reached 413 million and forest cover had declined to 17 percent (Fan and Dong, 2001; Liu and Tian, 2010). The forests of southern Asia were also converted to agricultural land to support the rapidly expanding population in that region. It is likely that the forest area in southern Asia has declined by more than half in the last 500 years. There, as elsewhere, colonization had an impact on forests, with the European colonizers heavily exploiting timber for use in other parts of the world. Nevertheless, ancient practices of shifting cultivation, within which forests are regarded as integral parts of wider landscapes that also meet agricultural needs, continued in many parts of Asia.

In the Americas, there is evidence that native cultures systematically used fire to convert forest areas for crop-growing or as a wildlife management tool. Large-scale forest conversion in the North American continent began, however, with the arrival of Europeans in the late fifteenth century. The rate of forest conversion rose sharply as the human population grew; on the other hand, the push westward by settlers in the nineteenth century led to forest regrowth on abandoned agricultural land in the east. In Central and South America, forest cover was probably about 75 percent of the land area before the arrival of Europeans; deforestation in the eighteenth and nineteenth centuries reduced this to about 70 percent by the early twentieth century.

In Africa, as elsewhere, fluctuations in population density have had consequences for forest cover. The spread of Iron Age farming through Africa is likely to have had an impact on forests due to the use of charcoal for iron smelting and the availability of iron tools. Periodic population declines due to disease and,

in more recent centuries, the Atlantic slave trade, probably led to the abandonment of agricultural land and forest regrowth in affected regions (Malhi *et al.*, 2013).

1900 to 2000

The geographical distribution of deforestation changed in the twentieth century, but its major driver continued to be the expansion of agricultural land, facilitated by greater mechanization. Other drivers included urban expansion, infrastructure development and mining.

Deforestation slowed or reversed in the late nineteenth century and the twentieth century in the temperate and boreal climatic domains. In western Europe, deforestation rates declined as a result of several factors, such as improvements in the productivity of existing agricultural land; the consideration that remaining forest lands were less suitable for farming; industrialization and associated urbanization; an increase in timber imports from other parts of the world; and the replacement of wood by coal as the main source of fuel. By the end of the twentieth century the forest area in most of Europe was stable or increasing, with forests covering around one-third of the total land area.[6] Forest area has been stable in North America since the early twentieth century, following two centuries of deforestation. Although forest cover in China had fallen to a historical low of less than 10 percent of the land area by 1949, it had recovered to nearly 20 percent of the land area by the end of the twentieth century as a result of major reforestation and afforestation programmes.

Deforestation generally increased in the tropical domain in the twentieth century, especially in developing countries; in Latin America, for example, forest area had declined to around 50 percent of the land area by the end of the century. Although colonialism was largely dismantled in the aftermath of the Second World War, the forest policies of many newly independent countries in the tropics continued to reflect its legacy. Nigeria, for example, lost more than 90 percent of its primary forest due to practices initiated in the colonial era, such as the mechanized logging of forest reserves, the establishment of state-owned agricultural plantations (such as cocoa and oil palm), and mining (Enuoh and Bisong, 2015). In general, however, deforestation in sub-Saharan Africa was lower than elsewhere in the tropics, and the drivers of forest conversion to other land uses also differed (Rudel, 2013). ■

2.3 TWENTY-FIRST CENTURY LAND-USE CHANGE DYNAMICS

Figure 2.1 shows the proportions of the total land area occupied by agriculture, forests and other land uses in various regions of the world, as of 2010. Asia has the highest proportion of agricultural land (52 percent) and the lowest proportion of forest (19 percent). Europe, including the Russian Federation, has the lowest proportion of agricultural land (21 percent) and the second-highest proportion of forest (46 percent). Globally, agriculture accounts for more than one-third (37.7 percent) of the land area, and forest and "other" for just under one-third each (30.7 percent and 31.6 percent, respectively).

Dynamics of land-use change, by climatic domain

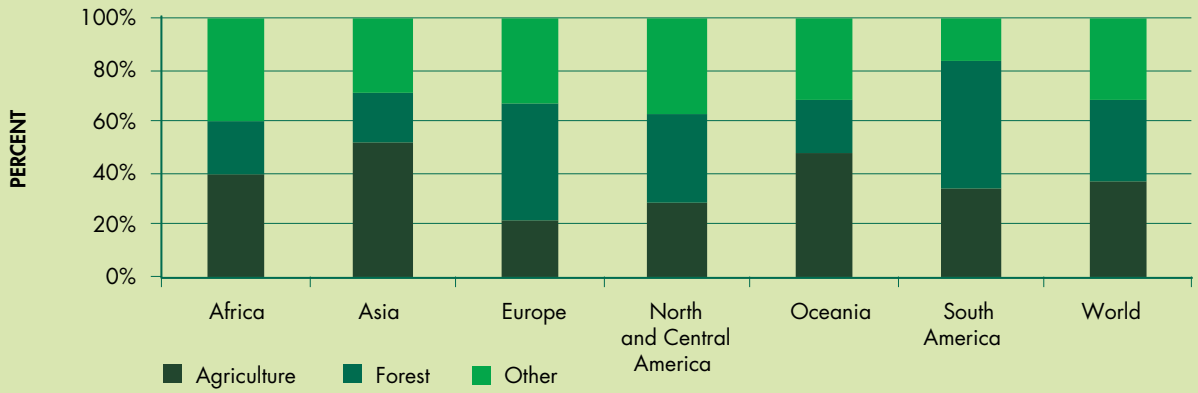
Figure 2.2 shows the net annual average change[7] in the areas of forest and agricultural land in the period 2000–2010 in the four major climatic domains (boreal, temperate, subtropical and tropical). In the boreal domain, the area of forest increased over the decade and the area of »

6 Excluding the Russian Federation; the figure is 46 percent if the Russian Federation is included.

7 Net change takes into account both gains and losses in forest and agricultural land; see the annex for more details on the analysis.

FIGURE 2.1

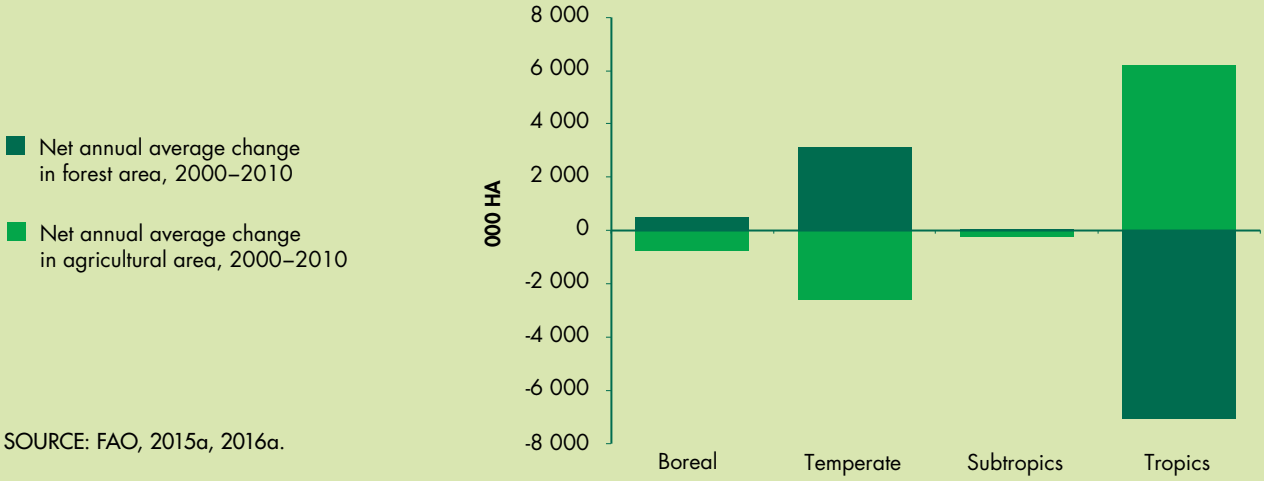
LAND AREA BY MAJOR LAND-USE CLASS, 2010



Note: "Other land" is all land not categorized as agricultural or forest land.
SOURCE: FAO, 2015a, 2016a.

FIGURE 2.2

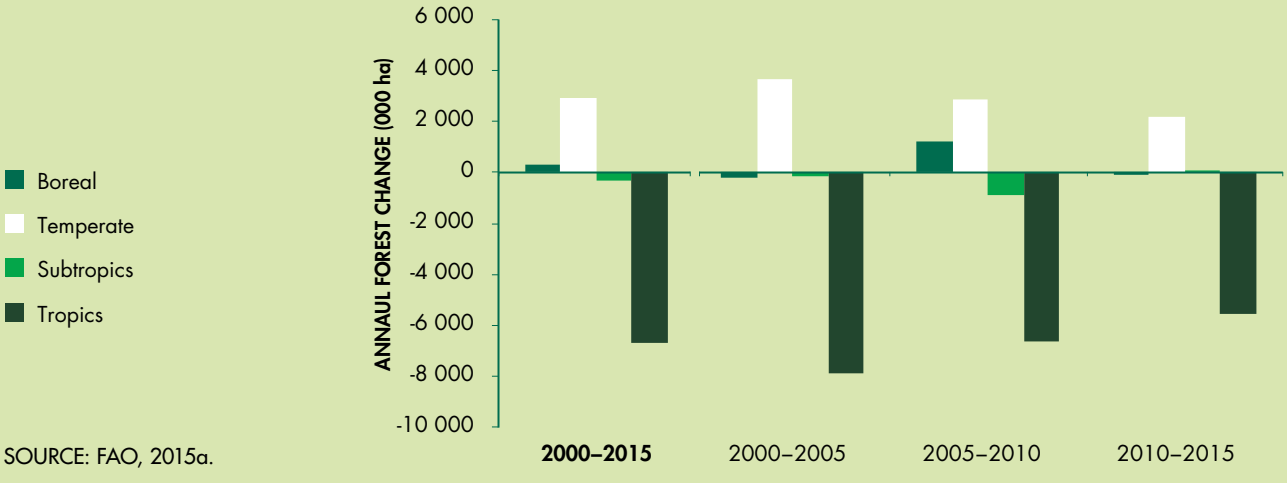
NET ANNUAL AVERAGE CHANGE IN FOREST AND AGRICULTURAL LAND, BY CLIMATIC DOMAIN, 2000–2010



SOURCE: FAO, 2015a, 2016a.

FIGURE 2.3

NET ANNUAL AVERAGE FOREST AREA CHANGE, BY CLIMATIC DOMAIN (000 ha per year)



SOURCE: FAO, 2015a.

» agricultural land declined. A similar change occurred in the temperate domain – an increase in forest area was accompanied by a decrease in agricultural area. The trend can largely be explained by the natural expansion of forest on abandoned agricultural lands, including rangelands, in territories that were part of the former Soviet Union. For example, there was an increase in forest area of 26 million hectares on abandoned farmland in Belarus, Kazakhstan and the Russian Federation (Lambin and Meyfroidt, 2011).

The tropical climatic domain had the highest decrease in forest area of any domain from 2000 to 2010, and it was the only domain to show an increase in agricultural area. An estimated 7 million hectares of forest was lost per year over the period in the tropics, and the area of agricultural land increased by 6 million hectares per year. The link between the decline in forest area and the increase in agricultural land is discussed in section 2.4.

Figure 2.3 shows that there were net declines in forest area in the tropical climatic domain in each of the three 5-year periods between 2000 and 2015. In contrast, the net forest area increased in the temperate domain in each of those periods, and there were only relatively minor changes in forest area in the boreal and subtropical climatic domains.

Figure 2.4 shows the relationship between change in total forest area and change in the rural population in the four major climatic domains in the period 2000–2010. The rural population increased in the tropical domain, where 64 percent the world's rural population lives, and decreased in the other domains. In the temperate domain, total forest area increased and total rural population fell; in the subtropical domain, both forest area and rural population decreased. The apparent relationship between increasing rural population and loss of forest cover does not apply everywhere; in some countries featured in case studies in Chapter 4, for example, forest area has increased despite increases in rural populations.

Land-use change dynamics by income category

Land-use change dynamics in 2000–2010 were further explored by examining net annual average changes in forest and agricultural area when countries were grouped in income categories (Figure 2.5). Those in the high-income category showed, overall, a reduction in agricultural area and an increase in forest area over the period. There was an overall decrease in forest area in the upper-middle-income, lower-middle-income and low-income categories. The largest annual net loss of forest area and annual net gain in agricultural area occurred in the low-income category of countries.

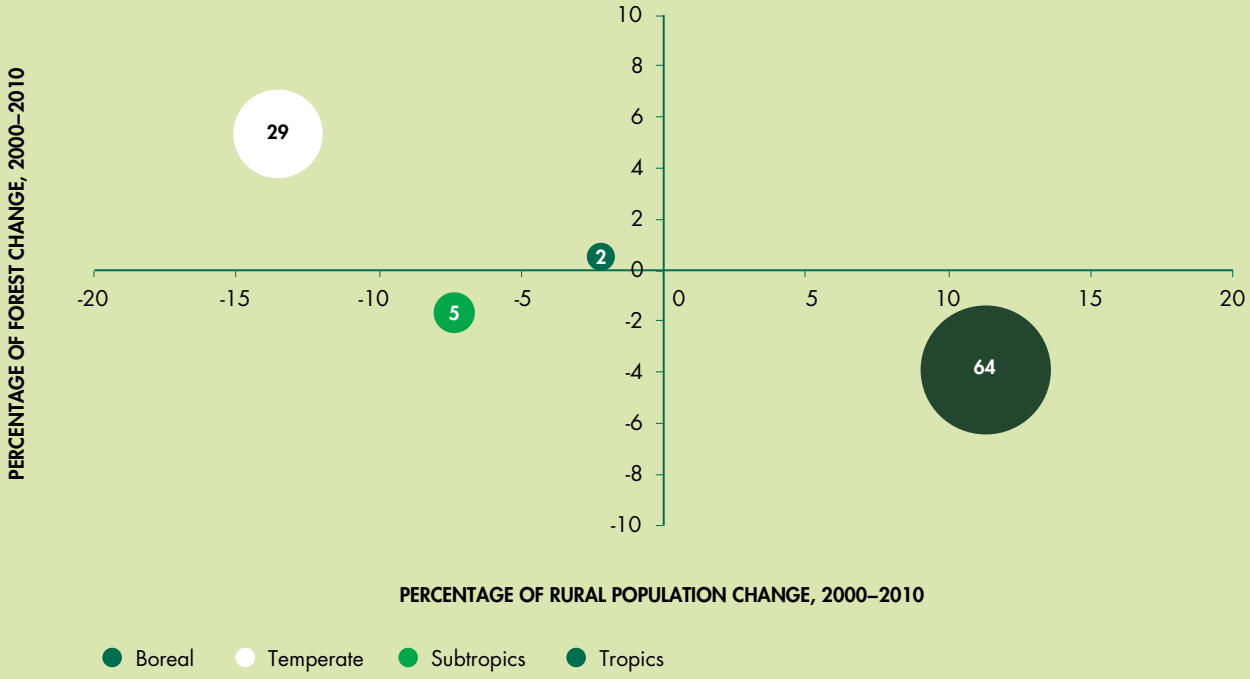
Land-use change dynamics by subregion

Net annual average change in the areas of forest and agricultural land by subregion were examined for the period 2000–2010. Figure 2.6 and Figure 2.7 show a strong correlation between agricultural expansion and deforestation in South America, sub-Saharan Africa, and South and Southeast Asia. This is consistent with the findings of Hosonuma *et al.* (2012), who reported that 70–80 percent of forest conversion in Africa, about 70 percent of forest conversion in subtropical Asia, and more than 90 percent of forest conversion in Latin America is due to agricultural expansion.

Figure 2.7 shows that there was a net reduction in the area of agricultural land and a net increase in forest in East Asia, Western and Central Asia, Europe and North America. »

FIGURE 2.4

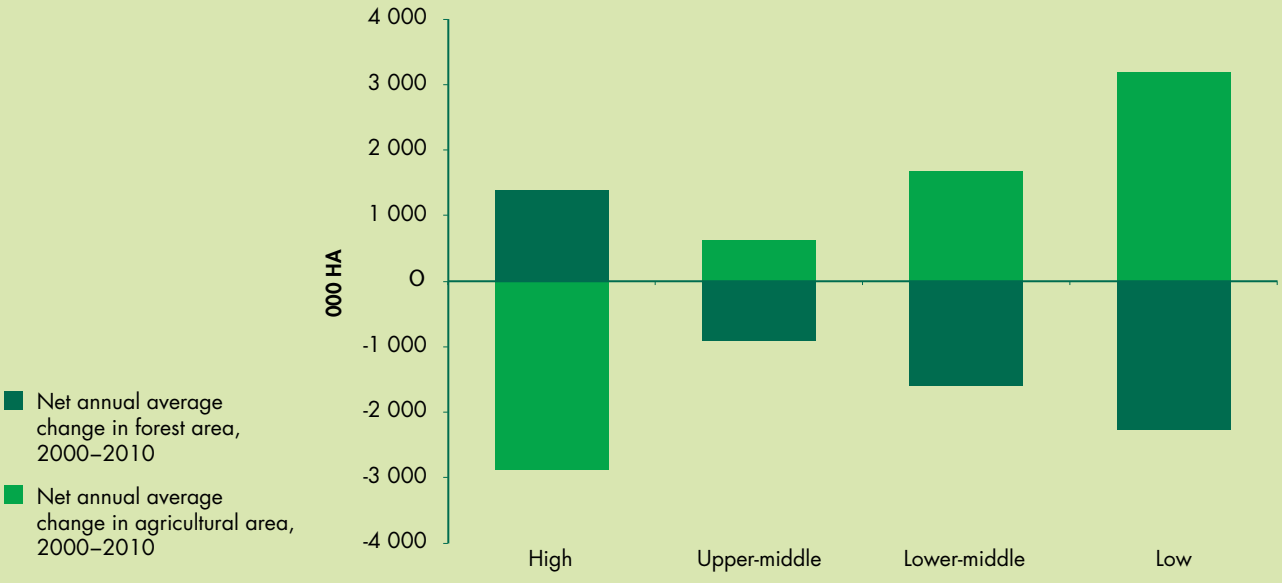
PERCENTAGE OF NET FOREST CHANGE AND RURAL POPULATION CHANGE, BY CLIMATIC DOMAIN, 2000–2010



Note: Bubble size and figure inside it = relative share of world rural population in each climatic domain in 2010.
SOURCE: FAO, 2015a, 2016a.

FIGURE 2.5

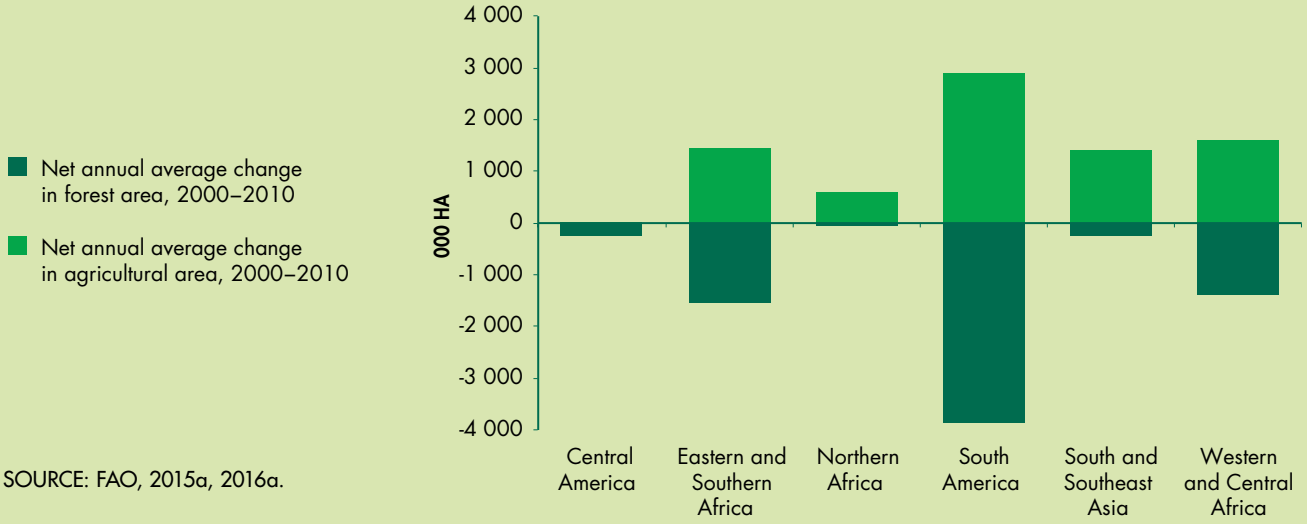
NET ANNUAL AVERAGE CHANGE IN AGRICULTURAL AND FOREST AREA IN COUNTRIES GROUPED BY INCOME CATEGORY, 2000–2010



SOURCE: FAO, 2015a, 2016a.

FIGURE 2.6

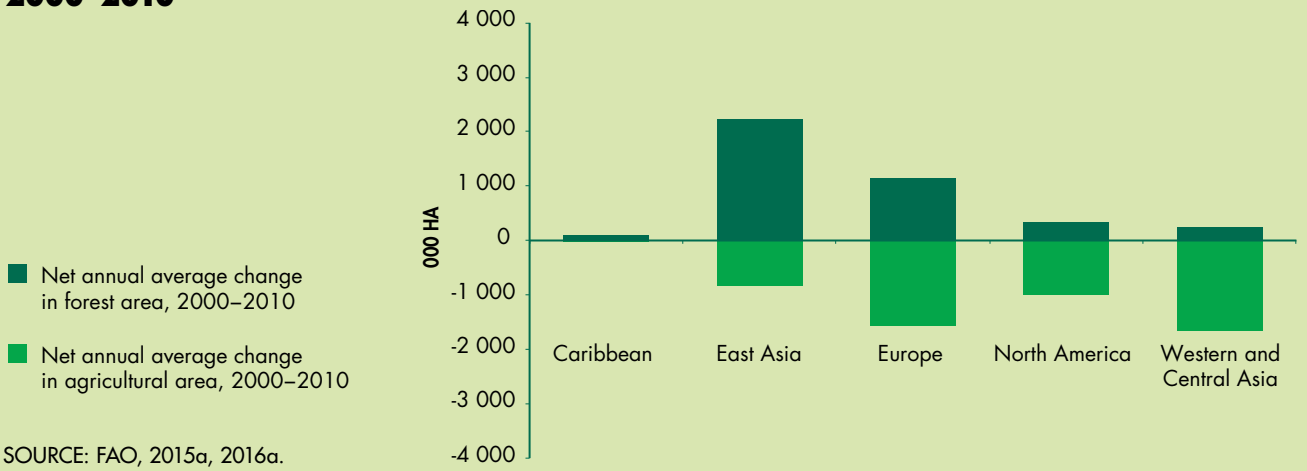
NET ANNUAL AVERAGE CHANGE IN AGRICULTURAL AND FOREST AREA IN SUBREGIONS, 2000–2010



SOURCE: FAO, 2015a, 2016a.

FIGURE 2.7

NET ANNUAL AVERAGE CHANGE IN AGRICULTURAL AND FOREST AREA IN SUBREGIONS, 2000–2010



SOURCE: FAO, 2015a, 2016a.

TABLE 2.1

COUNTRIES WITH NET GAINS IN AGRICULTURAL AREA AND NET LOSSES IN FOREST AREA, 2000–2010

REGION	COUNTRY	Net forest loss (000 ha)	Net agricultural gain (000 ha)
Africa	Angola, Benin, Burkina Faso, Cameroon, Chad, Ethiopia, Guinea, Liberia, Madagascar, Malawi, Mali, Niger, Senegal, Sierra Leone, Uganda, United Republic of Tanzania, Zambia, Zimbabwe	-19 821	31 190
Asia	Cambodia, Indonesia, Myanmar, Philippines, Sri Lanka, Thailand	-10 562	13 484
Europe	Finland*	-227	74
Central America	El Salvador, Haiti, Honduras, Panama	-1 421	545
South America	Argentina, Brazil, Paraguay, Peru	-29 834	32 068
TOTAL		-61 865	77 287

*Much of this loss can be explained by sampling error; the actual loss was due mainly to expansion of urban settlements.
SOURCE: FAO, 2015a, 2016a.

» Figure 2.8 indicates the various combinations of net gains or losses in forest area and agricultural area, by country/territory worldwide, in the period 2000–2010.

Most of the 33 countries and territories shown in dark brown in Figure 2.8 (indicating net losses in forest area and net gains in agricultural area in 2000–2010) are in Africa, South and Central America, and South and Southeast Asia (Table 2.1).

Seventeen countries and territories (shown in light brown in Figure 2.8) reported a decrease in both the area of agricultural land and forest area: Australia, Bangladesh, Colombia, Ecuador, Guadeloupe, Equatorial Guinea, Guatemala, Jamaica, the Republic of Korea, Mauritius, Nepal, Nicaragua, Nigeria, Portugal, Saint Lucia, Trinidad and Tobago, and the United States Virgin Islands. Six of these are Small Island Developing States and are not visible in Figure 2.8.

Forest area increased and agricultural area decreased in the 29 countries or territories shown in light green in Figure 2.8 (mainly in the temperate climatic domain). Combined, the forest area in these increased by 6 percent over the period, including a 25 percent increase in the area of planted forest.

The area of agricultural land and the forest area both increased from 2000 to 2010 in the 15 countries or territories shown in dark green in Figure 2.8. Combined, the forest area in these increased by 8 percent, including a 31 percent increase in the area of planted forest.

Other countries or territories for which data were available showed only small changes in one or other of the land uses.

Factors affecting global trends in land use are considered in more detail in sections 2.4 and 2.5. As the case studies presented in Chapter 4 highlight, the significance of particular drivers of deforestation depends to a large extent on the circumstances of each country. ■

2.4 DRIVERS OF CONVERSION FROM FOREST TO AGRICULTURE

Deforestation is the result of processes driven by multiple causes occurring at various scales and differing significantly between locations. Despite global concerns, there is a lack of quantitative information on deforestation drivers.

The causes of deforestation may be proximate (direct), or underlying (indirect) (Kaimovitz and Angelsen, 1998; Kissinger, Herold and De Sy, 2012). Proximate causes of deforestation include human activities with direct impacts on forest cover, such as agricultural expansion, urban growth, infrastructure development and mining. Although unsustainable wood removal, including illegal harvesting, is sometimes regarded as a cause of deforestation, it is more often associated with forest degradation because wood removal does not necessarily lead to changes in land use. Underlying causes of deforestation relate to macro-level interactions of demographic, economic, technological, social, cultural and political factors (Kissinger, Herold and De Sy, 2012; Geist and Lambin, 2001; Millennium Ecosystem Assessment, 2005) that may operate at some distance from the forests they affect. Both proximate and underlying causes of deforestation are described in more detail below.

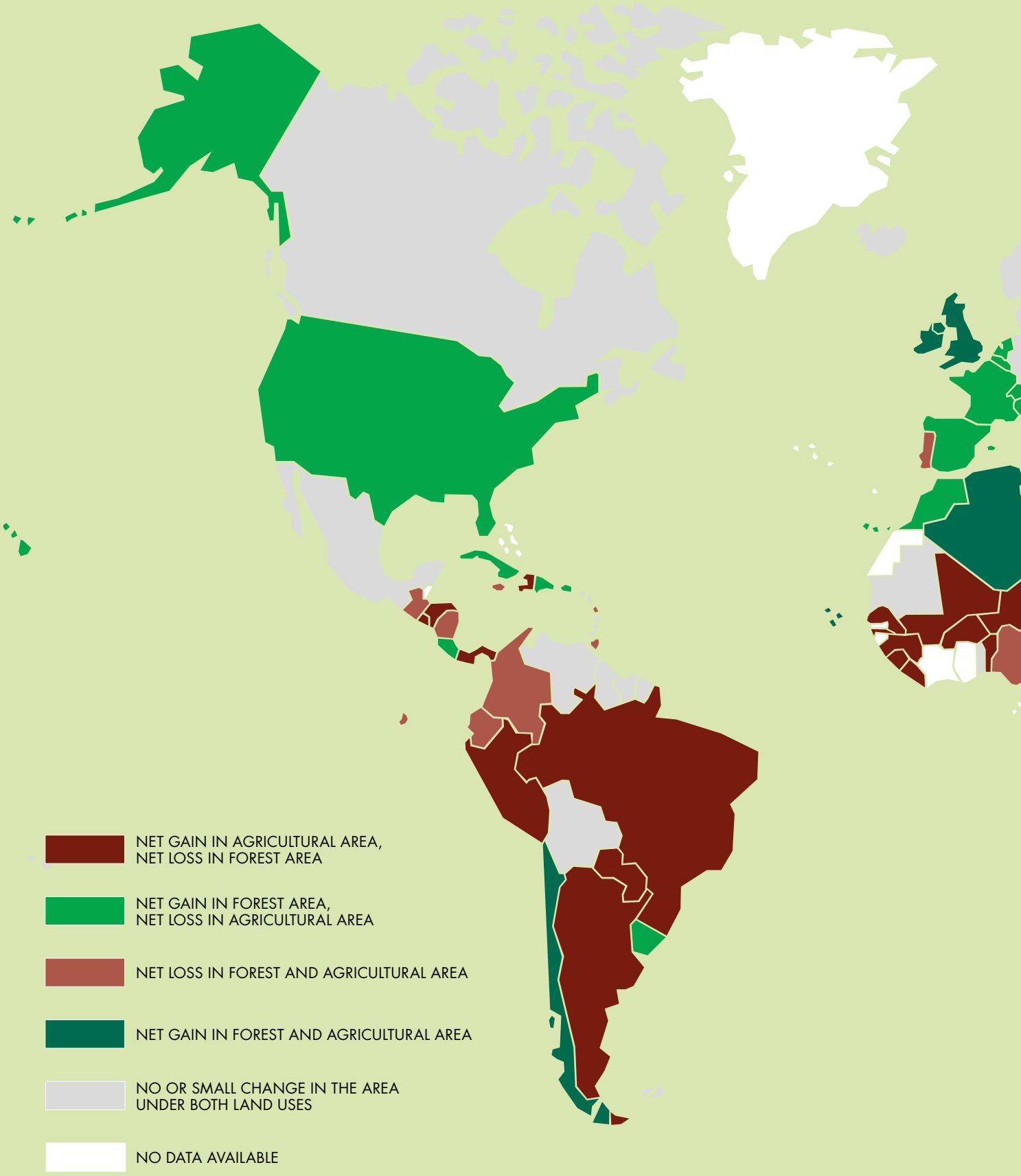
Proximate drivers

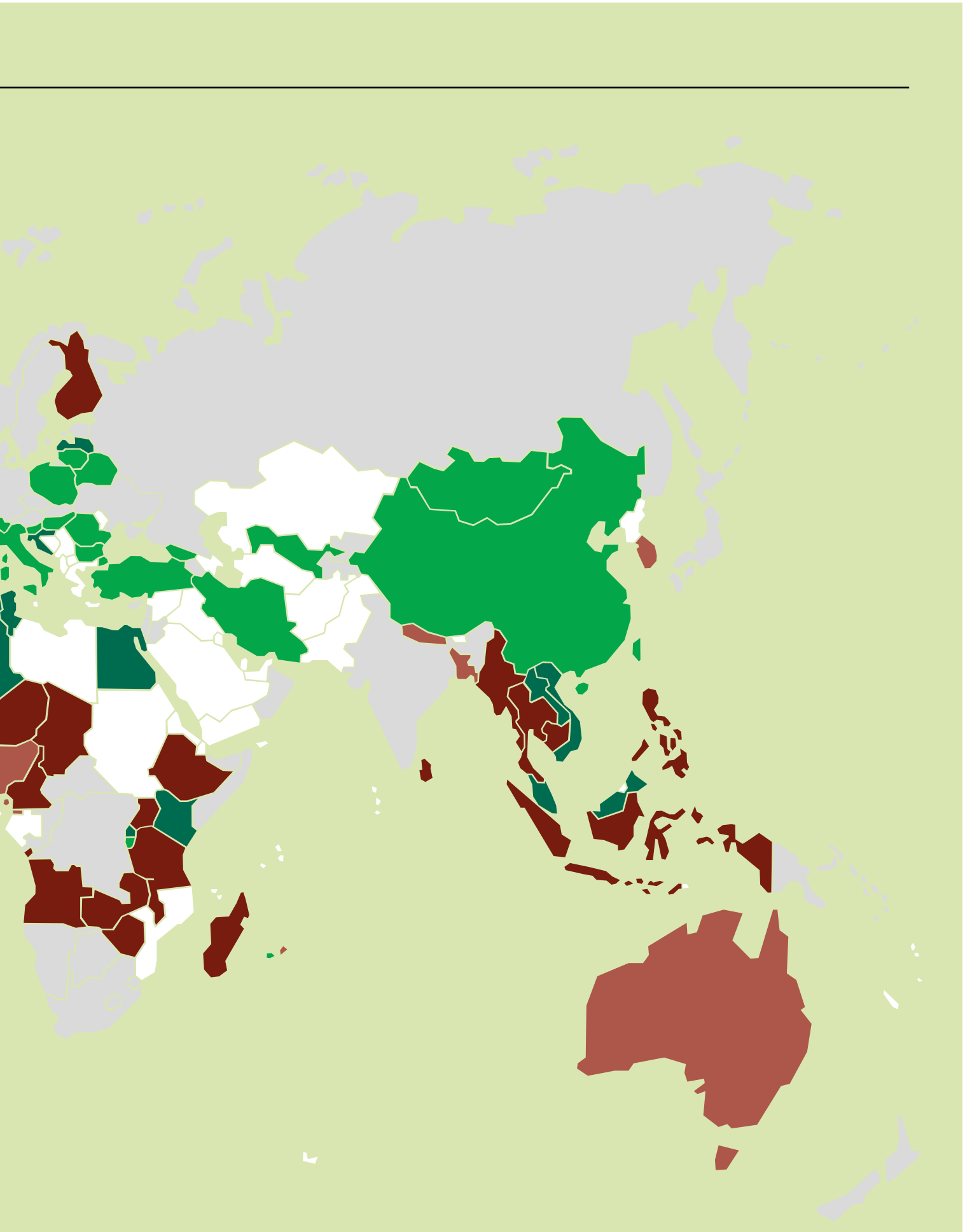
According to some estimates, agricultural expansion is the proximate driver of about 80 percent of deforestation worldwide (Kissinger, Herold and De Sy, 2012), albeit with differences in geographical distribution, as described above. As noted in Chapter 1, there is an important distinction between large-scale commercial agriculture and subsistence agriculture as deforestation drivers. Although it may bring other economic benefits and enhance

Continues on page 20 »

FIGURE 2.8

NET CHANGES IN AGRICULTURAL AND FOREST AREA, BY COUNTRY/TERRITORY, 2000–2010





SOURCE: FAO, 2015a, 2016a.

» *Continued from page 17*

global food security, the large-scale, export-focused commercial production of agricultural commodities may contribute little to food production at the local or national level. An analysis of national data for 46 tropical and subtropical countries representing about 78 percent of the forest areas in those domains (Hosonuma *et al.*, 2012) revealed that large-scale commercial agriculture is the most prevalent driver of deforestation, accounting for 40 percent. Local subsistence agriculture accounts for an estimated 33 percent of deforestation, urban expansion for 10 percent, infrastructure for 10 percent and mining for 7 percent. Hosonuma *et al.* (2012) noted that, in some cases, land-use change was preceded by forest degradation, for example caused by unsustainable or illegal wood removal.

Figure 2.9 shows how the relative importance of various proximate deforestation drivers varies between regions. Commercial agriculture accounted for almost 70 percent of the deforestation in Latin America in the period 2000–2010. In the Amazon, in particular, agribusiness production for international markets such as cattle ranching, soybean farming and oil-palm plantations has been identified as a main driver of post-1990 deforestation (Rudel *et al.*, 2009; Boucher *et al.*, 2011).

In Southeast Asia, oil-palm plantations established for the food industry and, to some extent, the production of biofuels have replaced substantial areas of natural forest. For example, the area of oil-palm plantations in Malaysia increased from 2.4 million to 4.2 million hectares from 1990 to 2005, replacing an estimated 1 million hectares of forest (or more) over the period. The area of oil-palm plantations in Indonesia increased from 1.7 million to 6.1 million hectares from 1990 to 2000, replacing an estimated 1.7 million–3.0 million hectares of forest (Fitzherbert *et al.*, 2008).

Small-scale agricultural processes dominate deforestation in Africa, where many poor households, particularly in sub-Saharan Africa, adopt low-risk, low-return agricultural and other income-generating strategies (FAO, 2015b); large-scale commercial agriculture, on the other hand, accounts for only one-third of deforestation in Africa (DeFries *et al.*, 2010; Fisher, 2010). There are opportunities to improve the efficiency of small-scale subsistence farms, for example through improved cultivation, irrigation, seed-storage, composting, agroforestry and food-storage practices, but there are also significant constraints to innovation. Collective action through farmer organizations can help, but poverty alleviation also requires effective rural development policies and social protection (FAO, 2014b). Large-scale commercial agriculture is likely to increase in Africa (Hosonuma *et al.*, 2012) due to growth in global markets, policies aimed at developing the palm-oil industry, and proposals for significant large-scale agricultural projects in Central Africa (Megevand, 2013).

A recent study of deforestation drivers in seven South American countries (De Sy *et al.*, 2015) highlighted the relationship between deforestation and pasture expansion for cattle ranching (Figure 2.10). Seventy-one percent of deforestation in those South American countries in 1990–2005 was driven by increased demand for pasture, 14 percent was driven by increased demand for commercial cropland, and less than 2 percent was the result of infrastructure and urban expansion. Pasture expansion caused at least one-third of forest loss in all countries except Peru, where smallholder cropland expansion (at 41 percent) was a more dominant driver. In Argentina, pasture expansion was responsible for nearly 45 percent of forest loss over the period and the expansion of commercial cropland for more than 43 percent. More than 80 percent of deforestation in Brazil in the period was associated with conversion to pasture land.

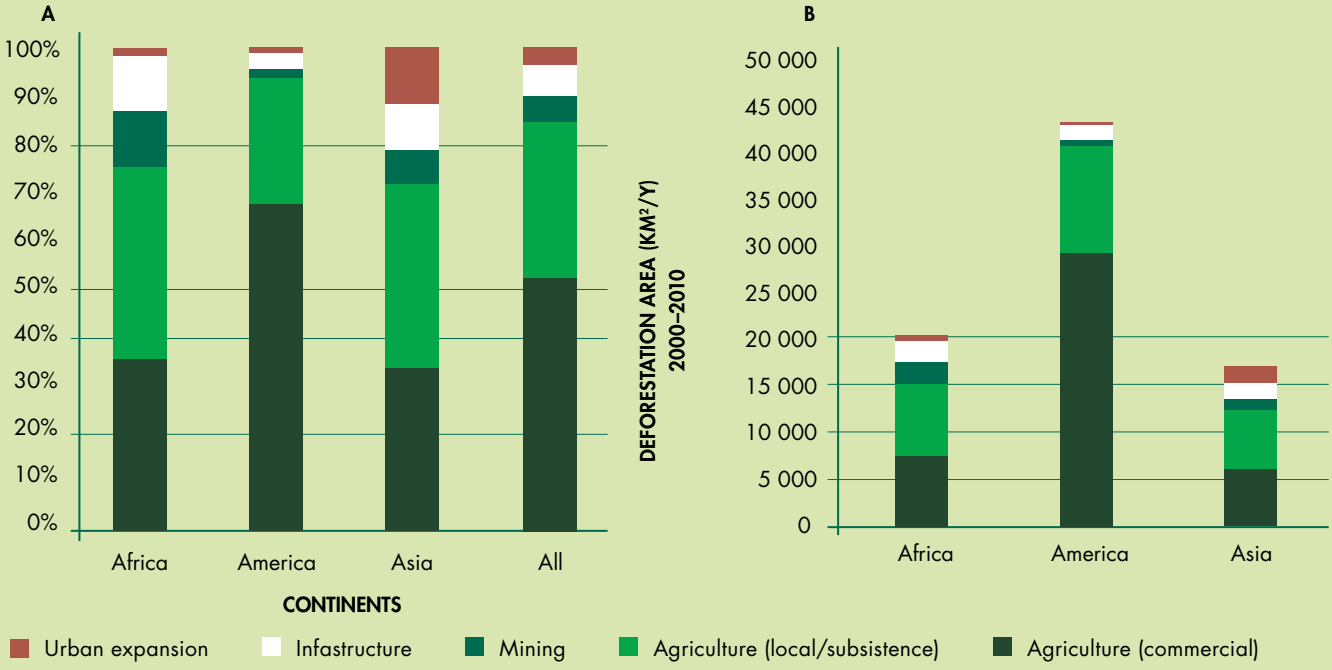
Underlying drivers

Underlying factors affecting the conversion of forests to agriculture include population growth, agricultural development, land-tenure security, and the governance of land-use change.

Although population growth has been slowing since the late 1970s, the world's population has doubled since 1970 and now stands at about »

FIGURE 2.9

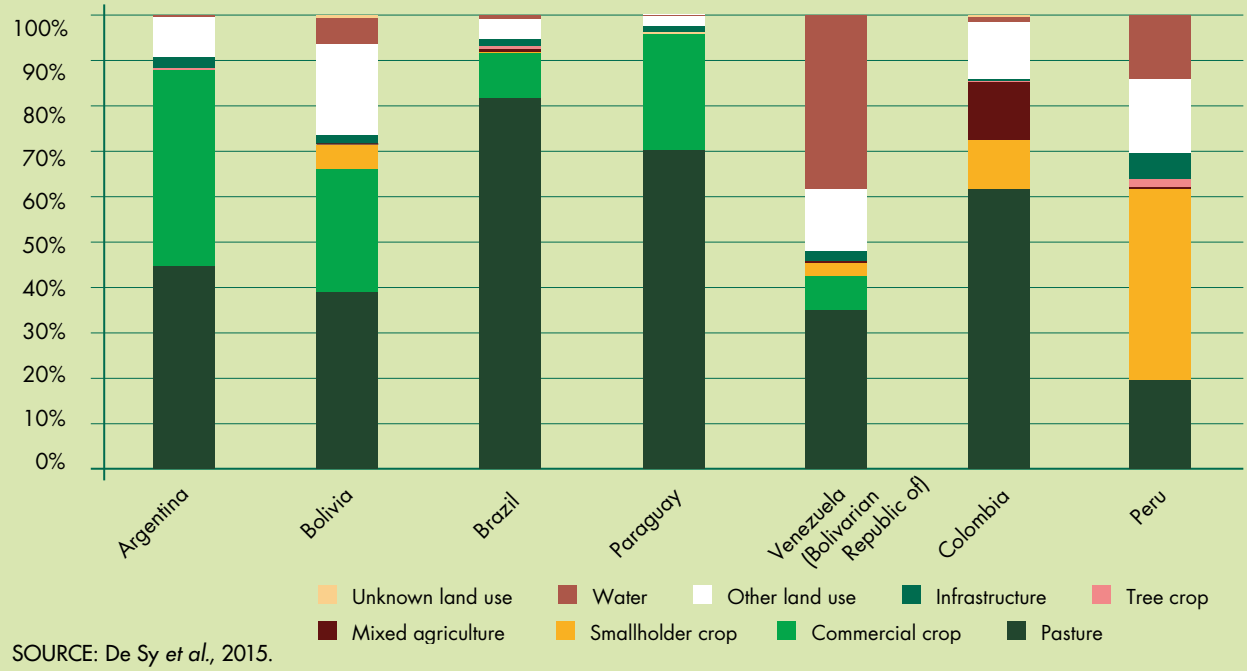
ESTIMATE OF (A) PROPORTION OF TOTAL AREA OF LAND-USE CHANGE ASSOCIATED WITH VARIOUS PROXIMATE DRIVERS OF DEFORESTATION, AND (B) ABSOLUTE NET FOREST AREA CHANGE ASSOCIATED WITH PROXIMATE DRIVERS OF DEFORESTATION, BY REGION, 2000–2010



SOURCE: Adapted from Hosonuma *et al.*, 2012.

FIGURE 2.10

PROPORTION OF DEFORESTATION ATTRIBUTED TO VARIOUS DRIVERS IN SEVEN SOUTH AMERICAN COUNTRIES, 1990–2005



SOURCE: De Sy *et al.*, 2015.

» 7.3 billion people. Per capita food consumption has also increased – from an average of 2 370 kilocalories (kcal) per person per day in the late 1970s to 2 770 kcal per person per day in 2012 – and diets have shifted towards the consumption of more livestock products and vegetable oils (Alexandratos and Bruinsma, 2012). The global population has increased by 37 percent since 1990 and food consumption has increased by 40 percent. Urban-based and international demand for agricultural commodities is an important driver of deforestation (DeFries *et al.*, 2010). With globalization, food availability depends increasingly on international trade.

Changes in market conditions and agriculture policies that increase profitability can increase demand for agricultural land and lead to deforestation. Agricultural profitability may increase, for example, due to preferential access to land; tax concessions and soft loans; better transportation links and cheaper access to urban markets; the development of new markets, such as biofuels; weaker currencies, leading to increased demand for exports; and improved technologies.

The forests most vulnerable to agricultural conversion tend to be on flat, easily accessible land with high-fertility soils, such as coastal and island forests with good sea transport links to markets. High levels of poverty and inefficient agricultural production systems can also put pressure on forests, with people seeking economic opportunities on the forest frontier.

There is evidence to show that land-tenure security is a necessary condition for preventing deforestation (although insufficient on its own) (Robinson, Holland and Naughton-Treves, 2013). Uncertain or insecure land tenure reduces the value placed on future forest production relative to the more immediate income possible from agricultural production, thus creating an incentive for forest conversion (Barbier and Burgess, 2001).

Poor governance can be a driver of deforestation in several ways. Where intersectoral linkages are weak, policies in higher-priority sectors – such as agriculture, mining, industrial development and energy – may have a greater impact on forests than the forest policy itself. Other potential aspects of poor governance include inadequate land-use and resource planning and monitoring; inadequate capacity for enforcing forest policies and combating illegal logging; inadequate involvement of local people and external stakeholders in decision-making processes; corruption; incoherent, incomplete or non-existent legal or regulatory frameworks; and inadequate investment in research and education (Rademaekers *et al.*, 2010). ■

2.5 DRIVERS OF CONVERSION FROM AGRICULTURAL LAND TO FOREST

The conversion of agricultural land to forest may be the result of natural forest expansion or tree planting. Natural forest expansion may occur when agricultural land is abandoned, for example when a rural population declines, land becomes sufficiently degraded that it becomes unproductive as agricultural land, or more productive agricultural land becomes available elsewhere. Forest policies might be put in place to encourage tree planting with the aim of meeting anticipated future needs for forest goods (such as woodfuel, timber and forest-grown foods) and environmental services (such as those related to carbon sequestration, biodiversity conservation, pollination, and the protection of soil and water resources).

The impact on forest area of "reverse drivers" such as afforestation policies is particularly evident in high-income countries such as the United States of America and those of Western Europe, where net deforestation bottomed out many

decades ago, but there is now evidence of a similar trend in some developing countries. In the period 1990–2015, 93 countries recorded net forest losses (totalling 242 million hectares), but 88 countries had net gains in forest area (totalling almost 113 million hectares) (FAO, 2015a).

The regional distribution of this net increase in forest area varies across regions. In Asia, 24 countries experienced a net increase in forest area in the period 1990–2015, amounting to 73.1 million hectares; this was due mainly to large-scale afforestation programmes in China. In Europe, 35 countries recorded a net increase in forest area, totalling 21.5 million hectares. Thirteen countries in Africa, eight countries in Oceania, six countries in North and Central America, and two countries in South America also had net increases in forest area over the period. ■

CHAPTER 3

THE GOVERNANCE AND MANAGEMENT OF LAND-USE CHANGE

VIET NAM
A local engineer demonstrates the links between forest management and soil and water protection.
©FAO/Hoang Dinh Nam

KEY MESSAGES

1 Although most countries have formal policies for their forest and agriculture sectors, there is an increasing need for **POLICIES ON LAND-USE CHANGE** between forest and agriculture in light of recent international agreements, such as the 2030 Agenda for Sustainable Development and the Paris Agreement on **CLIMATE CHANGE**.

2 Complexities in the governance of land-use change could be reduced with **BETTER COORDINATION** between policies on forests, agriculture, food, land use, rural development, water and climate change. Such coordination would include setting cross-sectoral priorities or strategic targets for land-use change, and appropriate institutional arrangements.

3 **LEGAL FRAMEWORKS** for the conversion of forest to agricultural land are often complex, and informal local practices may have a strong influence where implementation and law enforcement is weak. The role of customary law, based on traditional rights, is especially important for vulnerable groups.

CHAPTER 3

4 Forest loss is a feature of many low-income, food-deficit countries where government investment in agriculture and forestry is low. Countries that promote **AGRICULTURAL INVESTMENT** and **VALUE ADDED**, and provide **ENABLING INFRASTRUCTURE**, have addressed the problem of forest loss more effectively than those where investment is low.

5 The governance and management of land-use change requires a **MULTIPRONGED APPROACH** that includes coordinated policy development; secure land tenure; effective law enforcement; targeted economic incentives to promote sustainable agricultural intensification, sustainable forest management and social investment in rural areas; strong stakeholder engagement; public–private partnerships; integrated land-use planning; and adequate monitoring of land-use change.

6 Where countries have **SECURED INVESTMENT** in the forest sector, forest loss is generally lower. Some countries are investing in forests in ways that help achieve wider social and environmental goals related to employment, climate change, land degradation, landscape restoration, and the resilience of agriculture.

7 Integrated land-use planning is important for creating a **STRATEGIC FRAMEWORK** to balance competing land uses among stakeholders. This framework should encompass government agencies, local communities, civil society organizations, and responsible private-sector interests.

CHAPTER 3

THE GOVERNANCE AND MANAGEMENT OF LAND-USE CHANGE

3.1 INTRODUCTION

National policies and consequent land management decisions can significantly affect patterns of land-use change. For example, the expansion of agricultural land may be promoted in response to a need to increase food production or agricultural export revenues, and increases in forest area may be promoted as a way of improving livelihoods, protecting biodiversity and delivering environmental services. These policies are not necessarily mutually exclusive. The sound governance and management of land-use change requires policies that reflect national priorities and that are consistent, based on reliable evidence, and implemented effectively. Such policies need to be supported by appropriate tools and methodologies (such as land suitability assessments and land-use planning) to assist decision-makers in targeting their interventions and to guide future land use.

This chapter examines the ways in which countries address land-use change (from forest to agriculture and from agriculture to forest) in their national policies; and it provides an overview of the use of legal frameworks, investments in agriculture and forests, and institutional mechanisms for implementing policies on land-use change.

An important distinction exists between decisions on land-use change that occur in the "governed" sphere and those made in the "non-governed" sphere. The governed sphere encompasses land-use decisions subject to formal policies, laws, strategies and programmes and are implemented in accordance with legal provisions and prescribed processes, with formal central or provincial government approvals or consents. The non-governed sphere comprises those decisions on land-use change that are not subject to such rules, ignore such rules through illegal action, or are taken in the context of unclear or contradictory formal rules.

While this chapter focuses on the governed sphere and formal policies, the implementation of formal policies is influenced by informal, context-specific rules based on customary practice, cultural traditions and other social norms, including those related to gender, class and religion. For example, women may have access to woodfuel and non-wood forest products, but not to timber. The gender-based differentiation of ownership and use rights in forests can have major implications for forest management. Youth may also be disadvantaged in accessing forest tenure. Informal rules have an especially strong influence where formal policies fail to provide clear guidance on land-use change, institutions responsible for policy implementation are weak, or formal policies do not accommodate the needs of stakeholders. The non-governed sphere, with its informal rules, is an essential consideration in determining the outcomes of policy interventions in the formal sphere. ■

3.2 POLICIES FOR GOVERNING LAND-USE CHANGE BETWEEN FOREST AND AGRICULTURE

The influence of national policies on land-use change

There is considerable variation between countries, and between sectors within countries, in the approaches taken to land-use change and the importance placed on conversion from forest to agriculture (and vice versa). An analysis of national-level policies in 35 countries[8] showed that just under half (17) of those countries explicitly addressed land-use change between forests and agriculture, and vice versa, in their main policy documents; 10 of those countries addressed the issue in more than one of their national policies.

Figure 3.1 shows that, in the 27 countries whose policy documents addressed land-use change between forest and agriculture (see also Table A.2 in the Annex), this type of land-use change was most frequently addressed in land policies (67 percent) and forest policies (50 percent). Land-use change was less frequently addressed in national and rural development policies and agriculture policies, and it was seldom addressed in policies on food security.

8 The Annex lists these countries and those used for analyses presented in Figures 3.1–3.5 and provides more detail on the analyses reported in Chapter 3.

Some policies identified a need for strategies to halt or reverse forest loss: these included Ghana's forest policy, the land profile report of the Lao People's Democratic Republic, Mali's land-use policy, Rwanda's land-use policy, Senegal's forest policy, and Zambia's agricultural investment plan and forest policy.

Sustainable land use was highlighted in the land policies of Cambodia, Kenya, Niger, Romania, Uganda and Zambia. Policy objectives included the need to increase community participation in integrated land-use systems, especially where agricultural and forest areas are contiguous; the enhancement of living standards by taking into consideration the conditions and requirements of different regions (in a country); and the identification of land areas with natural potential for development.

Land-use change is addressed in international agreements such as the 2030 Agenda on Sustainable Development and the Paris Agreement on climate change; signatory countries to such agreements will need to ensure that sufficient emphasis is given to land-use change in their national policies and in the implementation of existing policies. For example, 77 percent of the INDCs submitted in the context of the Paris Agreement included forest-related actions and 88 percent included actions in agriculture. The Convention on Biological Diversity's Aichi Biodiversity Targets state that, by 2020, the rate of loss of all natural habitats, including forests, should at least be halved and, where feasible, brought close to zero (Target 5) and that areas under agriculture and forestry should be managed sustainably, ensuring biodiversity conservation (Target 7). The European Union's Forest Law Enforcement Governance and Trade (FLEGT) initiative aims to reduce illegal logging by strengthening »

FIGURE 3.1

PERCENTAGE OF 60 NATIONAL POLICY DOCUMENTS (FROM 27 COUNTRIES) ADDRESSING LAND-USE CHANGE BETWEEN FOREST AND AGRICULTURE, BY POLICY TYPE

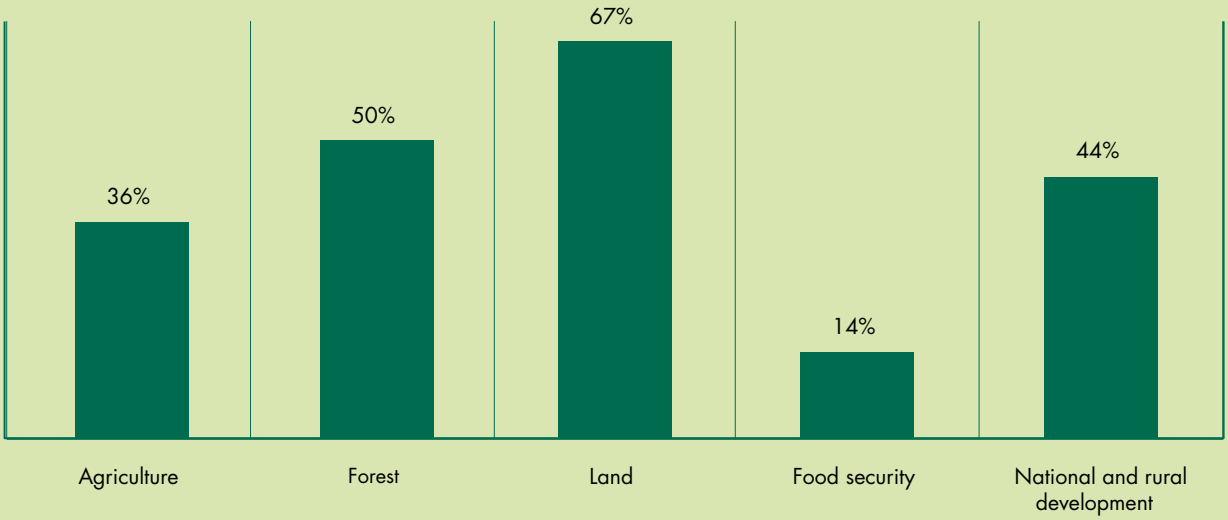
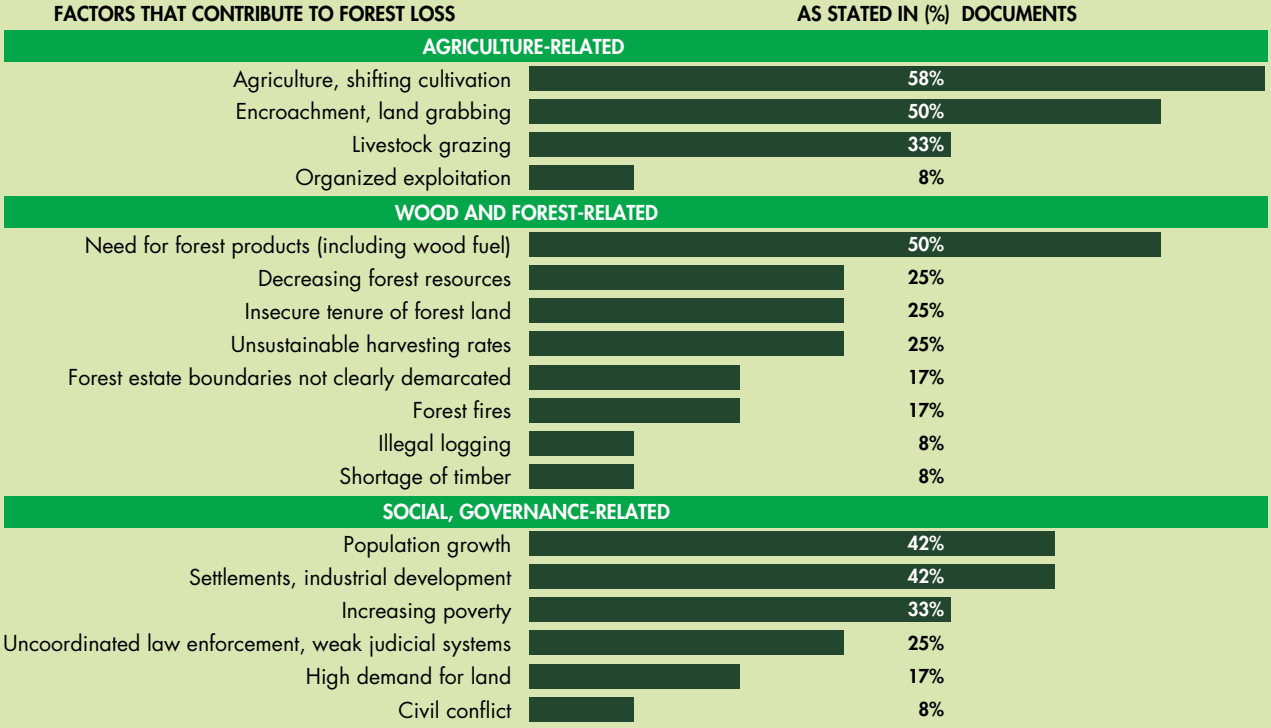


FIGURE 3.2

FACTORS CONTRIBUTING TO FOREST LOSS, AS STATED (SINGLE MENTION) IN THE FOREST POLICIES OF SEVEN COUNTRIES EXHIBITING DECREASES IN FOREST AREA AND INCREASES IN AGRICULTURAL AREA IN 2000–2010



» sustainable and legal forest management, improving governance, and promoting trade in legally produced timber. Countries are also making commitments to other initiatives that promote the goal of zero deforestation, including the 2014 New York Declaration on Forests, which has been endorsed by 36 national governments, 53 companies and 54 civil society organizations.

Causes of forest loss identified in policies

Recognition of the causes of forest loss is a crucial first step in developing effective policies. The analysis of policy documents revealed that the conversion of forests to other land uses is more likely to be identified as a problem in forest policies than in the policies of other sectors.

Policy documents in Zambia state that deforestation is caused primarily by agricultural expansion into forest land. Policy documents in Cambodia, Ghana and Kenya state that inappropriate land-use practices and environmental policies have encouraged land fragmentation, the extension of urban development into agricultural land, deforestation, and encroachment into catchment areas and wetlands.

The forest policy documents of seven countries that had experienced decreases in forest area and increases in agricultural area from 2000 to 2010 were examined in more detail to shed light on the causes of forest loss, as stated in forest policies. Figure 3.2 shows that agriculture (including shifting cultivation, encroachment, land grabbing and livestock grazing) was recognized as a contributing cause to forest loss in the forest policies of all seven countries, and the conversion of forest to agricultural land was seen as instigated by both corporate and smallholder farmers. The documents variously identified demand for forest products, population growth, poverty, and development as other causes of forest loss.

Differences in priorities and objectives between agriculture and forest policies

In any given sector, policy priorities are established in light of issues relevant to that sector. It is unsurprising, therefore, that an analysis of 34 sectoral policies in 18 countries (Figure 3.3) found that forest policies most frequently gave priority to maintaining or increasing forest area. Most (17 out of 19, or 89 percent) of the analysed forest policy documents had explicit policy objectives to increase forest cover or prevent deforestation. For example, Cambodia's forest policy noted that large areas of unmanaged forest are at a high risk of forest degradation and conversion to other land uses and highlighted the need for legal recognition of community forests, including forest concessions in community areas, to reduce the ease with which they can be converted to alternative land uses. Although 11 out of 15, or 75 percent of the agricultural policy documents analysed referred to forests, few made specific statements on, for example, targets for land-use change. Figure 3.3 compares the policy priorities of agriculture and forest policies in 18 countries.

Figure 3.4 shows that the benefits of forests most frequently cited in agriculture policies that referred to forests (those of ten countries) were the use of non-wood forest products for food and animal feed; protective measures for crops and soils; carbon sequestration; and improving irrigation and protecting watersheds.

Some agriculture policy documents recognized the advantages for agriculture of afforestation and agroforestry, and several mentioned mixed forest–agriculture systems. In addition to the benefits shown in Figure 3.4, reasons given in agriculture policy documents for planting trees included the provision of energy from biomass and the creation of additional sources of income for rural people.

The policy documents of nine countries were analysed for their strategic approaches to agricultural growth and increased food »

FIGURE 3.3

PRIORITIES LISTED IN 34 AGRICULTURE AND FOREST POLICIES IN 18 COUNTRIES

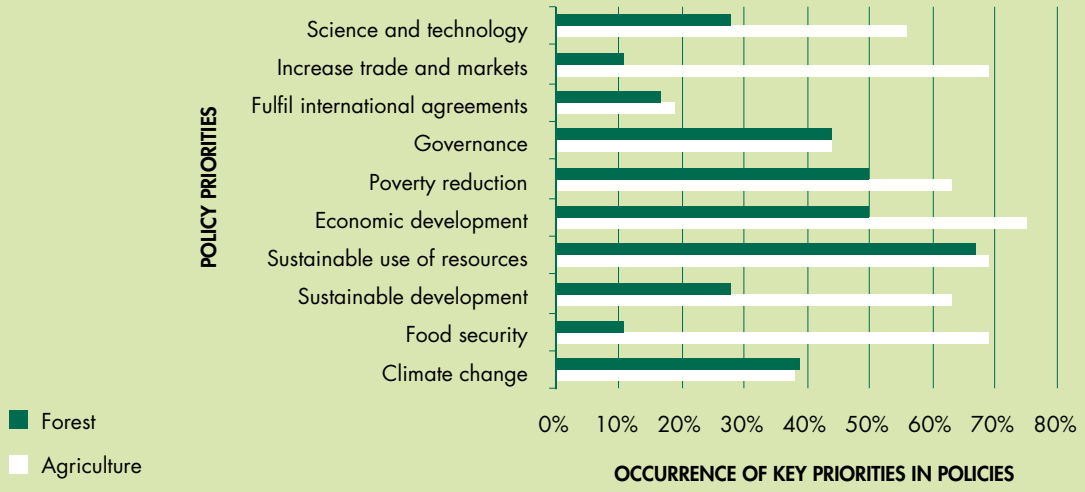


FIGURE 3.4

BENEFITS OF FORESTS, AS MENTIONED IN AGRICULTURE POLICIES (TEN COUNTRIES)

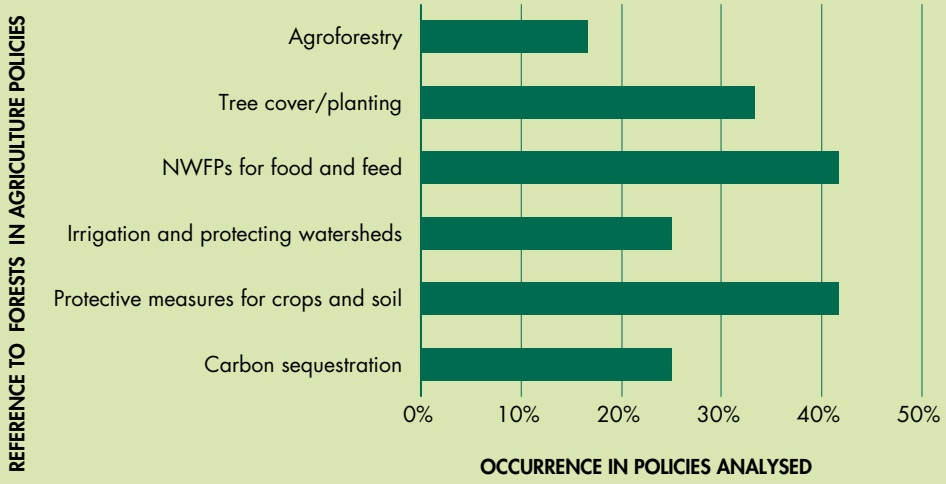
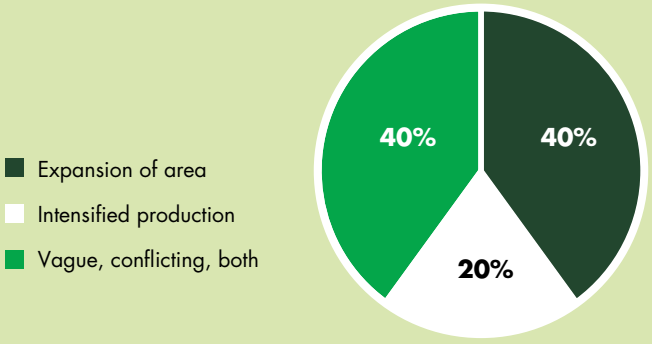


FIGURE 3.5

STRATEGIES FOR FOOD PRODUCTION IN AGRICULTURE POLICIES (NINE COUNTRIES)



» production. Figure 3.5 shows the proportions of strategies for food production in agriculture policies involving the intensification of production on existing agricultural land, the expansion of arable land, and a mixture of both. In two countries, agricultural policies explicitly promoted intensification to make better use of existing agricultural land, stating that increased production could be achieved through agriculture intensification and sustainable land-use practices. Ghana, for example, has a target of 6 percent annual growth in agricultural production, and the agriculture policy states that "increased productivity rather than land expansion has to be the main source of this growth".

On the other hand, three of the nine countries promoted an expansion in the area of agricultural land, which could put further pressure on forests, and the policies of the other four countries were either vague on this issue, had conflicting messages, or advocated both approaches. To achieve agricultural growth without driving deforestation, more agricultural policies should explicitly promote sustainable intensification of agriculture as their main approach to meeting production objectives

Achieving policy coordination

Many of the assessed countries have sustainable land-use objectives that can only be implemented through integrated approaches, with coordination between the forest, agriculture and other natural-resource sectors. Achieving such policy coordination remains a challenge, however. While most policy documents analysed mentioned the value of policy harmonization and cooperation between relevant sectors in general terms, relatively few gave details to demonstrate that this had been considered in depth through, for example, clear statements on institutional arrangements for policy coordination or targets for land-use change. Only 28 percent of the policy documents analysed showed clear evidence of coordination between agriculture and forest-related interests on land-use change. On the other hand, a good example was Zambia's agriculture policy, which stated that "agricultural land covering about 20 percent of the land area is the largest contributor to loss of forest in Zambia …[and] Forestry Management will target reduction in deforestation due to shifting cultivation and agriculture extensification".

Table 3.1 summarizes the intersectoral coordination measures identified in various types of policy document.

A number of policies – including Burkina Faso's rural development programme, Burundi's forest policy and Uganda's National Forest Plan 2011/2012–2021/2022 and National Development Plan 2010/2011–2014/2015 – have specific chapters or subchapters on harmonization with the policies of other sectors, such as agriculture, national development and poverty reduction. Several documents refer to the creation of multistakeholder or interministerial committees or similar bodies to facilitate or improve coordination. Rwanda's forest policy sets out defined tasks, together with a budget and timeframe, for intersectoral cooperation; and Zambia's land policy has a budget and timeframe for developing community participation in integrated land use. The forest policy of the United Republic of Tanzania highlights the value of coordination, stating that "sustainable forest management is impacted by a number of cross-sectoral issues both at management and institutional levels, which require new partnerships to find new innovative solutions".

Complexities in the governance of land-use change could be reduced if policies of potentially competing sectors, such as forests and agriculture, were harmonized and coordinated at the national level. Sectoral policy priorities tend to be internally focused, but the setting of cross-sectoral policies could address this constraint. Tools for helping coordinate approaches for achieving sustainable land-use objectives set out in the policy documents included land-use planning, land zoning, the regulation of land-use change, the demarcation of forest boundaries, and tenure reform. ■

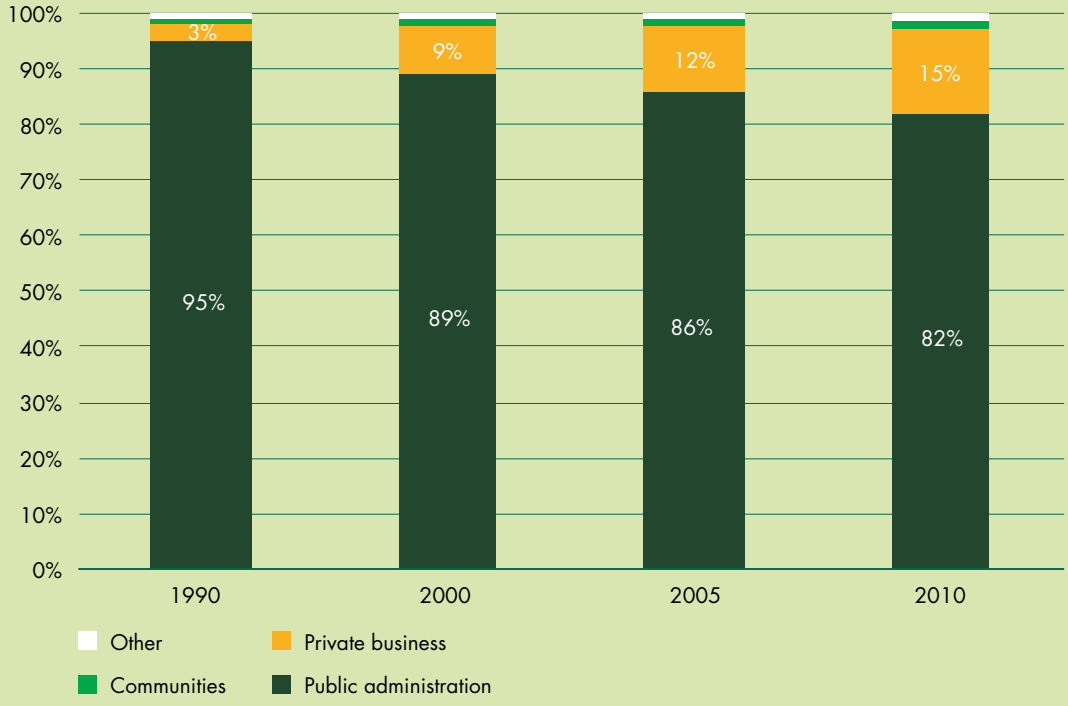
TABLE 3.1

EXAMPLES OF COORDINATION BETWEEN SECTORS, AS EVIDENT IN SECTORAL POLICIES

SECTOR/POLICY TYPE	SECTORS CITED FOR COORDINATION	COORDINATION MEASURE
AGRICULTURE	Rural development, forestry, land management, environment	Secretariat/programmes for coordination of sectoral policies Revision of other sectors' policies and legislation to align with agriculture policy objectives Reforms to harmonize the conflicting legal rights and objectives in the national land policy Formal recognition that effective implementation needs intrasectoral and intersectoral coordination
FOREST	Agriculture, land use, industry, energy, tourism, food security, others	Development of a planning and implementation framework to harmonize forestry with other national economic sectors and coordinate programme implementation Use of multistakeholder consultations, technical working groups, technical assistance and partners Cross-sectoral, holistic land-use planning that promotes coordination among jurisdictions and across local government borders and avoids overlapping claims on forest land Harmonization with national land demarcation programmes
FOOD SECURITY	Agriculture, forests, nutrition, water	Participatory management of policy actions through the creation of multisectoral and multistakeholder management bodies Policy coordination and coherence through the alignment of policies and action plans with other relevant food security and nutrition policies Commissions or interministerial committees to improve national dialogue on food security
NATIONAL DEVELOPMENT	Agriculture productivity, land, fisheries, forestry	Measures to prevent land-use change between forest and agriculture

FIGURE 3.6

CHANGES IN MANAGEMENT RIGHTS TO PUBLICLY OWNED FORESTS, 1990–2010



SOURCE: FAO, 2015a.

3.3 LEGAL FRAMEWORKS FOR LAND-USE CHANGE FROM FOREST TO AGRICULTURE: COMPLEXITIES AND CHALLENGES

The effective governance of land-use change relies on the use of legal instruments to implement national policy objectives. At the global level, there is a lack of comprehensive and consistent information on legal frameworks related to the conversion of forest to agricultural use. The preliminary analysis presented below reveals significant differences between legal frameworks in use around the world (and their implications for land tenure); provides examples of legal provisions related to the conversion of forests to other uses; and highlights the importance of consistency, clarity and effective law enforcement in preventing illegal deforestation.

Legal frameworks

Legal frameworks for regulating land-use change vary between countries and are usually complex, making international comparisons difficult. Their complexity depends on the gaps and inconsistencies within and between sector-specific legislations, and affects in particular the procedures for changing the use of forest land and the attribution of permits for clearing forests. Furthermore, it can be difficult to ensure compliance with the relevant legal framework in the absence of a national land-use plan. A lack of strong and functional institutions represents another major gap, as without such institutions operators may apply their own rules without any guarantee for third parties and national interests.

The situation is further complicated on the ground if existing customary laws that define the common rules and practices of rural communities are not recognized. This increases the risk of land tenure insecurity and the potential emergence of land disputes.

The recognition of customary rights may be especially important for vulnerable forest-dependent people, who may lack secure land tenure and depend on the common-property resources provided by forests for their livelihoods. In the absence of mechanisms to recognize tenure rights, including customary rights, there is an increased likelihood of land disputes caused by overlapping titles and claims to interests in land.

The *Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of Food Security* (FAO, 2012d), which member countries of the Committee on World Food Security adopted in 2012, include clear guidance on ensuring that governance frameworks "recognize and respect, in accordance with national laws, legitimate tenure rights including legitimate customary tenure rights that are not currently protected by law; and facilitate, promote and protect the exercise of tenure rights". Such frameworks should be non-discriminatory, and they should promote social equity and gender equality. The process of establishing policies and laws should be participatory and gender sensitive and should strive to provide technical and legal support to affected communities and individuals.

There are significant differences between countries in the proportions of forest under different types of ownership, and the associated land-use rights. In 2010, 74 percent of the global forest area was publicly owned and 19 percent was private, with the remaining area of unknown or unreported ownership. Figure 3.6 shows, however, that the proportion of publicly owned forest under public administration declined between 1990 and 2010 and the proportion allocated to private business increased.

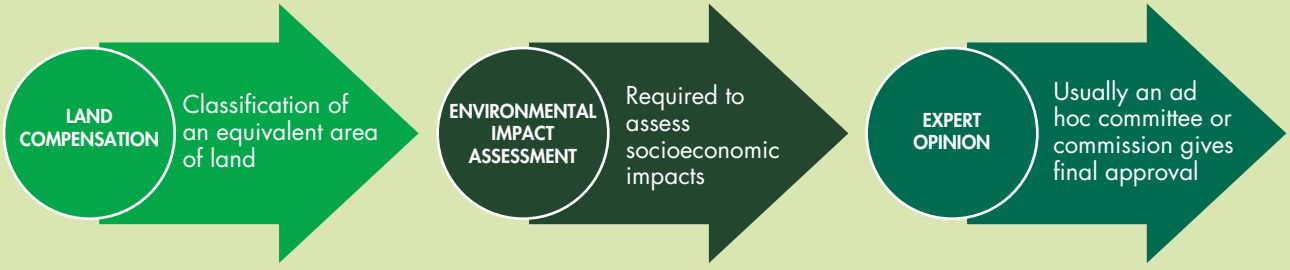
TABLE 3.2

EXAMPLES OF REASONS FOR ALLOWING FOREST CONVERSION AND RELATED CONDITIONS

REASON FOR ALLOWING FOREST CONVERSION	COUNTRY AND LAW REFERENCE	CONDITIONS
Public interest, when there are significant socioeconomic benefits for the country and/or livelihoods		
	Lao People's Democratic Republic (Forestry Law No. 06/NA. Date of text: 24 December 2007, Article 70)	The proposed land-use change should be included in the national socioeconomic development plan
	Colombia (Resolución No. 629: Requisitos y procedimiento para la sustracción de áreas de reserva forestal para programas de reforma agraria y desarrollo rural. Date of text: 11 May 2012)	The proposed land-use change should advance a programme of agrarian reform or rural development
Agricultural, mining, industrial, urban, tourism and other purposes		
	Democratic Republic of the Congo (Loi No. 11-2002 portant Code forestier. Date of text: 29 August 2002, Articles 53, 54)	A deforestation permit is required to clear forest. For agricultural activities, the permit is only required where deforestation covers at least 2 hectares
Existing investment project already approved by a competent state agency		
	Viet Nam (Decree No. 23/2006/ND-CP on the Implementation of the Law on Forest Protection and Development. Date of text: 3 March 2006, Article 29)	Requirements include an environmental impact assessment report; compensation for forest ground clearance; and reforestation of a different area

FIGURE 3.7

TYPICAL STAGES OF A PROCESS FOR DECLASSIFYING A FOREST AREA BEFORE PERMITS FOR CONVERSION MAY BE ALLOCATED



Legal provisions relating to the conversion of forests to agriculture

Most countries prohibit the clearing of forests in protected areas (e.g. national parks, wildlife reserves and protected water catchments), although clearing may be permitted if deemed to be in the "public interest".[9] More generally, legal provisions related to the conversion of forest land to agricultural use typically prescribe the reasons that may justify conversion, the associated conditions, and the institution(s) responsible for implementing and enforcing the law. General provisions pertinent to the conversion of forests to agriculture may be contained in the primary law, but the detailed conditions and rules for permits and concessions, and administrative procedures, are more usually set out in implementing decrees and regulations, and an analysis of procedural details is needed to fully appreciate the level of protection afforded. Table 3.2 presents examples of cited reasons for allowing forest conversion, and related conditions.

In countries where forest land may only be converted to agriculture if it is declassified, the procedures for such declassification are crucial. Figure 3.7 outlines the typical stages of a declassification process, involving the classification of an equivalent area of land as compensation, an environmental impact assessment, and subsequent decisions on the granting of approval. The requirement for an environmental impact assessment is common when investors acquire forest land and wish to convert it to agriculture. Countries with such requirements include Cambodia, Cameroon, Gabon, Ghana, Indonesia and Viet Nam, and the countries of the European Union.

Importance of consistency, clarity and effective law enforcement

The analysis of legal documents suggests that legal provisions related to land-use change are not always harmonized or coordinated between sectors. For example, while provisions related to the conversion of forests are most commonly made in forest laws, there may be relevant provisions in land laws and agriculture laws, and there is a risk that the various provisions are inconsistent or even contradictory.

The analysis of legal documents also revealed that provisions related to land-use change can lack detail and clarity, with the potential that this will lead to confusion and increased illegal activity. Therefore, provisions for the forest declassification process (for example) should give sufficient detail about procedures; expert committees with responsibility for decisions on the declassification of forest land should have clear scientific criteria as the basis for their decisions; and there should be clear provisions for stakeholder consultation. Permits and concessions that authorize forest clearing should include specific provisions to prevent the use of methods that cause environmental damage or ignore the rights of communities.

A comprehensive and exhaustive legal and regulatory framework cannot, in itself, prevent illegal forest conversion. While clear procedures and mechanisms are essential, they are of little value if they are unenforced or implemented ineffectively. Box 3.1 and Box 3.2 highlight challenges to implementation and enforcement in the Congo Basin and Papua New Guinea. ■

9 "Public interest" is seldom defined in forest legislation, however, and may be interpreted differently in different countries.

BOX 3.1

IMPORTANCE OF LAW ENFORCEMENT IN PREVENTING ILLEGAL FOREST CONVERSION

The independent monitor for voluntary partnership agreements under the European Union's Forest Law Enforcement, Governance and Trade (FLEGT) initiative has highlighted the risks of illegality in the Congo Basin linked to the lack of enforcement of existing laws. A report on three deforestation permits signed in June 2013 noted that, among other breaches, no environmental impact study had been carried out, even though the Forestry Code makes such a study a requirement for projects involving deforestation. The Independent Monitor in the Republic of the Congo (a unit established by the Congolese government in 2007 to oversee the implementation of the forest legislation) also reported non-compliance with basic conditions for the issuance of deforestation permits due to the failure to provide an environmental impact assessment.

SOURCES: Report No. 01/CAGDF, mission of 6–23 April 2014, pp. 10–11; Report No. 016/REM/CAGDF/FM Independent Observation-FLEG, mission report, November 2012.

BOX 3.2

EXAMPLE OF LEGAL PROVISIONS ON FOREST CONVERSION, AND IMPLEMENTATION CHALLENGES, IN PAPUA NEW GUINEA

LEGAL PROVISIONS

Papua New Guinea's Forestry Act, 1991, includes provisions related to the large-scale conversion of forest to agricultural or other land uses. Where the proposed clearance is more than 50 hectares in size, applications must include:

- a detailed development plan, evaluation report and certificate of approval from the relevant government department;
- an implementation schedule for the agricultural or other land-use project, showing the precise areas and proposed rate of harvesting to be carried out;
- detailed costs of the project and a bank certificate certifying that the full costs of funding the project will be available to the applicant;
- a map and description of the project area showing any areas with slopes in excess of 30°, any other areas unsuitable for agricultural or other land-use development, and any areas important for conservation;
- verification of ownership and the consent of each resource-owning clan agent; and
- approval of the environmental impact statement by the department responsible for environment and conservation matters.

When an application is submitted, the provincial forest management committee makes recommendations to the National Forest Board (which also includes stakeholders from the private sector and local government, and a representative of women) for approval or denial of the application. If the Board is satisfied with the recommendation and the outcome of the public hearing, it recommends accordingly to the minister, and then to the National Executive Council, that the application for conversion of forests to agriculture or other land use be endorsed.

SOURCE: Forestry Act, 1991, FAOLEX No: LEX-FAOC022285.

IMPLEMENTATION CHALLENGES

A recent study showed that, since 2007, 5 million hectares of forests (representing 16 percent of the accessible commercial forest area in the country) had been licensed for conversion to large-scale agricultural plantations in Papua New Guinea, consisting mostly of oil palm (but also cocoa and other crops). According to the study, "numerous protests by local landowners and a series of exposés by non-governmental organizations led the government to institute a Parliamentary Commission of Inquiry in 2012". The results of the inquiry were that, of 42 special-purpose agricultural business leases examined, "only four had proper landowner consent and viable agricultural projects. The remainder, or more than 90 percent, was obtained through fraudulent or corrupt means." The study noted that, of 36 oil-palm plantation projects, "only five were likely to be actually planted, while the rest were most likely simply covers for obtaining valuable timber".

SOURCE: Forest Trends, 2014.

3.4 INVESTMENTS IN AGRICULTURE AND FORESTS AND THEIR IMPACTS ON LAND USE

Impacts of investments in agriculture

For many developing countries, particularly low-income, food-deficit countries, agriculture is the largest sector in terms of both employment and share of gross domestic product (GDP), which can be as high as 30 percent. In such countries, public spending on agriculture is an important policy instrument for promoting agriculture growth and food security (FAO, 2012c). According to FAO's Agriculture Orientation Index[10] (FAO, 2015c), however, agricultural expenditure as a proportion of its contribution to GDP is declining in many of these countries. Poverty and hunger, perpetuated by a lack of economic opportunity, force poor people to exploit the natural resources around them. Forest loss, therefore, is a chronic feature in many low-income, food-deficit countries where government investment in agriculture is low. Figure 3.8 shows that the loss of forest cover is greatest in countries with a low Agriculture Orientation Index and that these are also low-income countries. This finding is in conformity with earlier studies that identified subsistence agriculture and large-scale commercial agriculture as significant causes of deforestation in some countries and regions.

Countries that promote agricultural investment and value added and support enabling infrastructure have mostly been able to address forest loss more effectively. According to FAO's recent comprehensive analysis of food and agriculture policies (Angelucci *et al.*, 2013; Demeke *et al.*, 2013), many low-income, food-deficit countries also suffer from a lack of investment in complementary agricultural infrastructure and financial services, such as processing, distribution and marketing. These countries mainly use input subsidies and other budgetary transfers to support producers and make only minimal efforts to address inefficiencies in the commodity value chain. Continued government spending aimed solely at increasing production without addressing such inefficiencies could result in an expansion of the area under agriculture – potentially at the expense of forests – without significantly improving food security.

Government spending on agricultural support services is particularly low in sub-Saharan Africa (FAO, 2012c, 2015c), but there has been considerable progress in providing such services in Asia and Latin America and the Caribbean. For example, nearly all countries in Asia have specialized banks serving agriculture. In India, loans to agriculture increased at a compound annual growth rate of 18.5 percent between 2005 and 2010. A sharp growth in the number of rural, cooperative and other banks has significantly increased the volume of agricultural loans in China. China and India together accounted for nearly half the global increase in spending on public agricultural research and development between 2000 and 2008. In addition to strengthening extension services for smaller producers, many countries in Latin America and the Caribbean promote trade through product differentiation and other value-added activities. Since 1981, however, production growth in sub-Saharan Africa has been based almost entirely on extending the area under cultivation (UN, 2008).

10 See the annex for definitions of Agriculture Orientation Index, government expenditure on agriculture, Human Development Index, investment, poverty headcount ratio, poverty gap, public-sector expenditure on agriculture and forestry, and subsidy.

Linking agricultural investment with environmental compliance and performance standards

Adjusting support for commercial agriculture by introducing environmental safeguards such as cross-compliance measures can help avoid forest loss, especially in those countries where large-scale agricultural subsidies have had a significant impact on deforestation (see Chapter 2). Commercial agriculture has led to forest loss in, for example, Argentina, Brazil, the Democratic Republic of the Congo, Ecuador, Indonesia, Mozambique, Myanmar, Nigeria, the United Republic of Tanzania, Venezuela (Bolivarian Republic of), and Zimbabwe (Rudel *et al.*, 2005; Boucher *et al.*, 2011). Agricultural subsidies increase the profitability of the commodities they support (by making them cheaper to produce) and attract investors. This leads to pressure to expand agricultural land, potentially at the expense of forests. Examples include industrial-scale cattle ranching and soybean production in the Amazon, and commercial oil-palm plantations in Southeast Asia (McFarland, Whitley and Kissinger, 2015). Combined, Brazil and Indonesia paid more than US$40 billion in subsidies to the palm-oil, timber, soy, beef and biofuel sectors in 2009–2012 (Kissinger, 2015); those two countries also accounted for over half of the total global forest loss in 1990–2010. In some countries, such as Mozambique, deforestation is occurring as a result of simultaneous pressures exerted by subsistence farming and commercial agriculture.

Producer subsidies for large-scale commercial agriculture do not in themselves always lead to deforestation. In China and the United States of America, for example, agricultural subsidies are high but forest area is increasing in both countries; this is also the case in some smaller countries, for example in the European Union. Regulatory frameworks are needed to mitigate the potential negative social and environmental impacts of agricultural subsidies, especially in countries that are attractive to investors in large-scale commercial agriculture and where there is a high risk that such investment will lead to forest loss (Committee on World Food Security, 2015).

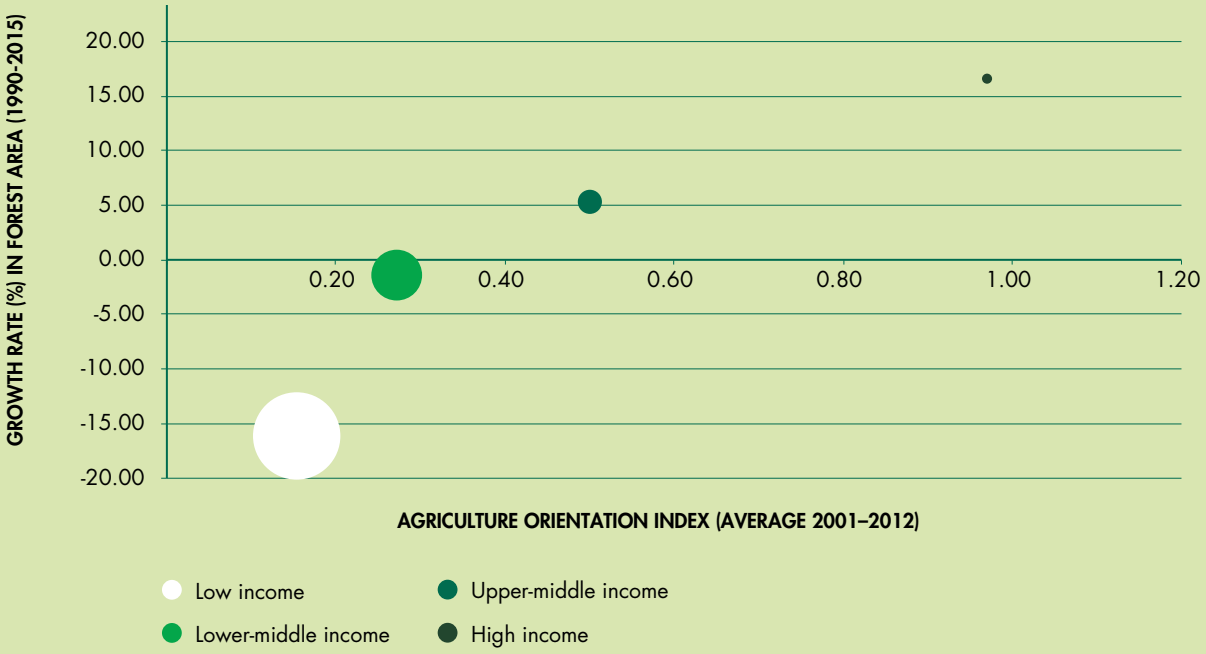
There is growing interest in improving the efficiency of agricultural subsidy programmes by changing their design from universal coverage to more targeted approaches (Demeke *et al.*, 2013; Angelucci *et al.*, 2013). The rules and criteria now being applied to ensure that subsidy programmes and other budgetary allocations are efficient, effective and equitable in the long run include environmental compliance and performance standards (e.g. relating to deforestation and poverty alleviation). It is estimated that a single reform in Brazil linking rural credit subsidies to environmental criteria saved US$1.4 billion in reduced loans in 2008–2011; moreover, without this reform an estimated 270 000 additional hectares of forest would have been lost due to increased beef production (McFarland, Whitley and Kissinger, 2015). Brazil's "Bolsa Verde", an example of a conditional cash-transfer programme, has the objective of conserving Brazil's important forest ecosystems and simultaneously improving the livelihoods of people living in extreme poverty (nearly 17 percent of people in the Brazilian Amazon). Thousands of forest-dependent poor families receive financial benefits through Bolsa Verde in return for a commitment to maintain vegetation cover and sustainably manage natural resources (Brazil, 2014).

Impact of investments on forests

Public expenditure on forests is a good indicator of a country's commitment to sustainable forest management. Because the majority of the world's forests are publicly owned, public-sector finance is a major source of funding for forestry activities, especially those focused on social and environmental benefits. In several countries, however, public expenditure on forests is disproportionately low compared with the forest sector's contribution to GDP, and this has contributed to deforestation. »

FIGURE 3.8

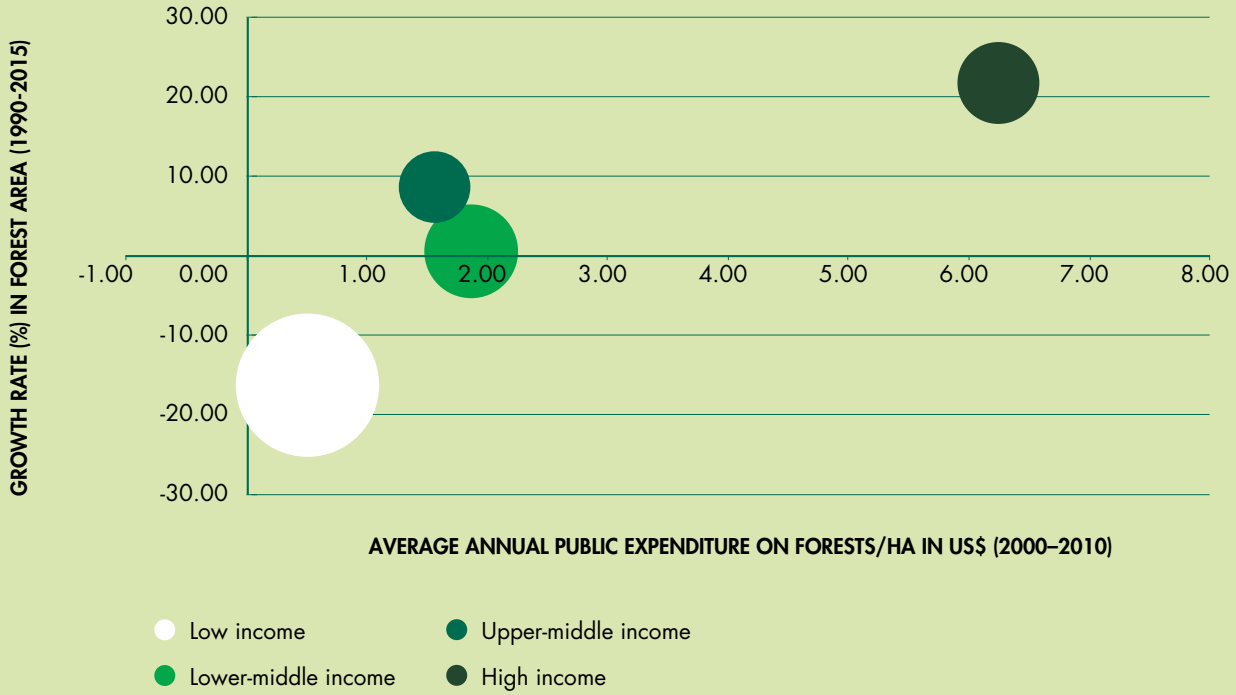
RELATIONSHIP BETWEEN INVESTMENT IN AGRICULTURE, CHANGE IN FOREST AREA, AND POVERTY



Note: Size of the bubbles represents the Poverty Head Count Ratio.
SOURCE: FAO, 2015a, 2015b.

FIGURE 3.9

PUBLIC EXPENDITURE ON FORESTS, FOREST GROWTH RATES, AND THE FOREST SECTOR'S CONTRIBUTION TO NATIONAL GROSS DOMESTIC PRODUCT



Note: Size of the bubble represents forest sector's contribution to GDP in 2011.
SOURCE: Based on FAO, 2015a.

» Figure 3.9 shows that, in low-income countries, the forest sector's contribution to GDP is relatively high but public expenditure on forests is low; this was also the finding of an analysis of forest-sector public expenditures by Fowler *et al.* (2011). In such countries, therefore, forests are exploited to generate revenue for the state, with little reinvestment and a loss of forest area. An additional pressure in such countries is high woodfuel demand. In high-income countries, in contrast, public expenditure on forests and associated rural development programmes is relatively high, and forest area is increasing. High-income countries also have the largest share of global forest area designated for production, and most of that production is concentrated on high-value products – the majority of global value added in the forest sector is in developed countries (FAO, 2014c). The contribution of the forest sector to total employment is also higher in developed countries because of the large number of people employed in further processing, and labour productivity is higher. On the other hand, despite abundant forest resources, sub-Saharan Africa accounts for an insignificant share of global value added in forest products; labour productivity is also low in the region.

Comprehensive global data are unavailable on the incentive mechanisms employed by countries to promote forestry, making it difficult to analyse the links between such mechanisms and land-use outcomes. A review of relevant literature and case studies conducted for this report, however, indicates that, in some countries, specific financial mechanisms have succeeded in arresting deforestation or increasing forest area. The review also suggests that those countries have become increasingly sophisticated in their approaches to funding for forestry. There is growing realization that innovative investments in forests can help achieve major public policy and economic goals, such as mitigating climate change, combating land degradation, promoting landscape-scale restoration, enhancing the resilience of agriculture, and providing additional income and jobs for local communities. Policy incentives to promote community forestry and small and medium-sized enterprises have helped generate incremental benefits for local people. Policies in the Gambia, for example, were designed to strongly incentivize local communities to assume greater responsibilities and make stronger commitments to managing forests sustainably. In Viet Nam, government support for the development of local forest enterprises constitutes a good example of forest-based rural development.

While there is wide variation in the nature and scale of forest investment strategies, the two major approaches used by countries are: 1) direct public-sector investment; and 2) measures to create and reinforce a favourable enabling environment with the aim of attracting and channelling private-sector investment in forests. These two approaches are discussed below.

Direct public investment programmes in forestry

Robust, long-term direct public investment programmes have helped some countries arrest deforestation caused by agricultural expansion. China, Egypt, India, Iran (Islamic Republic of), Kuwait, Mexico, Morocco and Tunisia, for example, have all launched national afforestation or forest rehabilitation programmes. Greater political priority has been given to forests in those countries as a result of concern that further forest degradation would lead to increased costs in the future. China budgeted more than US$40 billion for one of its programmes, the Sloping Land Conversion Programme, which aimed to convert 14.67 million hectares of cropland to forests as part of a massive afforestation drive (Bennett and Xu, 2005). Major afforestation and reforestation programmes have been underway in India since the enunciation of the 1988 forest policy, which included an objective of increasing the country's forest and tree cover to one-third of the land area. For example, the Green India Mission has set aside a budget of US$10.1 billion to increase forest area by 5 million hectares by 2020 (Gregersen *et al.*, 2011).

Complementarity between rural development and crucial environmental goals has made investment in forests a logical solution to poverty in countries such as Bhutan, the Gambia, Ghana, India, Mexico and Viet Nam. In many developing countries, forests and trees serve as major sources of livelihood, particularly for the poor and women, meeting subsistence needs, generating cash income and serving as economic "safety nets" in critical periods. Forest degradation can have direct negative effects on vulnerable people and lead to severe social unrest and conflicts, and recognition of this has led to active processes of integrating forestry into poverty reduction and rural development strategies (Gregersen *et al.*, 2011; Kissinger, 2015). Gender-differentiated tasks and responsibilities in food production and provision and the generation of cash income often mean that women and men have different needs, opportunities, priorities and concerns. Although women tend to commercialize forest products less than men, the sale of forest products can be an essential source of cash income for women, who lack many of the opportunities for generating cash income commonly available to men (Sunderland *et al.*, 2014). The REDD+ Gender Strategy aims to help forest communities, indigenous peoples and women participate in the design, monitoring and evaluation of REDD+ programmes and to ensure that funds and benefits are equally accessible to low-income women and men who manage the forests (UN-REDD, 2013).

Creating enabling environments for private-sector investment in forestry

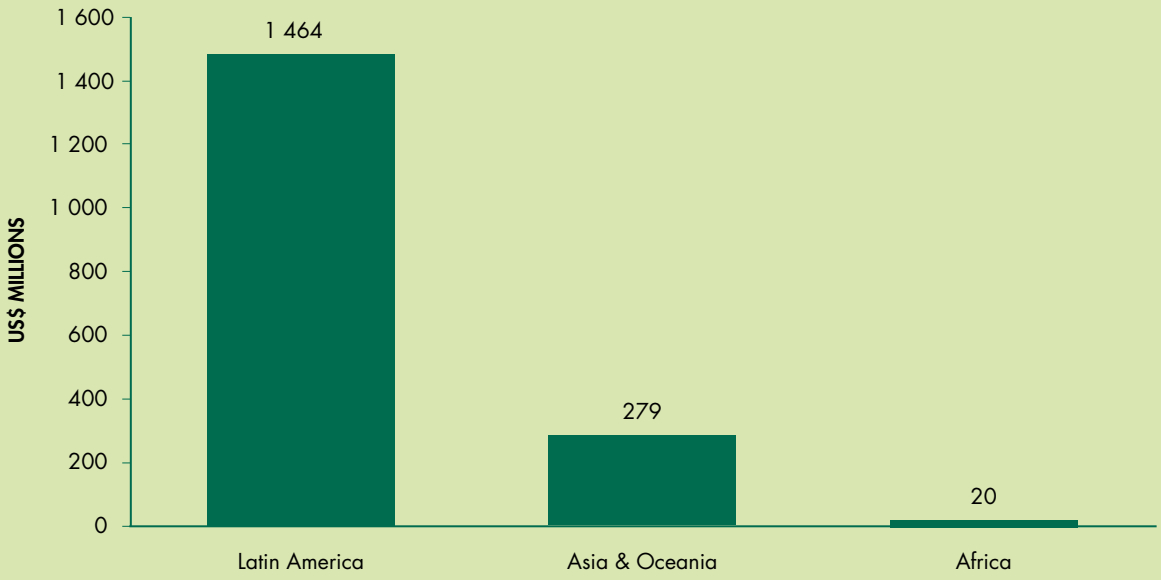
Many countries have created successful enabling environments for increased private-sector investment in forestry. Favourable investment policies have performed important leveraging functions in boosting private-sector investments in, for example, Chile, China, Costa Rica, Turkey, Uruguay and Viet Nam. Targeted incentives include subsidized credit, import subsidies, and tax breaks to promote forestry (Gregersen *et al.*, 2011). Investor apprehensions about investing in forests have been eased by measures such as insurance; price and purchase guarantees; the promotion of public–private and private–private partnerships; and improved access to financial and market services and information.

Latin America has led the way among developing countries in promoting private-sector forest investment (Figure 3.10). The high proportion of private forest ownership in the region is one of the factors behind this trend. Latin American countries have also pioneered fiscal instruments, such as payments for environmental (or ecosystem) services (PES), designed to encourage better environmental stewardship. Other strategies include the establishment of dedicated national forest funds and the promotion of new alliances through portfolio approaches to leveraging funds. In Uruguay, for example, the forest plantation area increased by about 40 000 hectares in 2008–2011, representing an estimated annual investment of US$48 million.

New instruments and capital market investments have emerged that allow forest owners to monetize their forest assets and enhance their income, for example through the forest-backed securitization of investments (FAO, 2015d). Risk–insurance mechanisms have been developed in cooperation with investment banks and integrated into national financial services. The objectives of such measures include reducing upfront establishment costs, providing liquidity, and mitigating risk and uncertainty. In Costa Rica, for example, forest and financing stakeholders are pursuing instruments such as microcredit, repurchase agreements, and the securitization of forest-based cash flows to improve financing for small-scale forestry (FAO, 2015c). Small-scale enterprises may also require assistance in strengthening their associations and cooperatives to increase their negotiating power, advocacy and access to markets and credit. ■

FIGURE 3.10

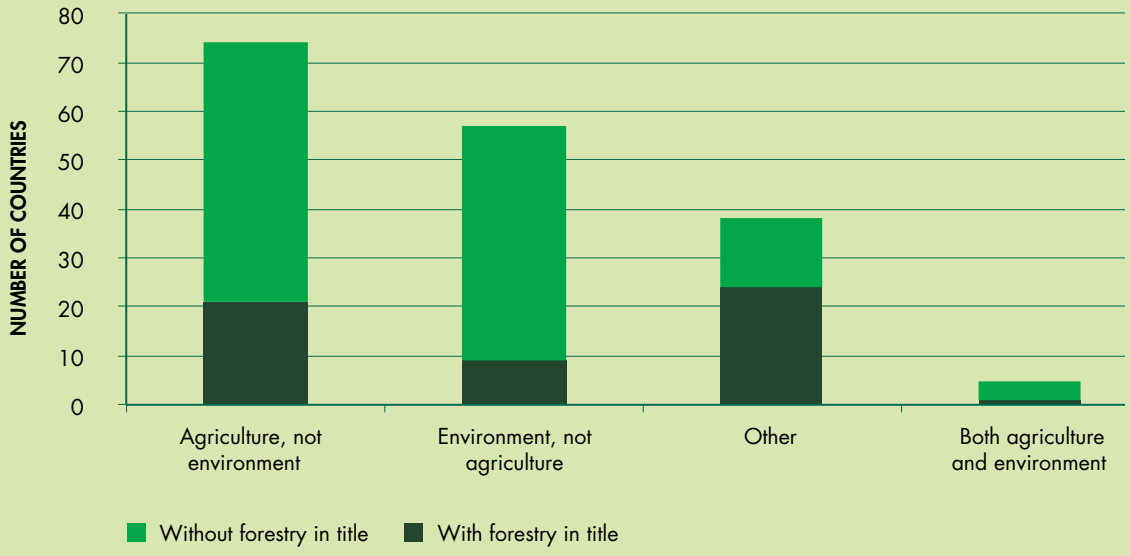
TOTAL PRIVATE FOREST PLANTATION INVESTMENT IN DEVELOPING COUNTRIES, 2011



SOURCE: Castren *et al.*, 2014.

FIGURE 3.11

MINISTRY WITH MAIN RESPONSIBILITY FOR FOREST POLICY, 2008



SOURCE: FAO, 2010.

3.5 INSTITUTIONAL MECHANISMS FOR GOVERNING LAND-USE CHANGE

Land-use planning

Land-use planning is an institutional mechanism employed by countries to balance competing land uses among stakeholders. It involves the systematic and iterative assessment of land and water potential in order to select and adopt the best land-use options and to create an enabling environment for the sustainable development of land resources. The aim is to select and put into practice those land uses that will best meet the needs of the people while safeguarding resources for the future and empowering people to make decisions about how to allocate those resources (FAO, 1993; FAO and United Nations Environment Programme, 1999).

Effective land-use planning is challenged when different line ministries and agencies – at both the central and decentralized levels – undertake their own land-use planning using separate processes, information and maps. Thus, while plans may exist for forests, agriculture and other sectors, the links between them may be weak. The risk of uncoordinated approaches is greater when forests and agriculture are under the jurisdiction of different ministries; Figure 3.11 shows that this is not uncommon.

The difficulty of coordinating land-use and watershed management planning is an issue that affects both developing and developed countries. A recent review of western European countries concluded that, despite the importance of coordination between forest planning and planning in other sectors, the plans concerned were barely consistent with each other in all the countries studied (Cullotta *et al.*, 2014). A landscape approach, as promoted by the Global Partnership on Forest and Landscape Restoration, has the advantage of a multifunctional perspective in which natural resource management is integrated with environmental and livelihood considerations. Such multifunctionality may include climate-change adaptation measures aimed at enhancing the natural resilience of ecosystems and reducing the vulnerability of people by maintaining environmental services (FAO, 2013c).

Tools and methodologies such as maps, databases and land suitability appraisals are available to assist integrated land-use planning on the most appropriate types of land use for given areas. At the national level, capacity for the interpretation of remote sensing data and the provision of credible and transparent information can be used to help design land-use incentives. Unifying the databases that support decisions on land use can help prevent inconsistent approaches to land-use planning among different government agencies. Brazil, for example, developed a map of public forests in 2006 that brought together a wide range of land-related information, from mining permits to social settlements, for use in the formulation and implementation of public policies. Indonesia approved its One Map initiative in 2014 (see Box 3.3) for a similar purpose as part of its REDD+ strategy.

Another challenge for land-use planning is to balance scientific and technical considerations (such as those related to soil capability, land suitability, topography, watersheds, ecological importance, proximity to cities, and minerals) with the needs and demands of local stakeholders. Whereas technocratic approaches were predominant in the 1980s and 1990s, participatory and stakeholder-centred methodologies are now more common (FAO, 2015e; BMZ, 2012). Adequate platforms and consultative instruments are needed for effective multistakeholder participatory processes.

Monitoring and enforcement

Participatory cross-sectoral land-use planning processes are necessary for sustainable land use and for balanced decisions on forest conversion, »

BOX 3.3

INDONESIA'S ONE MAP INITIATIVE

The aim of Indonesia's One Map initiative is to help resolve disagreements arising from the use of different data and maps, such as overlapping permits for plantation and mining operations. The Geospatial Information Agency has published a basic geospatial information map for use by government agencies, along with a national land-cover map, a national sea grass/shallow waterbed map, a national maritime characteristics map, and a provincial mangrove map of Sumatra. Accurate and up-to-date geospatial information will also help the government in drafting policies, resolving land disputes and managing its assets.

SOURCE: Salim, 2014.

BOX 3.4

BRAZIL'S RURAL ENVIRONMENTAL REGISTRY

Brazil's Rural Environmental Registry (CAR) was established in the new Forestry Code (Federal Law No. 12,651/2012). It is a public registry system; persons who possess or own rural land must register with it. The owner or possessor of rural land must certify their intent to comply with environmental regulations related to their rural property. If the rural landowner or possessor fails to comply with environmental regulations, they become subject to administrative, civil and criminal liabilities. Under the Forestry Code, commercial banks will be required – as of May 2017 – to request rural landowners and possessors to provide proof of registration with CAR before granting agricultural land loans.

TABLE 3.3

COMPARISON OF COUNTRY CAPACITIES FOR FOREST AREA CHANGE MONITORING WITH THE QUALITY OF REPORTED DATA ON DRIVERS DERIVED FROM THE REDD+ READINESS REPORTS OF 45 COUNTRIES

	COUNTRY FOREST AREA CHANGE MONITORING CAPACITY			
Quality of reported driver data	Low	Medium	High	Total
Low (listing)	8	7	3	18
Medium (ranking)	3	10	2	15
High (quantitative)	2	4	6	12
TOTAL	13	21	11	45

SOURCE: Kissinger, Herold and De Sy, 2012.

» but they may be insufficient on their own. Limited capacity, asymmetric information and the misuse of public power can all hinder the implementation of land-use plans. A recent study (Forest Trends, 2014) found that a very significant proportion of land conversion is illegal, either in violation of laws related to the issuance of licences or in the way the conversion is carried out. Good land-use planning depends not only on the planning process, but also on effective enforcement (and the appropriate use of incentives). Effective enforcement requires adequate capacity for monitoring and the use of institutional instruments capable of deterring, detecting and taking effective legal action against illegal activities. A survey of capacity for monitoring changes in forest area conducted in 45 countries (Kissinger, Herold and De Sy, 2012) found that only about one-quarter of the surveyed countries had the capacity to produce high-quality data on drivers of forest area change (Table 3.3).

Remote sensing is helping to increase the availability of information and improve monitoring strategies. The Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (Ministério do Meio Ambiente), launched in 2004, includes integrated actions among government institutions and innovative procedures for monitoring, environmental control, and territorial management. This approach helped reduce deforestation from about 2 million hectares in 1998 to less than 0.5 million hectares in 2012 (Ministério do Meio Ambiente, 2013; Midia Amazonia, 2015).

Private investors can use remote sensing to improve the management and monitoring of their lands, and civil society organizations can use it in their independent monitoring. Brazil's new Forest Code, enacted in 2012, makes mandatory the submission of georeferenced data for the registration of private rural properties (Box 3.4). Challenges with this requirement have been reported, especially the use of different image sources and variable technical capacity for interpretation (Soares-Filho *et al.*, 2014; Rajao and Azevedo, 2012). However, this mechanism has improved monitoring and accountability, and provided baselines for a number of private governance agreements, including the soy and cattle moratoria.

Engagement with civil society and the private sector

There is increasing recognition in public-sector institutions of the need to work closely with civil society and the private sector in multisectoral and multi-institutional platforms as a way of legitimizing national policies and improving the governance and management of land-use change. The institutional framework should be viewed not simply in terms of government departments and administrative structures but as an integrated system in which those components of the framework work with local communities, civil society organizations, and responsible private-sector interests. When local people are able to associate and form organizations and federations at the local and national levels they can engage more powerfully in advocacy to maintain their rights. The recognition of customary or informal tenure rights provides local people with a strong motivation to perform enforcement and oversight functions, thereby helping ensure that regulatory frameworks are applied. There is also evidence that, when sufficiently motivated, communities are at least as good – and sometimes better – at reducing deforestation than government agencies in strictly protected areas (Porter-Bolland *et al.*, 2012). In Viet Nam, for example, the government has engaged with communities and paid them to protect local forests and plant trees; local people have now become the "front line" in enforcing regulations to control illegal logging, showing the importance – and cost-effectiveness – of governments working with civil society and community-based organizations to tackle deforestation.

Private governance has become more prominent in promoting sustainable land use, with an increasing number of private companies voluntarily committing to eliminate deforestation »

GRENADA
The Ceiba tree, a giant among tropical forest trees, the products of which include its use for medicinal purposes and Kapok for mattress stuffing.
©FAO/Giuseppe Bizzarri

» from their supply chains. Initiatives include voluntary certification schemes, such as those of the Forest Stewardship Council, the Programme for the Endorsement of Forest Certification, the Roundtable on Sustainable Palm Oil, and Rainforest Alliance Certified Coffee Farms. The Consumer Goods Forum (CGF), which represents 400 companies in 70 countries, has published sustainable sourcing guidelines for palm oil and soy. Through its Soft Commodities Compact, the CGF is also working with the banking industry to help achieve zero deforestation. In 2012 it formed the Tropical Forest Alliance in partnership with the Government of the United States of America, launching the Africa Palm Oil Initiative in 2015. Cameroon, Côte d'Ivoire, Gabon, Ghana, Liberia and Nigeria are engaged in this initiative, which aims to achieve a prosperous palm-oil industry in a way that is environmentally and socially sustainable and protects the region's forests.

Another example of private governance is the soy moratorium in Brazil, under which major soybean traders have agreed not to purchase soy grown on lands deforested in the Brazilian Amazon after July 2006; previously, nearly 30 percent of soy expansion occurred through deforestation rather than the replacement of pasture or on other previously cleared lands, but this has now fallen to about 1 percent (Gibbs *et al.*, 2015a). Zero-deforestation cattle agreements signed by major meatpacking companies have also helped reduce deforestation in parts of Brazil (Gibbs *et al.*, 2015b). Increasingly, companies are willing to support social and environmental projects as part of their corporate social responsibility strategies. In Tunisia, for example, the forest administration is coordinating the "Pact for a Green Tunisia", which acts as a project broker for companies wanting to provide voluntary support for forest-based development (FAO and Global Mechanism of the UNCCD, 2015).

Need for a multipronged approach

The effectiveness of individual policy tools, such as legal provisions, financial incentives, land-use plans, monitoring and enforcement mechanisms, and partnerships with the private sector and civil society should not be assessed in isolation. A review of developing countries that have recently simultaneously achieved increases in food production and forest cover highlighted the importance of multiple interacting mechanisms, such as agricultural intensification, land-use zoning, forest protection, increasing reliance on imported food and wood products, and foreign capital investments (Lambin and Meyfroidt, 2011). The remarkable reduction in deforestation rates in the Brazilian Amazon noted above, for example, was achieved partly through a combination of: inclusive public social investment for development; well-targeted economic incentives and changes to agricultural incentives; increased agricultural yields; improved law enforcement and monitoring of deforestation; the creation of protected areas; and the legal recognition of indigenous lands. External factors are also important: research by the Climate Policy Initiative (Assunção, Gandour and Rocha, 2012) attributed around half the drop in annual deforestation in Brazil since 2004 to factors such as lower world prices for beef and soya (and the other half to governmental actions). ■

CHAPTER 4

MAKING ROOM FOR FORESTS AND FOOD SECURITY

SIERRA LEONE
The chairwoman of a local Agri-business centre on a community cabbage plot.

KEY MESSAGES

1 Case studies in several countries show that **ECONOMIC REFORMS** can help increase food security while also maintaining or increasing forest cover. Market-oriented agriculture policies, with social and environmental safeguards, have helped increase productivity through increased investment, especially by the private sector, without requiring expansion of agricultural land to boost production.

2 Effective land-use policies recognize the full **ECONOMIC, SOCIAL AND ENVIRONMENTAL VALUES** of forests, including their role in delivering wider economic development and poverty reduction programmes.

CHAPTER 4

3 Effective and inclusive legal and institutional frameworks provide **PREDICTABLE AND SECURE LAND AND FOREST TENURE**, with rights to trees, tree products and services, and measures to regulate land-use change effectively. Building the capacity of producer and community organizations contributes to improving institutional frameworks.

4 **DEVOLVING FOREST MANAGEMENT RIGHTS** to local communities and smallholders helps improve access to forest benefits, leading in turn to greater recognition of the value of forests. Effective collaborative forest management requires that public institutions and community organizations understand their roles and have the capacity to perform them.

5 Approaches for integrating land uses and landscape management include **STRATEGIC LAND-USE FRAMEWORKS**, collaboration among agricultural and forest institutes on research, development and extension, strengthening of farm–forest links, and the promotion of agroforestry.

CHAPTER 4

MAKING ROOM FOR FORESTS AND FOOD SECURITY

4.1 REDUCING DEFORESTATION AND IMPROVING AGRICULTURE AND FOOD SECURITY

One of the main drivers of deforestation identified in Chapter 2 is the conversion of forest land to agriculture, but measures aimed at improving food security need not cause deforestation. This chapter presents case studies from countries that have succeeded in improving food security while also increasing or maintaining their forest areas as a way of understanding the underlying factors that have contributed to these positive trends.

According to the 1996 World Food Summit, "food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life". The four dimensions of food security are 1) food availability, 2) economic and physical access to food, 3) food utilization, and 4) stability; nutrition is also integral to food security.

Although agriculture and forestry are sometimes perceived as conflicting land uses, well-managed forests have tremendous potential to promote food security. Forests cover one-third of the earth's land surface, and forest environmental services are crucial for agricultural production because of the key roles they play in water cycles, pollination, natural pest control, soil fertility, local climate regulation and resilience to changing environmental conditions. Forests contribute to rural livelihoods and poverty alleviation through income generated by employment in the production of forest goods and environmental services. Millions of people depend on food from diverse plants and animals found in forests and from trees located outside forests, increasing the nutritional quality and diversity of their diets; forest foods can also serve as safety nets in periods of food scarcity. Another major contribution of forests to food security is the provision of woodfuel for cooking and to water sterilization; it is estimated that 2.4 billion people, or about 40 percent of the population of less-developed countries, cook with woodfuel (FAO, 2014a).

A suite of food-security indicators is used to measure the four dimensions of food security (FAO, 2013b) . Two indicators of the "access to food" dimension are the prevalence of undernourishment (PoU) and the number of people who are undernourished (NoU). In the selection of case studies for this report, these two indicators were used as criteria for identifying countries that have improved food security since 1990. Data from the *Global Forest Resources Assessment 2015* (FAO, 2015a) were used to identify countries in which forest area had increased or been maintained since 1990. An analysis based on these criteria identified 22 countries that had both improved food security and increased or maintained their forest areas since 1990. Those countries were clustered according to region and using the World Bank income-level classification; because no low-income countries were in the list of 22 countries,

TABLE 4.1

INCREASES IN FOREST AREA AND IMPROVEMENTS IN FOOD SECURITY, 1990–2015

COUNTRY	CHANGE IN FOREST AREA (%)	CHANGE IN AGRICULTURAL AREA (%)	PREVALENCE OF UNDERNOURISHMENT (%)		NUMBER OF PEOPLE UNDERNOURISHED (MILLIONS)	
	1990–2015	1990–2010	1990–92	2014–16	1990–92	2014–16
Chile	+16.2	-1.0	9.0	< 5.0	1.21	ns
Costa Rica	+7.5	-19.1	5.2	< 5.0	0.16	ns
The Gambia	+10.4	+5.0	13.3	5.3	0.13	0.10
Georgia	+2.5	-23.2	56.5	7.4	3.02	0.32
Ghana	+8.2	+23.9	47.3	< 5.0	7.09	ns
Tunisia	+61.9	+16.1	< 5.0	< 5.0	ns	ns
Viet Nam	+57.8	+60.1	45.6	11.0	32.13	10.29

Note: ns = not significant.

low-income countries that met the forest area criteria and Millennium Development Goal 1C but not the World Food Summit criteria were also considered for inclusion.[11]

Seven case-study countries were selected from the longer list in a way that achieved geographical balance; included countries with a range of per-capita incomes; and provided an opportunity to examine different policies, institutional frameworks and instruments. For each of these countries, a case study was commissioned to analyse – using a standard reporting framework – factors contributing to positive trends in food security and forest area in 1990–2015. The countries selected as case studies were:

- Africa – the Gambia, Ghana and Tunisia;
- Asia – Georgia and Viet Nam; and
- Latin America – Chile and Costa Rica.

Table 4.1 shows the increases in forest area reported in FAO (2015a)[12] and the indicators showing improvements in food security in the seven countries since 1990. It also shows change in agricultural area, although this was not used as a selection criterion. ■

11 The Annex provides further explanation of how case studies were selected. It also provides further explanations of PoU and NoU and their links with the Millennium Development Goals and the World Food Summit targets.

12 Data from FAO (2015a) are used for consistency, although some case studies used different data sources with, for example, different definitions of what constitutes the forest area.

4.2 COUNTRY CASE STUDIES

This section summarizes each case study, based on the case-study reports[13] and other data from FAO and World Bank sources.[14] The summaries note the economic and demographic context; discuss trends in food security, agriculture and forest condition; outline the policy, legal and institutional frameworks; and suggest key factors that have contributed to positive trends in food security and forest area.

Chile

Economic and demographic context

Chile is a high-income country in South America. It had a population of 17.76 million people in 2014 and a gross national income (GNI) per capita of US$14 910 (the equivalent of 21 580 international dollars – $Int – using purchasing power parity – PPP – exchange rates).[15] Chile has a land area of 74.35 million hectares.

Chile's economy is strong, with GDP increasing by 6.4 percent per year between 1990 and 2000 and by 4.0 percent per year between 2000 and 2014. This growth is a result of policies that encouraged the development of an open economy focusing on international trade, free competition, tariff reductions, and private ownership of the means of production. There are still problems of inequality, however: in 2013, the highest 10 percent of the population earned 45.5 percent of the income, and the lowest 10 percent earned 1.7 percent.

Population growth slowed from an average of 1.45 percent per year in 1990–2000 to 1.13 percent per year in 2000–2014. There has also been rural-to-urban migration, with the rural population falling from 2.21 million people (17 percent of the total population) in 1990 to 1.82 million (10 percent of the total population) in 2014.

Trends in food security, agriculture and forest condition

Improvements in food security can be attributed to improved agricultural yields, favourable economic conditions, and well-targeted social protection. Social welfare programmes include grants for food and other basic expenses, and housing improvement. Food security remains a problem for the poorest people, however, and there are also problems of obesity associated with poor food quality.

The value-added contribution of agriculture, including forestry and fishing, to the economy rose by 5 percent per year from 1990 to 2013, although the overall contribution of the sector to GDP fell slightly, from 3.7 percent in 1990 to 3.5 percent in 2013. The area of agricultural land fell slightly from 1990 to 2015, from 15.90 million hectares to 15.78 million hectares. The average value of food production per person increased by 48 percent between the periods 1990–1992 and 2011–2013.[16]

The increase in the value of agricultural production is partly the result of major changes in agricultural production patterns, notably a reduction in traditional crops such as cereals and vegetables and growth in the production of wine, fruit and flowers. The area of land under arable crops fell by 1.49 million hectares (53 percent) from 1990 to 2013, the area of permanent crops increased by 0.21 million hectares (84 percent), and the area of permanent meadows and pastures increased by 1.16 million hectares (9 percent).

These changes in production have taken place in response to changes in the relative profitability of

13 Full country reports and their associated references are available at http://www.fao.org/publications/sofo/

14 Throughout, changes in GDP and in value added in agriculture, forestry and fisheries are expressed in real terms, using United States dollars at 2005 prices. Unless otherwise noted, data on food imports and exports exclude fish; percentages of total imports/exports relate to total merchandise imports/exports.

15 GNI per capita based on PPP is GNI converted to international dollars using PPP rates. An international dollar (Int$) has the same purchasing power over GNI as a US dollar has in the United States (World Bank, 2016).

16 The average value of food production per person in constant terms is a food-security indicator related to availability (FAO, 2016a).

different products, especially in export markets. Export markets have been essential for creating economies of scale because the domestic market is relatively small. Food exports were worth US$7.9 billion in 2012, which was 10 percent of Chile's total exports; by value, the main food exports in that year were wine, grapes, apples and other fruit. Food imports were valued at US$3.9 billion in 2012, which was 5 percent of Chile's total imports; the main imports by value were beef and veal, maize and wheat, and cattle feed. Chile has received food aid in exceptional circumstances, such as in the aftermath of the 2010 earthquake.

Productivity increased by 50 percent from 1990 to 2015 for many arable crops and fruits. Measures to increase productivity included the recuperation of soil degraded by erosion and a lack of nutrients; improved irrigation with the introduction of sophisticated systems;[17] the application of new technologies in genetics; and investment in equipment. Financial instruments for improving productivity included incentives for fertilizer programmes (at a cost of US$319 million in 2005–2009), improved irrigation (at a cost of US$982 million from 1990 to 2014), drainage, and the agro-environmental sustainability of agricultural soils. Economies of scale have also been achieved: for example, the area of properties more than 2 000 hectares in size increased from 60 percent of the agricultural area in 1997 to 70 percent in 2007, and technological development has tended to concentrate in these large farms.

Around 40 percent of rural holdings in Chile are less than 5 hectares in size; much of the country's less-productive agricultural land is farmed on a close-to-subsistence basis by smallholders. Medium-sized farms are tending to increase in size to benefit from economies of scale, but this is not happening for very small farms.

Farmers make most of the investment in agriculture, obtaining their finance from banks and, to a lesser extent, input suppliers. Investments by banks were valued at US$7 billion »

17 The percentage of arable land equipped with irrigation is a food-security indicator related to stability (FAO, 2016a).

BOX 4.1

KEY FACTORS CONTRIBUTING TO POSITIVE TRENDS IN FOOD SECURITY AND FOREST COVER IN CHILE

- Economic growth in an open and competitive market environment has led to increased exports and reduced unemployment and poverty. A framework of reliable institutions has supported economic growth and provided social protection.
- The agriculture sector has been flexible in reacting to changing market conditions, including export potential, and it has responded positively to tariff reductions by replacing traditional crops with more profitable alternatives.
- Crop productivity has increased due to the use of the best available technologies and increases in farm size, which has brought economies of scale.
- Finance has been available, mainly from commercial banks. Governmental financial instruments have focused on encouraging private-sector investment, restoring degraded soils and improving irrigation systems.
- Well-targeted programmes with both social and production objectives have supported small and medium-sized enterprises, including by providing technical assistance, financial support and training to improve the productivity and sustainability of family farms.
- Forest plantations to produce timber for industrial processing and to deliver environmental benefits such as soil protection have been encouraged by subsidies for afforestation, a legal requirement to replant after harvesting, and a positive response to such opportunities in the private sector.
- Policy recognition of the potential of agriculture and forestry, based on the suitability of the land for different uses, has led to strong and effective support for both sectors.

» in 2012. There has also been foreign direct investment, focused on export-oriented agribusinesses. All farming is carried out by the private sector. Public investment has focused on improving degraded soils and irrigation: the percentage of arable land equipped with irrigation increased from 42.9 percent in 1990–1992 to 85.5 percent in 2010–2012. The state-owned bank also helps improve conditions for small farmers.

Forests cover nearly 24 percent of Chile's land area. The country has developed a major forest plantation resource that forms the basis of a significant export industry. More than 1 million hectares of plantations have been established since 1990, mainly on land that previously had been under extensive agricultural use or was threatened by erosion. By 2013, the contribution of the forest sector (and related industries, excluding pulp and paper) to GDP was 2.7 percent. The timber harvest for industrial use has nearly tripled in the last 25 years, reaching 41 million m^3 in 2013; from 2025, plantations are projected to produce a sustainable wood harvest of about 50 million m^3 per year. The value of forest product exports was US$4.7 billion in 2013, compared with imports of US$0.8 billion. The main export products were pulp and paper, sawnwood, boards and wood chips.

Most investment in forestry derives from the private sector, which has invested about US$0.6 billion in afforestation and US$11.7 billion in wood processing since 1990. State incentives totalling US$565 million from 1974 to 2014 helped catalyse this private investment and were based on recognition of the environmental benefits of forests. The plantations, which consist mainly of pine and *Eucalyptus* species, account for 98 percent of the economic output of forests. This has reduced pressure on natural forests, in which industrial timber harvesting fell from 16.1 percent of the total timber harvest in 1990 to 0.8 percent in 2013. Overall, there has been an 8 percent increase in the area of primary and other naturally regenerated forest since 1990. In some cases, plantations replaced natural forest, but forestry companies have now agreed to restore about 40 000 hectares of natural forest. The impact of fast-growing species on water supplies is a concern in some areas, and scientific studies are underway to address the issue through, for example, better species choices.

It is estimated that another 1.5 million–2.0 million hectares of forest plantation could still be established. Grade 6 land, which is stony with steep slopes, thin soils and high erosion potential, has low value for annual cropping but is suitable for permanent fruit crops, grazing and afforestation. Some Grade 7 land is also suitable for afforestation. On the other hand, there has been some conversion of degraded *esclerófilo* forest land to agriculture where climatic conditions are favourable for vineyards, olives and fruit-growing.

Policy, legal and institutional frameworks

Chile's success in increasing production, improving productivity and expanding trade in agricultural and forest products in the last 25 years is explained by the use of well-targeted policy instruments that have provided incentives for a responsive private sector. Government expenditure on agriculture, forestry and fishing was US$751 million in 2012, representing 1.54 percent of total government outlays.

Agricultural improvement programmes have increased productivity and brought previously unproductive land into productive and profitable agricultural use. In addition, the National Institute for Agricultural Development (INDAP) has supported small and medium-sized producers through: the co-financing of agroforestry and agricultural investment projects; a programme to strengthen agriculture, forestry and related activities in indigenous communities to improve incomes and quality of life while respecting the world views of those communities; support to improve the operational, economic and financial performance of business associations; skills development and capacity building in smallholder organizations; and credit for irrigation and the management of native forests. INDAP also offers technical assistance and training. It has extension offices throughout the country to communicate scientific advice from universities and research

farms to farmers, including family farms and medium-sized producers. To develop an integrated approach to extension work, INDAP and the Forest Institute collaborate on the training of professional extension workers.

The management of natural forests and plantations is regulated by law, and there is a requirement to reforest all harvested areas, including plantations. Forest action plans set out strategies for the forest sector, covering productive, social and environmental functions. A 20-year state forest policy requested by the Minister of Agriculture is under preparation; it will provide a framework for future policy instruments, and the public and private sectors are working jointly on its development. Work is also underway to improve the effectiveness of incentives for rehabilitating degraded natural forest.

Box 4.1 presents the key factors contributing to positive trends in food security and forest cover in Chile.

Costa Rica

Economic and demographic context

Costa Rica is an upper-middle-income country in Central America. It had a population of 4.76 million people in 2014 and a GNI per capita of US$10 120 (Int$14 420 using PPP exchange rates). The country has a land area of 5.11 million hectares.

Costa Rica's economy has been growing steadily, with GDP increasing by 5.2 percent per year from 1990 to 2000 and by 4.3 percent per year from 2000 to 2014. The economy is increasingly based on the service sector, tourism and new technologies. Under the structural adjustment programmes of the 1980s and 1990s, Costa Rica reduced the size of its public sector, withdrew government market interventions, promoted non-traditional exports, encouraged foreign direct investment, and entered into a number of significant free-trade agreements.

The rate of population growth has been falling, from 2.4 percent per year in 1990–2000 to 1.38 percent per year in 2000–2014. Most population growth today is the result of immigration from nearby countries, and many immigrants work in rural areas. Although the proportion of people living in rural areas in Costa Rica has fallen from 50 percent to 31 percent since 1990, the absolute number has been relatively stable, at around 1.5 million.

Trends in food security, agriculture and forest condition

Costa Rica's food-security indicators are generally positive, but poorer people – including landless rural families – still suffer from food insecurity. Food security has improved overall since the 1990s due to increases in agricultural productivity, and the importation of food from countries with lower production costs (although this increases vulnerability to global fluctuations in food prices). Net forest loss due to conversion to cattle ranching and other types of agriculture has been halted; previously, forests were regarded as "land banks" that could be converted as necessary to meet agricultural needs.

The value-added contribution of agriculture, including forestry and fishing, to the Costa Rican economy increased by 3.2 percent per year between 1990 and 2013, but the proportion of total GDP contributed by the sector fell from 12 percent to 6 percent over the period. The area of agricultural land declined from 2.30 million hectares in 1990 to 1.82 million hectares in 2015; with improved productivity, however, the average value of food production per person increased by 26 percent in the period 1990–1992 to 2011–2013. The reduction in agricultural land occurred largely because the area of permanent meadows and pastures declined from 1.79 million hectares in 1990 to 1.26 million hectares in 2015. This decline, in turn, was associated with a reduction in the number of head of cattle – from 2.2 million in 1990 to 1.3 million in 2010 – due to structural adjustment policies that reduced direct support for cattle raising and affected prices. The area of arable crops declined by 28 000 hectares (11 percent) between 1990 and 2013, but the area under permanent crops rose by 70 000 hectares (28 percent) in the same period. These shifts in production reflected changing market conditions.

Much agricultural production in Costa Rica is by large-scale landowners and transnational corporations who specialize in the intensive production and export of commodities such as pineapples, bananas, livestock products, coffee, sugar and palm oil. The percentage of arable land equipped with irrigation increased from 30.4 percent in 1990–1992 to 41.7 percent in 2010–2012. Small-scale farmers continue to produce food for local markets, and subsistence farming is becoming less significant. The production of oil crops, cereals and meat rose between 1996 and 2011, while coffee production fell. In 2011, Costa Rica's food exports were valued at US$2.9 billion (28 percent of total exports), while food imports amounted to US$1.3 billion (8 percent of total imports). By value, the main exports were bananas, pineapples and coffee, and the main imports were maize, soybeans and wheat.

Deforestation reached its peak in Costa Rica in the 1980s and has since reversed, with forest area increasing from a low point in 2000 to reach nearly 54 percent of the country's land area in 2015. The production of commodity crops for export was an important driver of deforestation, but this pressure has reduced due to structural changes in the economy and the priority given to forest conservation and sustainable management. The reduction in the number of cattle also led to some land abandonment and the subsequent regeneration of secondary forest. Although the area of secondary forest is increasing, illegal clearance for agriculture continues; in addition, some farmers prevent forest regrowth because they do not want to lose the opportunity to use the land for agriculture (the forest law prohibits changes in land use from natural forest, except in special circumstances). The area of forest plantations, many of which were established with incentives in the 1970s and 1980s, has been declining. This is often because they are not replanted after harvesting, partly so that the land can be used for other purposes, such as growing fruit or urban development, and partly because of the impact on the market of cheap imported wood, especially from Chile. There is some agroforestry, for example to provide shade for coffee crops and livestock.

The contribution of the forest sector to the economy in Costa Rica fell from 0.5 percent of GDP in 1994 to 0.2 percent in 2015 due to an increase in timber imports and the greater use of substitute products in construction. However, these official percentages do not include the value of woodfuel, wood processing or the provision of environmental services. Moreover, although international tourism accounts for 18 percent of total exports, and forests are widely used in promotional campaigns for that industry, this forest benefit is not reflected in national accounts. Annual wood removals from forests have been relatively constant since 1990, at about 4.7 million m^3, of which 74 percent is woodfuel. Removals from natural forests fell from 248 000 m^3 in 1998 to 23 000 m^3 in 2015 as a result of greater environmental protection. There is a significant trade deficit in wood products: in 2013, the value of imports was US$550.1 million, and the value of exports (charcoal, teak roundwood and manufactured wood products) was US$62.4 million.

Policy, legal and institutional framework

Costa Rica's agriculture and forest policies operate within the context of broader policy objectives aimed at developing a successful open economy and maintaining strong environmental credentials. In the last 25 years, structural adjustment programmes – including reduced import tariffs and subsidies – have had significant impacts. Agriculture's average share of public spending fell from 14 percent in 1990–2000 to 5 percent in 2001–2013; the government spent US$827 million on agriculture, forestry and fishing in 2011.

The country's agriculture and food policies aim to increase competitiveness at all scales of entrepreneurship and to help farmers innovate and develop profitable businesses with access to internal and external markets. The policies also encourage local production: for example, the government introduced limited price support measures in 2008–2010 to help boost the domestic supply of staple foods such as rice, maize and beans. The two elements of the National Food Plan, introduced following a global escalation in

food prices in 2008, were the promotion of food production and social assistance to vulnerable families.

Costa Rica has had a national policy on land management since 2012. The Ministry of Housing and Human Settlements works with the Land Use Sector Council and a range of other ministries and public bodies to formulate policies and guidelines on land-use planning and housing within the context of the National Development Plan. The speed of development often exceeds the capacity to develop and implement regulatory plans, however. The Rural Development Institute promotes development in rural areas but tends to focus on encouraging agriculture and potentially could do more to incorporate forests in local development strategies.

The emphasis of forest policy has shifted away from wood production and towards forest protection, preventing deforestation, and increasing forest cover. In 1996, the National System of Conservation Areas (SINAC) was created as an agency in the Ministry of Environment, Energy and Telecommunications with responsibility for forests and protected areas. Whereas the previous Directorate General for Forests (in the Ministry of Agriculture) promoted wood production, the main focus of SINAC is conservation. About 50 percent of the country's forest area is in protected areas, in which the forest law prohibits land-use change. There can be difficulties in defining the stage at which regrowth on abandoned agricultural land legally constitutes secondary forest, however. There is a need for the law to distinguish more clearly between the management regimes appropriate for primary forests and secondary forests.

Forest incentives aimed at plantation development were replaced in the mid-1990s by the PES scheme. The National Fund for Forest Financing receives a proportion of the tax levied on the consumption of fossil fuels, reflecting Costa Rica's recognition that forests deliver important environmental services that require public funding. The country's PES scheme has been a significant, stable source of funding for »

BOX 4.2

KEY FACTORS CONTRIBUTING TO POSITIVE TRENDS IN FOOD SECURITY AND FOREST COVER IN COSTA RICA

- Structural changes in agriculture reduced pressures to convert forest to agricultural use and led to an increase in the area of secondary forest.
- Agriculture and food policies have aimed to increase the competitiveness of entrepreneurship at all scales, including local production.
  The government responded to an escalation in food prices in 2008 by promoting food production and providing vulnerable families with social assistance.
- Legal controls have been introduced to prevent land-use change from natural forests.
- Stable funding for forests has been provided since 1997 through a system of payments for environmental services (PES). Priorities for PES funding include forest and watershed protection, conservation, agroforestry and silvopastoral systems, and reforestation with native species.
- Publicly owned protected areas have been consolidated, and there is a willingness among some private owners to adopt similar approaches on their land so they can benefit from ecotourism and PES.
- The significance of primary forests for the ecotourism sector, and recognition that forests are crucial for Costa Rica's strong environmental credentials, mean that forest policy – as well as agriculture and food policies – are priorities for government.

» forests for nearly 20 years. Priorities for the allocation of payments under the scheme include forest and watershed protection, conservation, agroforestry and tree-pasture systems, and reforestation with native species. The PES scheme has been used to strengthen the protected-area system, including through voluntary land purchases by the state; develop biological corridors covering 437 000 hectares; tree-planting incentives for farmers, who have planted 5.4 million trees; and support forest conservation in indigenous territories. In total, US$318 million was invested in forest-related PES projects between 1996 and 2015; 64 percent of the funding came from the fossil fuel tax, 22 percent from World Bank credits and the remainder from other sources. It is intended that Costa Rica's PES scheme will provide a structure for REDD+ payments, supporting the country's goals of becoming a carbon-neutral economy, conserving biodiversity, and growing its nature-based tourism sector.

Box 4.2 presents the key factors contributing to positive trends in food security and forest cover in Costa Rica.

The Gambia

Economic and demographic context

The Gambia is a low-income country in West Africa. It had a population of 1.93 million people in 2014 and a GNI per capita of US$440 (Int$1 560 using PPP exchange rates). The Gambia has a land area of 1.01 million hectares.

The economy has a narrow base; important sectors are the re-export trade, tourism, construction and agriculture. GDP grew by an average of 3.4 percent per year from 1990 to 2013, but it fell in 2014 due to a decline in tourism (although the Gambia is free of Ebola, the prospect of this disease affected it as a destination for tourists) and a 15–30 percent decline in crop production due to poor rains. Remittances have become one of the country's largest sources of foreign exchange, growing from 3–4 percent of GDP in the 1990s to almost 20 percent in 2013. The value of food imports was 142 percent higher than the value of total merchandise exports in 1990–1992, 313 percent higher than total merchandise exports in 1999–2001, and 181 percent higher in 2009–11.[18]

The Gambia's population grew by 2.97 percent per year (on average) in the period 1990–2000 and by 3.27 percent per year in the period 2000–2014. Despite migration to urban areas, the rural population has continued to increase. About 1.47 million people, or 78 percent of the total population, live close to forest and depend at least to some extent on forest resources for food, domestic energy, fodder, construction materials and poles.

Trends in food security, agriculture and forest condition

About 11 percent of Gambian people are considered food-insecure or vulnerable to food insecurity during normal times. The major contributing factor to food insecurity is poverty, and food insecurity is generally higher in households headed by women. Low and unevenly distributed rainfall also adversely affects household security, resulting in low production, loss of income, and lower food stocks. Most agricultural producers need to buy some food imports, making them vulnerable to external price fluctuations. When food stocks are low, households depend on income generated through the sale of groundnuts and other cash crops, or on remittances.

The value-added contribution of agriculture, including forestry and fishing, to the Gambian economy rose by 2.6 percent per year from 1990 to 2013, although the overall contribution of the sector to GDP fell from 28 percent to 23 percent in the same period. Agriculture provides about 75 percent of employment in the country. There was little overall change in the area of agricultural land from 1990 to 2015, although the area of arable land under cultivation increased

18 The value of food imports as a proportion of total merchandise exports is a food-security indicator related to stability; it captures the ability of a country to finance food imports through the export of goods and services (FAO, 2016a). By comparison, the value of food imports as a proportion of total merchandise exports was 6 percent or less in Chile in the period 1990–2010 and 11 percent or less in Costa Rica.

from 200 000 hectares in 1997 to 440 000 hectares in 2012. The average value of food production per person fluctuated in the period 1990–1992 to 2011–2013, with no clear trend. The quantity of food imports increased by 166 percent between 1990–1992 and 2008–2010, however.[19]

Cropping patterns have been changing in the Gambia, especially with an increase in the area of paddy rice. In 2012, the most important agricultural commodities were, by value, groundnuts, millet, paddy rice, beef, sorghum, milk, game meat, fresh fruit, cashew nuts and vegetables. Rice production, which was boosted by the introduction of the "New Rice for Africa" variety, increased from 34 300 tonnes in 2008 to 69 700 tonnes in 2013; this has created problems, however, such as reduced water availability for other crops, and erosion. Despite increased production, rice imports also increased, from an average of 63 300 tonnes per year in 1990–1999, to 89 300 tonnes per year in 2000–2009, to 93 600 tonnes per year in 2010–2013; other imports, such as sugar and flour, also increased. In 2011, food imports were valued at US$108 million, which was 31 percent of all imports, and exports were worth US$20 million, which was 21 percent of all exports. The main net food exports are groundnuts, groundnut oil and cashew nuts.

Agricultural production in the Gambia is highly dependent on rainfall and therefore fluctuates significantly. Average precipitation has declined in the last 30 years, and other factors adversely affecting farm productivity are low soil fertility, inappropriate farming techniques, expensive inputs (there is limited use of fertilizer because of low farm-product prices), difficult access to markets, insecure tenure, and weak producer organizations. Traditional and modern land-tenure systems co-exist, with local district authorities responsible for the allocation of customary land for farming, residential and vegetable gardens and community forests, and local governments responsible for the modern tenure system. Smallholders and poor farmers face inequality and insecurity under these tenure systems. »

19 Three-year averages of import quantity index (FAO, 2016a).

BOX 4.3

KEY FACTORS CONTRIBUTING TO POSITIVE TRENDS IN FOOD SECURITY AND FOREST COVER IN THE GAMBIA

- The development of domestic agriculture (for example through an increase in the area of arable land under cultivation and increased rice production) and an increase in food imports have reduced both the prevalence of undernourishment and the number of undernourished people.
- The transfer of forest ownership to communities for sustainable management, and increased recognition of the importance of participatory forest management, have helped reduce pressure on forest resources and increase the benefits of forests accruing to local communities.
- External support has helped promote innovation and development in the agriculture and forest sectors, for example by strengthening community-based producer organizations.
- The incorporation of sustainable forest management in the Gambia National Agricultural Investment Plan reflects the importance of a holistic approach, recognizing, for example, that upland erosion causes lowland siltation and that agricultural expansion should take place on undercultivated land to avoid forest encroachment.
- Public awareness has increased of the problems associated with land degradation, and of its causes (e.g. human activities and climatic variation).

» The total value of official development assistance (ODA) investments in agriculture in 2008–2015 was about US$375 million. Such assistance funded projects addressing agricultural land and water management; livestock and horticultural development; the commercialization of the agricultural value chain; sustainable land management; rice production; participatory integrated watershed management; and rural finance. As part of such programmes, producer organizations benefited from funding to improve agricultural production in, for example, institutional development, capacity building, cereal banking, family farming, and land governance and tenure.

The World Food Programme has provided food relief supplies in the Gambia following natural disasters such as drought, crop failures as a result of pest invasions, and cereal shortages due to heavy rains. Recent programmes included a school meals' project worth US$9.8 million in 2012–2015, and a Protracted Relief and Recovery operation for food-insecure and vulnerable households worth US$5.5 million in 2013–2015.

Much of the Gambia's forest comprises tree and shrub savannah, which is subject to degradation as a result of pressure from nearby communities for agricultural expansion and settlements. There are also about 1 000 hectares of remnant primary forest. All naturally growing trees belong to the state, but the land on which they grow is mainly subject to customary tenure. There are 357 000 hectares of "forest reserves"; 34 000 hectares of "forest parks" and "jointly managed forest parks"; and 32 000 hectares of "community forests".

In recent years there has been a major shift in forest tenure through the permanent transfer of parts of forest reserves to local communities for participatory forest management. Although there continues to be some clearance of forest cover for agriculture, participatory forest management, together with solid forest tenure rights, has increased recognition of the value of the sustainable production of wood and non-wood forest products and demonstrated that forest areas should not be regarded as "worthless bush".

The contribution of the forest sector to GDP was 0.5 percent in 2011, although this does not include the value of non-marketed goods and environmental services. For example, official statistics do not refer to the cross-border trade in forest products with Senegal, even though the Gambia is highly dependent on Senegal for imported woodfuel. Average annual wood removals in the Gambia increased from 0.57 million m^3 in 1990–1994 to 0.80 million m^3 in 2007–2011. Most such removals were for woodfuel; the component of industrial wood removals remained relatively constant at about 0.12 million m^3 per year, most of which was used for domestic construction. Forest product exports were valued at US$68.3 million in 2013 and forest product imports were valued at US$4.3 million.

Drought, floods, storms and wildfires cause losses of lives and property. For example, an average of 170 600 hectares of land burned each year in 2003–2012.

Policy, legal and institutional framework

Key economic policy aims of the Government of the Gambia include poverty eradication, increasing national income through stable economic growth, and reducing inequalities. Policies on agriculture and natural resources seek to create a diversified modern agriculture sector with sustainable food security by increasing agricultural trade and investment, improving productivity, commercialization, and active private-sector participation. The Gambia National Agricultural Investment Plan (2011–2015) aimed to achieve at least 8 percent growth in the agriculture sector, with programmes aimed at improving agricultural land and water management; improving the management of other shared resources, including forests; developing agricultural chains and market promotion; national food and nutritional security; and sustainable farm development.

An objective of the Forestry Policy (2010) is to manage 75 percent of forest land under community or private forestry for environmental and socioeconomic development. The "sustainable management of forest resources" component of the Gambia National

Agricultural Investment Plan focused on increasing the participation of communities in sustainable forest management; agroforestry development; strengthening the Forestry Department; and collaborative research and information exchange.

The State Land Regulations (1995) provide that forests should be protected according to the Forest Act and the Local Government Act (2002), which give decentralized local government bodies responsibility for the protection, control and management of forest resources in their areas of jurisdiction. The Forest Bill, currently under consideration, is intended to regulate the involvement of local communities in forest management by setting out the obligations of the government and of management partners, and by making provisions for conflict resolution and tax incentives.

The development of infrastructure and the construction of settlements and hotels in the Gambia have often involved forest clearing, leading to conflict between planning authorities and the Forestry Department. Although economic benefits usually take priority over environmental considerations, the Biodiversity and Wildlife Act (2003) seeks to resolve such conflicts by requiring that land-use management has "due regard" for biodiversity conservation. There is considerable scope for promoting public participation in decision-making processes related to, for example, planning, the designation of land as "state land" (which has consequences for customary rights), the work of land boards and planning authorities, and the formulation of land-use laws.

At the village level, community-based organizations are responsible for managing community forests within the framework of bylaws that provide guiding principles for sustainable management.

The annual government budget allocation for forests was $US0.45 million in 2012–2015, and the annual contribution to government funds from forest product sales and taxes was US$0.55 million. Support for forests from external donor agencies in the period 2008–2015 included projects worth US$0.9 million; upcoming projects include a Global Environment Facility/FAO dryland forest management project worth US$6.5 million. Such external support has helped build capacity in the Forestry Department, develop the capability of farmers, and promote participatory approaches that have increased the contribution of forests to the socioeconomic development of the rural poor.

Box 4.3 presents the key factors contributing to positive trends in food security and forest cover in the Gambia.

Georgia

Economic and demographic context

Georgia is a lower-middle-income country in the Caucasus. Georgia had a population of 4.50 million people in 2014, down from 4.91 million in 1993. GNI per capita was US$3 720 in 2014 (Int$7 510 using PPP exchange rates). The country has a land area of 6.95 million hectares.

Georgia's GDP increased at an average rate of 4.3 percent per year from 1993 to 2014, although growth was interrupted in 2008–2009 by an armed conflict and the global economic crisis. Remittances play a significant role in the economy, averaging about 7–9 percent of GDP. The value of food imports amounted to 299 percent of total merchandise exports in 1990–1992, 56 percent in 2000–2002 and 44 percent in 2009–2011.

Georgia's population fell by an average of 1 percent per year from 1991 to 2000, mainly due to emigration for economic reasons, but it rose by 1.37 percent per year from 2000 to 2014. Georgia has about 253 000 internally displaced persons and refugees. Almost half the population lives in rural areas, although the rural population declined from 2.22 million in 1991 to 1.85 million in 2014. Many rural dwellers rely at least partly on low-productivity farms for their livelihoods. Most rural villages are near forests, and wood and non-wood forest products (mainly procured illegally) are often important sources of income. Wood is an important source of energy for rural people for heating and cooking.

Trends in food security, agriculture and forest condition

Most of the improvement in food-security indicators in Georgia occurred in the immediate transition phase to a market economy. The PoU fell progressively from 56.5 percent in 1990–1992, to 11.1 percent in 1997–1999, to 7.4 percent in 2014–2016, and the NoU fell from more than 3.0 million in 1990–1992, to 0.50 million in 1997–1999, to 0.32 million in 2014–2016. Although Georgia benefits from its capacity to produce a wide variety of food, it remains vulnerable to food insecurity, due mainly to poverty. The area of agricultural land fell from 3.23 million hectares in 1990 to 2.55 million hectares in 2015. The average value of food production per person fluctuated over the period from 1990–1992 to 2011–2013, with no clear trend, and the quantity of food imports increased by 34 percent from 1992–1993 to 2012–2013.

The value-added contribution of agriculture, including forestry and fisheries, to Georgia's economy fell by an average of 10.6 percent per year from 1991 to 2000 and by 0.4 percent per year from 2000 to 2013. The contribution of agriculture to GDP was 29 percent in 1991 and 9 percent in 2013. Traditionally grown crops include grapes, wheat, maize, meat, milk, fruits and vegetables. The value of food imports was US$896 million in 2011, and food exports were worth US$227 million; food accounted for 13 percent of all imports and 10 percent of all exports. The main food imports in 2011, by value, were wheat, chicken meat, sunflower oil and sugar, and the main exports were hazelnuts, wine and spirits.

There is potential to increase agricultural production. With fertile soils and a favourable climate, the conditions are very good for farming in Georgia, but in the last 20 years there has been a steady decrease in agricultural production due to a lack of an effective agriculture policy. About 25 percent of agricultural land is now private property, but land tenure is highly fragmented: 70 percent of holdings are less than 1 hectare in size, and 98 percent of holdings are less than 5 hectares. Pastures may be used for a small annual fee, but many are overgrazed. Foreign direct investment in agriculture averaged US$13.7 million per year in 2007–2014. Foreign investment is controversial, however, and there was a moratorium on the sale of land to foreigners from 2012 to 2014.

Support for agriculture has been a government priority since 2013, with the aim of providing food security and overcoming poverty in rural areas through high-quality agricultural production. Funding for agriculture has increased from government and international donors for improving infrastructure (including irrigation); increasing the use of agricultural machinery; providing assistance for small farms; preventive veterinary measures; action to develop the processing sector; and export promotion, including laboratory equipment for international accreditation.

Forests cover slightly more than 40 percent of the land area in Georgia. Most are in mountainous areas, and only about 20 percent is considered suitable for commercial production. There has been no recent loss of forest through conversion to agricultural use, and in some places there is forest regrowth. Migration away from rural areas, especially in the mountains, has reduced pressures associated with forest cutting and excessive grazing.

Forests and forest operations were managed centrally until 1999; forests are still publicly owned, but operations are now delegated to the private sector. The granting of short-term permits led to excessive timber cutting because permit-holders had no incentive to invest in the forests. Since 2005, however, licences have been granted for up to 20 years and licence-holders are required to invest in forest management. The private sector manages some areas of forest under land grants involving long-term tenure. Planted forests account for only 2.5 percent of the forest area.

The contribution of the forest sector to GDP is 1.3 percent (but this does not include non-wood forest products). According to official data, an average of 0.58 million m^3 of wood has been removed annually since 1998, of which 78 percent is woodfuel. It is difficult to quantify actual

volumes removed because of illegal activities; some unofficial estimates suggest that the volume of woodfuel removals is around 2.5 million m^3. Processed timber is sold in local markets. Georgia started to export timber such as hornbeam, fir and spruce after independence, but temporary restrictions on harvesting and log exports were applied in the late 1990s to reduce pressure on forests. Regulations for forest use and timber exports were introduced, and international trade has increased since 2006. In 2013, the value of forest product exports was US$23 million and the value of imports was US$92 million.

Policy, legal and institutional framework

Georgia's national strategy for social and economic development, Georgia 2020 (approved in 2014), defines priorities for ministries. It is based on the principles of inclusive, private-sector-driven economic growth and the sustainable use of natural resources, and one of its priorities is the development of agricultural infrastructure. It also recognizes that agriculture, hydroelectric power generation and tourism benefit from healthy forest ecosystems. Specific measures (also identified in the Strategy for Agricultural Development in Georgia) include the enhanced competitiveness of rural entrepreneurs; the improved commercialization of products produced by subsistence farms; improved processing and storage capacity for agricultural products; better transport networks; institutional development; the rehabilitation of irrigation and drainage infrastructure; the development of value chains; veterinary and plant protection measures; and food safety. The Deep and Comprehensive Free Trade Area Agreement will open up trade with the European Union in agricultural and forest products.

Responsibility for land resources is divided between the Ministry for Environment and Natural Resources Protection, which is responsible for planning and coordinating activities aimed at combating desertification and land degradation, the Ministry of Agriculture, which promotes sustainable land use, the Ministry of Economy and Sustainable Development, which deals with the privatization »

BOX 4.4

KEY FACTORS CONTRIBUTING TO POSITIVE TRENDS IN FOOD SECURITY AND FOREST COVER IN GEORGIA

- Migration away from forest areas has reduced pressure exerted on forests by excessive cutting and grazing.
- The replacement of short-term permits for timber harvesting with longer-term licences (for up to 20 years) has improved forest management.
- Recognition that current legislation does not comply with the principles of sustainable forest management has led to work on a new forest code. There has also been capacity building in the National Forestry Agency.
- The involvement of stakeholders in the development and implementation of national forest policies has helped generate support for the principles of sustainable forest management.
- Since 2013, assistance for agricultural development has been one of the government's main priorities, leading to increased investment by the state and through official development assistance in this area.

» of state land and related tenure issues, and the Ministry of Justice, which is responsible for land registration. In addition, local administrations prepare spatial development plans.

Responsibilities for forest policy and forest management have been separated. The Forestry Policy Office and the Environmental Supervision Department are in the Ministry of Environment and Natural Resources Protection, while responsibility for the management of state forests lies with the National Forestry Agency and the Agency for Protected Areas. The value of ODA projects related to forests and biodiversity was around US$38 million in the period 2002–2015; such projects contributed to sustainable forest management, capacity building, community forestry, and forest law enforcement and governance.

The National Forestry Concept of Georgia was prepared in 2013 with the active participation of stakeholders. Priorities for the National Forestry Policy, also approved in 2013, include reforestation and the restoration of degraded forests. As a first step towards restoration, degraded areas prone to soil erosion and landslides will be identified and action plans prepared. As current laws regulating the forest sector do not comply with the principles of sustainable forest management, work began on a new forest code in 2014. Work is also underway, supported by donor organizations, to develop legislation aimed at encouraging the sustainable use of non-wood forest resources. International agreements will provide a framework for the new forest legislation. Under the Biodiversity Policy and Georgia's 2014–2020 Action Plan, the aim is to protect forest biodiversity through the introduction of best practices in sustainable forestry by 2020.

Box 4.4 presents the key factors contributing to positive trends in food security and forest cover in Georgia.

Ghana

Economic and demographic context

Ghana is a lower-middle-income country in West Africa. In 2014 it had a population of 26.79 million people and a GNI per capita of US$1 600 (Int$3 910 using PPP exchange rates). Ghana has a land area of 22.75 million hectares.

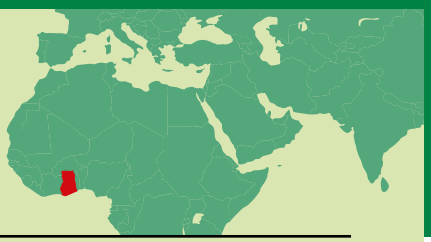
Ghana's GDP grew by 4.3 percent per year from 1990 to 2000 and by 6.6 percent per year from 2000 to 2014. The driving forces behind this economic growth were political stability, consistency in policy implementation, structural changes in the economy, and increased exports (including – since 2010 – oil). Northern Ghana lags behind the rest of the country, however, with poverty identified as a leading cause of food insecurity there.

The rate of population growth over the period 1990–2013 was 2.55 percent per year. Despite net rural-to-urban migration, the rural population increased from 9.3 million people in 1990 to 12.2 million in 2014. An estimated 2.5 million people live in, and are dependent on, forests.

Trends in food security, agriculture and forest condition

Ghana has achieved many of its food-security targets in recent decades as a result of national and sectoral policy interventions and investments in agriculture and a consequent doubling of agricultural production. The growing population poses a continuing challenge, however.

The value-added contribution of agriculture, including forestry and fishing, to Ghana's economy increased by an average of 3.9 percent per year from 1990 to 2013, although its overall contribution to GDP fell from 34 percent to 23 percent over the period. The area of arable land increased from 2.70 million hectares in 1990 to 4.70 million hectares in 2013, and the area of permanent crops increased from 1.50 million hectares to 2.70 million hectares. The average value of food production per person increased by 68 percent from 1990–1992 to 2011–2013.



BOX 4.5

KEY FACTORS CONTRIBUTING TO POSITIVE TRENDS IN FOOD SECURITY AND FOREST COVER IN GHANA

- There has been political stability and consistency in policy implementation.
- The Economic Recovery Programme recognized the importance of modernized and sustainable agricultural production and sustainable forest management as part of its vision for a structurally transformed economy.
- Agricultural productivity increased by applying the outcomes of research and development, investing in infrastructure (such as irrigation), the application of fertilizers, and targeted support for smallholders.
- Environmental impact assessments are used to regulate the conversion of forest land to agricultural land, and vice versa.
- Forest governance has improved due to institutional reform and capacity strengthening.
- Tree-tenure reform is ongoing to give farmers the right of ownership in and benefits from the trees they have planted.
- Private-sector investment in plantations has been encouraged through financial instruments (such as those funded from levies on the export of air-dried lumber) and the allocation of land in degraded parts of forest reserves.
- Stakeholder participation in policy development has been encouraged and policies introduced to safeguard the interests of communities and small and medium-sized forest enterprises. Collaborative forest management approaches are used to improve community access to forest benefits.

Government investment in the agriculture sector in the past 25 years has focused on agricultural research and development; it amounted to US$95 million (0.4 percent of total government expenditure) in 2007. Specialist research institutes have developed and promoted improved agricultural techniques and tackled crop diseases with the aim of increasing yields. The area of irrigated agricultural land increased from 10 000 hectares in 1997 to 34 000 hectares in 2012. Although government intervention in the supply of inputs was abolished in 1990, fertilizer subsidies (of 50 percent) were reintroduced in 2008 to improve smallholder crop productivity; more than 730 000 tonnes of fertilizer were subsidized through this scheme in 2008–2013. Programmes to develop a modern agricultural production and processing sector have also included value-chain investment, improved extension services, the strengthening of farmer associations, and the building of access roads. ODA in the agriculture sector was US$146 million in 2000 and US$126 million in 2010.

The most important agricultural commodities in 2012, by value, were yams, cassava, cocoa beans and plantains. The production of paddy rice more than doubled from 1996 to 2011 and cocoa and oil-crop production also increased, while coffee production fell. Food exports were worth US$2.9 billion in 2011, which was about 23 percent of total exports, and food imports were valued at US$1.6 billion, which was 10 percent of imports. Cocoa accounted for 82 percent of the value of agricultural raw-material exports, and the main imports were sugar, chicken meat and wheat. Food aid in the form of cereals, rice and wheat flour has been greatly reduced since 2010.

The agriculture sector consists mainly of smallholder farmers. Within farming communities, customary law guides the inheritance of rights to land and local-level land-tenure agreements, although these are rarely documented. The inheritance system marginalizes women and affects their control of productive agricultural land. »

» Forests cover 41 percent of Ghana's land area. The majority of forests is in public ownership: in Ghana this means that forests are owned by the people and managed and controlled by the government for the benefit of the people and in the public interest. Forest reserves and national parks have legal protection. Naturally regenerated trees are vested in the President, on behalf of the people of Ghana, and are managed by the Forestry Commission, but individuals and private groups have rights to the trees they plant in off-reserve areas. The government allocates land in degraded parts of forest reserves to private companies for plantation development and to farmers for intercropping food crops in the first years of plantation establishment (this is called a modified taungya system).

The Forest Plantation Development Fund was established in 1999 to encourage private-sector investment in commercial plantations; the area of planted forest increased from 60 000 hectares in 2000 to 325 000 hectares in 2015. The Forest Plantation Development Fund is financed with levies imposed on the export of air-dried lumber. The National Forest Plantation Development Programme was re-launched in 2010 with the aim of planting 30 000 hectares of forest per year.

The drive towards sustainable agriculture and the promotion of cocoa certification has increased the use of agroforestry in the cocoa sector and led to the establishment of agroforestry research farms. Community forest protection is encouraged in off-reserve areas, where "community resource management areas" support the adaptation of farming practices that promote wildlife conservation and local economic benefits.

Although the forest area has increased as a result of plantation development and agroforestry, timber logging and the expansion of agricultural land has degraded existing forest. The area of closed forest declined by an average of 46 000 hectares per year in 1990–2010, while the area of open forest increased by 74 000 hectares per year. This has implications for biodiversity in the "high forest" zones, and logging has been prohibited in some forest reserves.

Average annual wood removals increased from 17.1 million m^3 in 1990–1994 to 25.2 million m^3 per year in 1995–1999 and declined to 13.8 million m^3 in 2007–2011. Most removals are for woodfuel, although the volume of industrial wood removals has been relatively constant, at an average of 1.3 million m^3 per year. The contribution of the forest sector to GDP was 3.38 percent in 2011. Action under the FLEGT voluntary partnership agreement with the European Union has included initiatives to reduce illegal logging and improve wood production efficiency in artisanal sawmills. Ghana is a net exporter of forest products: the value of forest product exports was US$283.2 million in 2013 and the value of imports (mainly paper products) was US$80.7 million.

Policy, legal and institutional framework

The Economic Recovery Programme and the Accelerated Agricultural Development Programme have provided the basis for increased agricultural production. The Economic Recovery Programme and the Poverty Reduction Strategy recognize the importance of forests and the timber-processing industry.

Agricultural and land-use policies focus on increasing agricultural productivity through modernization, intensification, sustainable land-use practices and the application of science and technology to provide food security and employment opportunities and reduce poverty. Reforms since the late 1980s have included strengthening institutional capacity; the privatization of services such as fertilizer marketing and the provision of tractors and veterinary drugs; rural finance; tenure reform; and measures to improve productivity.

The aims of the 2012 forest policy, which was developed through a transparent consultative process and is widely accepted by stakeholders, include the rehabilitation and restoration of degraded landscapes through plantation development and community forestry; sustaining the supply of raw materials for domestic and industrial consumption; and environmental protection.

Legislation related to land, agriculture and forests deals with specific issues and sectors, including land rights and registration, animal health, environmental protection, soil conservation, bushfires, wildlife conservation, the cocoa and fruit industries, and timber marketing. There is also a legal requirement that stakeholders, such as district assemblies, are engaged in the preparation of local development plans, although this does not generally apply to agriculture or forestry. Overall, the legal environment is complex, and legislation has not always kept pace with policy developments. Although farmers may cut timber to prepare farmland provided the timber is not used for economic gain, investors who acquire forest land and want to use it for agricultural purposes may be required to undertake an environmental impact assessment and secure authorization. The same procedure applies to the conversion of agricultural land to forest. Under environmental assessment regulations, mitigation action or compensation may be required if the loss of forest or agricultural land is unavoidable.

The Ministry of Lands and Natural Resources has overall policy responsibility for forests, and the Forestry Commission is responsible for regulating the use, conservation and management of forest and wildlife resources. Forest governance has improved as a result of institutional reforms, which have included placing greater emphasis on stakeholder participation and collaborative forest management.

Forest-related ODA averaged US$32 million per year in the period 1989–2009. A major programme was the Forest Resource Management Programme (1989–1997), which strengthened the capacity of regulatory institutions and made other interventions in forest management, reforestation, policy reform, livelihood support and biodiversity conservation.

Box 4.5 presents the key factors contributing to positive trends in food security and forest cover in Ghana.

Tunisia

Economic and demographic context

Tunisia is an upper-middle-income country in northern Africa. It had a population of 11 million people in 2014 and a GNI per capita of US$4 210 (Int$10 600 using PPP exchange rates). Tunisia has a land area of 15.54 million hectares.

Tunisia's GDP grew by an average of 4.7 percent per year from 1990 to 2000 and by 3.9 percent from 2000 to 2014 (a period in which economic growth was affected by the 2011 revolution). Industry has improved its competitiveness since 1990 and has responded positively to the European Union's removal of import tariffs on industrial products.

The rate of population growth in Tunisia fell from an average of 1.59 percent per year in 1990–2000 to 1.0 percent per year in 2000–2014. The proportion of the total population living in rural areas fell from 42 percent in 1990 to 33 percent in 2013, although the absolute number increased from 3.4 million to 3.6 million. An estimated 734 000 people live in or near forests, and their average income is less than one-third the national average; nevertheless, forests provide income opportunities and are important sources of food and energy.

Trends in food security, agriculture and forest condition

Even though, overall, Tunisia has a high level of food security, poorer people face food insecurity.

The value-added contribution of agriculture, including forestry and fishing, to Tunisia's economy increased by an average of 2.6 percent per year from 1990 to 2013, although its overall contribution to GDP fell from 12 percent to under 9 percent in the same period. Although there has been little overall change in the area of arable land, the area under permanent crops increased from 1.94 million hectares in 1990 to 2.28 million hectares in 2013, including the expansion of olive tree plantations in rangelands. The average value of food production per person increased by 15 percent from 1990–1992 to 2011–2013.

Increased agricultural production in Tunisia can be attributed to improved yields, the better use of existing agricultural land, increased irrigation and fertilizer use, mechanization, improved seeds, and better farming practices. Drought can reduce production in some years. Irrigated land contributes 30–40 percent of agricultural production, although it represents less than 10 percent of the total area of arable and permanent crops.

In 2012, the most important agricultural commodities (by value) were olives, tomatoes, milk, wheat, almonds, chicken meat, chillies and peppers, beef, and dates. Production has increased since 1990 of livestock products, olives, tomatoes and watermelons. The balance of trade in agricultural and food products is generally negative: the main imports, by value, are wheat, sugar, soybean oil and maize, and the main exports are olive oil, dates and maize oil. Food accounted for about 10 percent of imports in 2011 and for 8 percent of exports. The last food aid shipments to Tunisia were in the late 1990s. To help protect producers, including small farmers, from the impacts of fluctuating markets, the government maintains certain import barriers and provides price support for specified products (such as cereals, milk and sugar beet) and some input subsidies.

Tunisia has 4.7 million hectares of private land, which includes 54 000 hectares of forest; about 4 million hectares of collectively owned rangelands; and 1.3 million hectares of state-owned land, which includes 0.9 million hectares of forest. Only 3 percent of farms are larger than 50 hectares, but they occupy 34 percent of the agricultural land. Fifty-four percent of farms are less than 5 hectares in size and cover 11 percent of the agricultural land; the number of small farms is increasing as the land is subdivided through inheritance.

Forests cover 6.7 percent of Tunisia. Forest land, which is mostly in mountainous areas, is considered unsuitable for agriculture, both for environmental reasons and because agricultural production would be very low. Most forest is in public ownership, but forests on private and collectively held land are also subject to regulation. Special authorization is needed to harvest forest designated for the prevention of erosion, the protection of water sources or the conservation of endangered species. Most private forest was established in the 1960s, often to fix sand dunes or provide windbreaks. Forest expansion continues in marginal areas of low agricultural value; this also helps increase forage production for sheep and goats. The total forest area is increasing, mainly through the establishment of planted forests: the area of planted forests increased from 293 000 hectares in 1990 to 725 000 hectares in 2015. Deforestation has been averaging about 500 hectares per year since 2010.

The contribution of the forest sector to GDP was 0.1 percent in 2011, but many forest goods and environmental services are not marketed and therefore not included in this figure. Average annual wood removals averaged 0.23 million m^3 per year from 1990 to 2010 (varying from 0.11 million to 0.37 million m^3 per year), about half of which was woodfuel. The main forest products are cork (49 percent of total value), wood (25 percent) and other non-wood products. The government earned 10 million Tunisian dinars (TND)[20] from forest products in 2012, but the full economic value of forest goods and environmental services was estimated at TND182 million, which incorporated both the social benefits (valued at TND208 million) and the cost of degradation (valued at TND26 million). Social benefits include forage for livestock (38 percent), carbon sequestration (24 percent), non-wood forest products (12 percent), protection against erosion and the siltation of reservoirs (12 percent), wood (5 percent), the option value of pharmaceutical plants (6 percent), and cultural value (2 percent).

Despite its increase in forest cover, Tunisia remains highly dependent on imports of forest products. In 2013, the value of forest product imports was US$388 million and the value of forest product exports was US$37 million. The main imports are sawnwood and chemical pulp, while the main exports are paper products and

20 On 31 December 2012, US$1 = TND 1.55.

cork; non-wood products, such as essential oils from rosemary and thyme, are also exported.

Policy, legal and institutional framework

The Social and Economic Development Plan (2010–2014) and a new plan now in preparation place priority on economic growth, poverty reduction, regional integration and sustainable development. The plans recognize the role of forests in protecting land against erosion and desertification and the need to involve local people to achieve successful forest protection. Agriculture policy priorities are food self-sufficiency, competitiveness, exports, and the conservation of natural resources.

Forest policy is an integral element of agriculture policy because of the important role of forests in protecting watersheds. There is considerable scope, however, for more effective policy coordination and the better integration of forest policies with those related to, for example, agriculture, watershed management, biodiversity conservation, recreation, climate-change adaptation and mitigation, and sustainable development.

The existing forest strategy has a target of increasing the forest area from 8.2 percent in 2014 to 9.2 percent in 2024. The President personally reviews progress towards this target annually (on Tree Celebration Day); the success achieved in increasing forest cover can be attributed to support from policymakers, which has led to funding allocations in public budgets and ODA.

The Directorate General for Forests in the Ministry of Agriculture is responsible for applying the Forest Code, managing state forest land, and promoting forest expansion. It has 424 engineers and technicians and about 12 000 workers, half of whom are forest guards. The forest guards control illegal activities, such as the clearing of forests for conversion to agriculture. Offenders are prosecuted, except where tolerance is shown for minor offences arising from poor socioeconomic conditions. »

BOX 4.6

KEY FACTORS CONTRIBUTING TO POSITIVE TRENDS IN FOOD SECURITY AND FOREST COVER IN TUNISIA

- Poverty and population growth have both declined.
- National development plans recognize the beneficial role of forests in protecting land against erosion and desertification. Forests are an integral element in the agriculture policy with the aim of conserving water resources, protecting agricultural land from erosion, preventing flood risk, and increasing agricultural production.
- Agricultural production has increased through intensification that makes better use of existing agricultural land through, for example, irrigation, fertilizers, mechanization, improved seeds and better farming practice.
- Significant government and official development assistance funds have been invested in agricultural and forestry development. This has improved agricultural productivity while expanding forest cover to provide forest products and environmental services and employment for poorer people living in or near forests.
- Incentives are available for establishing plantations, including free seedlings and compensation for the loss of agricultural income.
- Forest development is a political priority, and a financing strategy for forests is in place to help mobilize funds, including official development assistance, for the implementation of forest policies.
- Regulations for controlling land-use change and protecting forests are enforced.

» A system was introduced in 2005 to devolve forestry activities to local communities, non-governmental organizations and the private sector for the co-management of forest resources. Under the Forest Code, the minister may grant temporary occupancy permits and longer-term concessions over state forest land where it is in the public interest or where it promotes silvopastoral development, or for sustainable forest management projects. The concessions relate to, for example, forest nurseries, the establishment of plantations, rangeland improvements, and investments in ecotourism. Public procurement rules apply to the granting of concessions.

The government spent US$791 million on agriculture, forestry and fishing in 2012, which was 4.2 percent of total outlays; this was down from 7.7 percent of total outlays in 2002. Such expenditure funds research and development, irrigation, improved agricultural production and watershed management, and forest programmes.

Developing a financing strategy for forests has helped mobilize funds from the national budget and forest revenues for priority tasks, and overcome dependence on ODA.

In 1992–2015, 61 percent of the national budget for forests and pastoral areas was used for plantations, 13 percent for protection against fire and insects, and 10 percent for infrastructure. Forest-related funding is also expected to provide jobs for poor and unemployed people in marginal rural areas (although this can reduce the cost-effectiveness of work programmes). Although incentives for establishing plantations meet 30–50 percent of the costs of doing so, landowners remain concerned about being subject to the strict forest regime and about the profitability of forest plantations compared with land uses such as fruit, nut or honey production. Incentives for forest plantations also include free seedlings, and compensation for a loss of income for the first three years. Despite an overall decrease in ODA in real terms, Tunisia has been able to harness international funds for forests because it has identified forest development as a priority.

Box 4.6 presents the key factors contributing to positive trends in food security and forest cover in Tunisia.

Viet Nam

Economic and demographic context

Viet Nam is a lower-middle-income country in Southeast Asia. It had a population of 90.73 million people in 2014, and its GNI per capita in 2012 was US$1 890 (Int$5 350 using PPP exchange rates). The country has a land area of 31.01 million hectares.

Viet Nam was among the world's poorest countries in 1990, but since then its GDP has grown at an average rate of 6.9 percent per year. The achievements of the past 25 years are due largely to a process of economic reform known as *Doi Moi* launched in 1986. *Doi Moi* abolished the centrally managed system, which was dependent on state subsidies, and shifted the focus to a market-driven economy featuring trade liberalization, land-tenure reform, and reforms in the agriculture and forest sectors.

The rate of population growth fell from 1.63 percent per year in 1990–2000 to 1.12 percent in 2000–2014. The percentage of the total population living in rural areas declined from 80 percent in 1990 to 68 percent in 2014, although the absolute number increased from 54.96 million to 62.06 million. It is estimated that around 25 million people live in or near forests in Viet Nam.

Trends in food security, agriculture and forest condition

Food security has increased significantly in Viet Nam in the last 25 years; once a net importer of staple foods, the country is now one of the world's top rice exporters.

Agricultural production contributed 34 percent to national GDP in 1990. The structure of the economy has changed, however, and services now account for 44 percent of the economy, industry for 38 percent and agriculture, including forestry and fishing, for 18 percent. The value added of

agriculture, forestry and fishing increased in real terms by an average of 3.9 percent per year from 1990 to 2013. The area of arable land increased from 5.34 million hectares in 1990 to 6.41 million hectares in 2013, the area under permanent crops increased from 1.04 million hectares to 3.82 million hectares, and the area of permanent meadows and pastures increased from 0.33 million hectares to 0.64 million hectares. The average value of food production per person doubled from 1990–1992 to 2010–2013.

With the introduction of *Doi Moi*, farm households became independent production units, and farmers were given security of land tenure and allowed to transfer their land rights. The period of tenure, which is renewable, is now 30 years for annual crops and 70 years for trees and perennial crops. Previously, collectives held most agricultural land. Individuals and households held 53 percent of agricultural land in 2013, state agencies 20 percent, communal people's committees 13 percent, and domestic economic organizations 11 percent.

Investment in the agriculture sector has grown, with domestic private sources representing 73 percent of investment in 2005; foreign direct investment is also significant. Public investment in agricultural research and development more than doubled in real terms between 2000 and 2010. The percentage of arable land equipped with irrigation also increased, from 53.7 percent in 1990–1992 to 71.7 percent in 2010–2012.

Agricultural policy instruments include specified exemptions from agricultural land-use taxes and fees; soft loans; export promotion; price guarantees for rice-growers at levels reflecting the production cost plus 30 percent; support for purchasing machinery and equipment; incentives to reduce post-harvest losses; and contributions towards agricultural insurance premiums. These support mechanisms also form part of rural development and poverty alleviation programmes, which include a development programme for ethnic minorities and communities in remote and mountainous areas. Domestic government spending on agriculture was US$1.68 billion in 2013. Recipients of support from the state must comply with the Vietnamese Good Agricultural Practices, representing the national standards for production, food safety, environmental work and product traceability.

Production patterns have changed in accordance with market signals and crop yields. In 2012, the most important agricultural commodities, by value, were rice, pork, vegetables, coffee, fresh fruit, cashew nuts, cassava, rubber, beef and chicken meat. The main agricultural raw-material exports, by value, were coffee, cashew nuts, cassava, pepper, fresh fruit and tea, while the main imports were soybean cake and soybeans, chicken meat, wheat, distilled alcoholic beverages and palm oil. In 2011, food (excluding fish) exports were worth US$6.9 billion, which was about 7 percent of the value of all exports (if fish are included, food accounted for about 12 percent of all exports), and food imports were worth US$7.1 billion, which was 7 percent of all imports. Despite being a net food-exporting country, Viet Nam has received food aid in the last 25 years, consisting mainly of cereals and wheat flour.

Viet Nam's forest cover increased from a low point of 28 percent in the 1990s to nearly 40 percent[21] in 2013, despite continuing deforestation and forest degradation. The area of primary forest declined from 384 000 hectares in 1990 to 85 000 hectares in 2005 but has now stabilized. The area of other naturally regenerated forest increased steadily from 8.0 million hectares in 1990 to 11.0 million hectares in 2015. The area of planted forest also increased, from 0.97 million hectares in 1990 to 3.66 million hectares in 2015; this includes rubber plantations, the area of which increased from 0.22 million hectares in 1990 to 0.91 million hectares in 2012.

There has been a major shift in forest tenure in the last 25 years, away from state forestry toward people-centred forestry. The 152 state forestry companies were managing a forest area of about 1.9 million hectares in 2013, and local people

21 According to national statistics and excluding rubber and special-products trees.

were managing more than 28 percent of the total forest area. There is now an estimated 4 500 private forest companies, and village-level forest management boards have been established in more than 10 000 villages. In 2012 there was 2.14 million hectares of "special-use forests" (national parks, nature reserves, tourism and spiritual forests, and research forests) and 5.83 million hectares of watershed protection forests. Average annual wood removals declined from 31.2 million m^3 (85 percent of which was woodfuel) in 1990–1994 to 27.1 million m^3 (75 percent of which was woodfuel) in 2007–2011. Industrial wood removals increased over the same period, from 4.67 million m^3 per year to 6.70 million m^3 per year. Production is increasing fastest for medium-density fibreboard, wood pellets and paper products. In 2013, the value of forest product imports was US$2.49 billion and the value of forest product exports was US$1.86 billion. The value of exports has grown by an average of 25–30 percent in the last decade, with Viet Nam becoming a major producer of wooden furniture.

Policy, legal and institutional framework

The objectives of the Comprehensive Strategy for Growth and Poverty Reduction to 2005 and towards 2010 included more efficient and diversified agricultural production, the development of forestry to become an effective business contributing to rural employment, enhanced access to financial services and rural credit, and long-term household economic development. Agriculture and forest policy documents have specific aims, such as the proportion of agricultural land to be converted to fodder production areas for livestock, and a forest cover target of 43–45 percent by 2020.

Land laws regulate the conversion of land, including agricultural and forest land, to other uses; they state that this must be based on approved land-use planning and master plans, which form part of national-level land-use planning documents. There is a legal obligation to engage stakeholders in land-use planning processes and potential to address land-use conflicts collaboratively, seeking to avoid win–lose situations and taking greater account of the rights and interests of all actors. There is also scope for civil society organizations to encourage more stakeholder participation in agricultural and forest development activities.

Challenges in enforcing legislation include land-use conflicts, where farmers face pressure to convert their land into other uses; corruption and flaws in the land administration system, with incomplete land dossiers for identifying land-use rights; confusion caused by changing land policies and land-use rights regimes; and a lack of recognition of customary tenure in statutory law, which is a particular problem in mountainous areas, where there are high percentages of ethnic minority groups.

The Viet Nam Forestry Administration is an agency under the Ministry of Agriculture and Rural Development. It has around 20 000 staff, including 180 at the national level, and it monitors forest law enforcement. As stated above, local communities have tenure to about 28 percent of the total forest area, but this only produces desirable outcomes if local communities can put their rights into effect. The forestry administration has limited capacity to support local forest management, facilitate participatory processes, and meet the needs of ethnic groups who do not understand Vietnamese.

Public investment in forestry has increased. Programmes have included the re-greening of bare land and denuded hills; The Five Million Hectare Reforestation Program (for the development of production forests); and support – in the form of land and forest allocations, price support, low interest loans and free technical advice – for smallholders, local ethnic communities and people living in remote upland areas. Community-based forest management has been introduced to involve local people in forestry activities, for example through the forest land allocation programme and forest protection contracts with local households. A PES scheme to support sustainable forest management, livelihood improvement and environment protection was piloted in 2008 and became part of the national policy in 2010.

ODA plays an important role in forest investment, far exceeding expenditure on forests by the Government of Viet Nam. ODA, which amounted to US$85 million in 2010, has helped fund sustainable natural forest management; the processing, trade and marketing of forest products; the development of institutional capacity; action related to the voluntary partnership agreement under the European Union's FLEGT initiative; and REDD+-related activities.

Box 4.7 presents the key factors contributing to positive trends in food security and forest cover in Viet Nam.

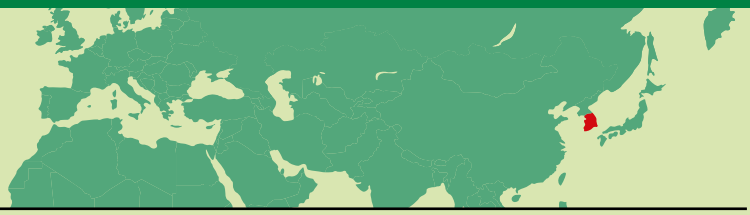
Box 4.8 reports on a separate study in the Republic of Korea, which offers many of the same insights as the case studies presented above. The full report of that study[22] highlights the benefits of forest rehabilitation in improving food security and sustainable livelihoods. ■

BOX 4.7

KEY FACTORS CONTRIBUTING TO POSITIVE TRENDS IN FOOD SECURITY AND FOREST COVER IN VIET NAM

- Economic reform, including trade liberalization, integrated Viet Nam into the global economy; agricultural reform placed farm households at the centre of economic activities; and state forest enterprises were restructured to become business-like enterprises.
- Political will has existed for maintaining and increasing forest cover, with policy directions translated into sectoral strategies, programmes and plans.
- National-level land-use planning documents have been used to inform decisions on land conversion, including from agricultural and forest land to other uses.
- Support has been given to both the agriculture and forest sectors, with clear targets for agricultural development, food production and forest protection and development.
- Land tenure was reformed to provide secure land tenure as a way of encouraging long-term investment.
- Policy instruments have been applied to promote the implementation of an agriculture policy aimed at increasing agricultural productivity. These include land tax exemptions; soft loans; export promotion; price guarantees; support for mechanization and reductions in post-harvest losses; and contributions towards agricultural insurance premiums.
- Financial instruments, such as payments for forest environmental services, have been used to support sustainable forest management, livelihood improvement and environment protection.
- There has been a shift from state forestry to multistakeholder forestry, with a focus on the active participation of local people and community-based forest management, including the forest land allocation programme and forest protection contracts with local households.

22 Available via *State of the World's Forests* website.



BOX 4.8

INTEGRATED POLICY FOR FORESTS, FOOD SECURITY AND SUSTAINABLE LIVELIHOODS – LESSONS FROM THE REPUBLIC OF KOREA

Koreans have traditionally relied heavily on forests for timber, woodfuel and non-wood forest products such as mushrooms and edible wild greens. In the 1950s and 1960s, the Republic of Korea was one of the world's poorest and least-developed countries, and half its forest cover had been lost through slash-and-burn agricultural practices, large-scale land conversion and the excessive extraction of timber and woodfuel. This deforestation caused severe erosion and exacerbated the impacts of droughts and floods, leading to decreased agricultural production and the loss of lives and property. Attempts to meet food needs led to further deforestation and further threats to food security.

Breaking this vicious circle was the rationale for an intensive forest rehabilitation programme that began in the 1960s and led to two successful Ten-Year Forest Rehabilitation Plans in the 1970s and 1980s. The government saw that restoring forests, especially in mountain watersheds, would help prevent agricultural disaster and provide a solid foundation for food production, and it would be fundamental for overcoming poverty and developing the national economy. As a result of this massive forest rehabilitation effort, the forest growing stock increased nearly 14-fold in the period 1955–2010, from 58 million m^3 to 800 million m^3.

The government integrated rehabilitation plans with the New Community Movement (*Saemaul Undong*), a community-based, integrated rural development programme aimed at improving village conditions, introducing new attitudes and skills and reducing the income gap between urban and rural communities. *Saemaul Undong* contributed to reforestation through small-scale village-level self-help projects such as nurseries and plantations for woodfuel and erosion control. These community projects also provided jobs and payments (either in wages or food) that helped people overcome hunger and brought vitality to the rural economy. To reduce pressure on forests, the rehabilitation programme banned the use of woodfuel in 20 cities and introduced alternative sources of energy for cooking.

Forest rehabilitation contributed to food availability through the planting of fruit and nut trees, especially chestnut. Income from forest rehabilitation projects improved food access by enabling people to buy food. Restored mountain forests contributed to food utilization by supplying clean water for cooking, and food from fruit and nut trees helped diversify diets. Food security improved as forests controlled erosion and protected watersheds.

LESSONS LEARNED

The experience in the Republic of Korea demonstrates that achieving food security through forest rehabilitation and sustainable forest management is most likely to be successful if there is:

- an integrated approach to ensure that relevant sectors work together;
- people's participation, with opportunities for them to benefit and earn income;
- strong political will and leadership; and
- a holistic approach to economic and social development.

4.3 COMMON THEMES AND LESSONS LEARNED: HOW TO IMPROVE FOOD SECURITY AND INCREASE AGRICULTURAL PRODUCTION WITHOUT REDUCING THE FOREST AREA

The seven case studies presented in this chapter demonstrate ways in which it is possible to improve food security and reduce poverty through integrated approaches to landscape management that include developing stronger synergies between agriculture and forestry. The case studies revealed a number of common themes, including the importance of: favourable economic conditions; policies that consider the agriculture and forest sectors in a balanced way; a market-oriented agricultural policy that includes social and environmental safeguards; policies that recognize the full economic, social and environmental benefits of forests; using the right policy instruments to increase agricultural productivity and promote sustainable forest management; an effective legal and institutional framework; adequate funding for implementation; devolving forest management rights to local communities; and promoting integrated land use.

It is important to note, however, that there are also significant differences between the case-study countries, for example in terms of geography; natural advantages for particular agricultural products and forest types; history, with its implications for political systems and land tenure; demographics; and level of economic development. Specific examples of these differences include the wide range of farm sizes (e.g. many farms in Chile are larger than 2 000 hectares, while farms less than 1 hectare in size are common in Georgia and Viet Nam); the relatively greater importance of food imports for food security in the Gambia and Georgia; the development of plantation forest resources in Chile, Ghana, Tunisia and Viet Nam; and the high value of forests for ecotourism in Costa Rica.

FAVOURABLE ECONOMIC CONDITIONS

All the case-study countries have experienced economic growth in real terms since 1990, although for a variety of reasons the rate of growth has not always been steady. Much of the growth has been associated with economic reforms initiated in the 1980s or 1990s. These reforms, which included strengthening the private sector, trade liberalization measures, and the transformation of the public sector, caused structural changes in the economy, usually with a higher proportion of value added in the services sector. Typically, such reforms also led to the withdrawal of at least some of the trade barriers that protected domestic producers.

In the forest sector, most countries have transferred management responsibilities from the state to the private sector and to smallholder farmers and local communities, at least to some extent. In most countries, the value added in agriculture (including livestock, forestry and fisheries) has grown in real terms since 1990 but fallen as a percentage of GDP because of more rapid growth in other sectors of the economy.

Most case studies highlighted the links between poverty and food insecurity and the importance of including poverty eradication and the reduction of inequality as key national economic policy objectives. For example, poverty is a leading cause of food insecurity in northern Ghana, which lags behind the rest of the country in its economic growth; in Costa Rica, poorer people – including landless rural families – still suffer from food insecurity. In the Gambia, most agricultural producers need to buy imported food, which increases their vulnerability to external price fluctuations; food insecurity is

generally greater in households headed by women. While some countries have benefited from food aid programmes, favourable economic conditions mean that governments are increasingly capable of addressing food security in more vulnerable communities without the need for such assistance.

A BALANCED POLICY APPROACH TO THE AGRICULTURE AND FOREST SECTORS

A number of the case studies demonstrate the value of governments developing policies and policy instruments that recognize the importance of forests to agriculture and food security. This approach has helped achieve positive developments in the forest sector while also improving food security and agricultural productivity. In Chile, Ghana and Viet Nam, for example, policy recognition of the potential of both agriculture and forests has led to strong and effective support for both sectors. In Costa Rica, the role of primary forests in ecotourism and more generally as a key element of the country's strong environmental credentials has put forest policy on an equal footing with agriculture and food policies. The benefits of forests for agriculture are well-recognized in Tunisia, and the forest policy there is regarded as an integral part of the agriculture policy. Food security can also be improved where there are supportive policies for forests that bring benefits to rural livelihoods, help alleviate poverty, provide a source of food and woodfuel, and maintain essential environmental services.

MARKET-ORIENTED AGRICULTURE WITH SOCIAL AND ENVIRONMENTAL SAFEGUARDS

As part of wider economic reform programmes, policies for agriculture and natural resources have typically sought to create diversified modern agriculture sectors offering sustainable food security by improving productivity and increasing investment (especially by the private sector) and through some degree of trade liberalization. Through such reform processes, the focus of public-sector investment has generally shifted towards research, development and extension with the aim of improving competitiveness, stimulating innovation, and communicating science-based best practices to farmers. Direct price support and input subsidies have usually been reduced, although not always eliminated; other public-sector interventions have focused on, for example, the development of rural finance and microcredit, and export promotion. It has proved possible to increase agricultural production through intensification rather than the expansion of agricultural land.

Since 1990 there have been considerable changes in the proportions of land used for arable farming, permanent crops, and permanent meadows and pastures for livestock. The case studies attribute these changes, as well as changes in crop production patterns, to farmer responses to price signals from both domestic and international markets, as well as to the impact of government policies on trade barriers, tariffs and support regimes.

A number of case studies showed that the drive towards a modernized and open agricultural economy should include safeguards for vulnerable groups in the population, smallholders, and the environment. Such safeguards are important for a number of reasons, including for ensuring that policies do not exacerbate poverty and food insecurity, protecting against the impact of increased exposure to global market fluctuations caused by trade liberalization, and preventing environmental damage from more intensive agricultural production (the Gambia case study cited rice production as an example of this). These safeguards include food aid (which generally has decreased as food security has improved in the case-study countries); various forms of social assistance for vulnerable households; and targeted measures such as price support, input subsidies and public procurement rules to encourage local food production. Support programmes for smallholders in Chile, for example, have included non-reimbursable financial incentives for agroforestry and agricultural investment; a programme to improve agriculture, income and quality of life in »

NEPAL
Potted seedling in a forest nursery that is part of a wood-for-energy project.
@FAO/F. McDougall

» indigenous communities; a programme to develop financial and business skills in smallholder organizations; and credit programmes linked to irrigation and natural forest management. In Viet Nam, rural development and poverty alleviation programmes, including those promoting socioeconomic development in ethnic minorities and remote communities with special difficulties, provide price support and subsidies to purchase machinery, equipment and agricultural insurance.

POLICIES THAT RECOGNIZE THE FULL ECONOMIC, SOCIAL AND ENVIRONMENTAL BENEFITS OF FORESTS

In most case-study countries, forest policies contribute to wider economic development and poverty reduction programmes. The Economic Recovery Programme in Ghana, for example, recognized the importance of both forestry and agriculture in achieving its vision for a structurally transformed economy, and Chile has also recognized the economic value of planted forests. In Tunisia, the Social and Economic Development Plan highlights the role of forests in protecting land from erosion and desertification, and the President annually reviews progress towards the forest expansion target. An objective of Viet Nam's Comprehensive Strategy for Growth and Poverty Reduction to 2005 and toward 2010 is for forestry to become an effective business that contributes to rural employment. In Georgia 2020 (Georgia's strategy for social and economic development), the protection and rational use of forest resources is listed as a priority in recognition that attention to forests will significantly improve the social and economic situations of people and that agricultural development depends on the health of forest ecosystems.

Although the percentage contribution of forests to GDP is low in all the case-study countries, such percentages, which are based on national accounts, fail to reflect the full economic contributions of forests. In the Gambia, for example, where forestry officially contributes about 0.5 percent of GDP, more than three-quarters of the population depends heavily on forest resources for domestic energy, food, fodder, construction materials and poles. In Costa Rica, forests make substantial contributions to the tourism sector, but the economic value of this contribution is not recognized in national accounts. The non-market environmental benefits of forests, such as climate-change mitigation, the regulation of water flows and soil conservation, are rarely included in economic accounts. In Tunisia, for example, healthy forests, covering 75 percent of the landscape, reduced the potential siltation of reservoirs by 35 percent, but this benefit is not reflected in the country's national accounts. To secure the political commitment necessary to implement policies aimed at reducing deforestation and increasing forest cover effectively it is essential that the non-market benefits of forests are properly recognized, despite the difficulty in giving them a monetary value.

USING THE RIGHT POLICY INSTRUMENTS TO INCREASE AGRICULTURAL PRODUCTIVITY AND PROMOTE SUSTAINABLE FOREST MANAGEMENT

In addition to developing suitable policies for improving agricultural productivity and promoting sustainable forest management, countries need to deploy appropriate instruments to promote implementation. Several case-study countries have used fiscal measures (such as incentives and tax breaks) and regulatory tools to do this.

Chile, for example, has provided significant incentives for the greater use of fertilizers and the installation of sophisticated irrigation equipment, as well as for the restoration of degraded soils, and extension services are available aimed especially at small-scale producers. Government investment in Ghana's agriculture sector has focused on agricultural research and development with the aim of developing and promoting technologies that can improve agricultural productivity and combat threats to crops posed by disease. Increased agricultural production in Tunisia has been obtained through the better use of existing

agricultural land, increased irrigation, the greater use of fertilizers, mechanization, improved seeds, and better farming practices. Viet Nam doubled its public investment in agricultural research and development between 2000 and 2010. Agricultural policy instruments in that country include exemptions from agricultural land-use taxes, soft loans, export promotion measures, price guarantees, support for mechanization, incentives to reduce post-harvest losses, and contributions to agricultural insurance premiums. Those receiving support from the state must comply with the Vietnamese Good Agricultural Practices code.

In Costa Rica, a PES scheme has helped strengthen protected areas and develop biological corridors, provided farmers with incentives to plant trees, and supported forest conservation in indigenous territories. In Ghana, private-sector investment in plantations has been encouraged by the Forest Plantation Development Fund (funded by levies on the export of air-dried lumber) and the allocation of land in degraded areas of forest reserves. Incentives for establishing plantations in Tunisia have included free seedlings and compensation for the loss of agricultural income.

LEGAL AND INSTITUTIONAL FRAMEWORKS

All countries featured in the case studies demonstrate the importance of effective legal and institutional frameworks for promoting food security, ensuring a productive agricultural sector and managing forest resources sustainably. Critical elements for improving food security while maintaining or increasing forest cover include the need for predictable and secure land tenure so that landholders have incentives to improve the productivity of their lands and manage them sustainably, and measures to regulate land-use change. Some case studies highlighted the important role of producer organizations as part of the institutional framework and the need to strengthen them through capacity-building programmes. Despite their successes in improving food security without reducing forest area, however, there is a continuing need in most countries to improve the legal and institutional frameworks.

In Viet Nam, land-tenure reform was undertaken to encourage long-term investment in land. A tree-tenure reform process is underway in Ghana aimed at giving farmers the right to harvest trees they have grown. The case studies on the Gambia and Ghana illustrate the complexities, uncertainties and inequalities that can arise when customary and statutory tenure arrangements co-exist. Tenure arrangements can also marginalize women: even when women have ownership rights to land, their access to forest products and opportunities for forest-generated income may not be assured. Traditions of inheritance may reduce the average size of farm holdings, adversely affecting agricultural efficiency. In Viet Nam, the lack of recognition of customary tenure in statutory law particularly creates problems in areas with a high proportion of ethnic groups. Other challenges in Viet Nam include confusion caused by frequent changes in land-tenure arrangements; the need to help local communities understand how they can benefit from their legal tenure rights; and incomplete land dossiers recording rights to land. In Chile, indigenous communities are raising concerns regarding their ancestral rights over land now occupied by forest plantations.

The case studies provide examples of the use of regulations in land-use change. Costa Rica has legal controls to prevent changes in land use for natural forests. Ghana requires that environmental impact assessments are undertaken before the significant-scale conversion of forest land to agriculture or of agricultural land to forest. Land laws in Viet Nam regulate the conversion of land, including agricultural and forest land, to other uses. In Tunisia, special authorization is needed to harvest protection forests designated for the prevention of erosion, the protection of water resources, or the conservation of endangered species.

The enforcement of such laws remains a challenge. Problems can arise from a lack of staff capacity to monitor and address activities on the ground; corruption; and a lack of understanding of the rationale for regulations, leading to a lack

of community and stakeholder support for enforcement. Even when an effective process for regulating land-use change is in place, the interests of those proposing forest conversion or exploitation may carry more weight than the interests of those seeking to protect the forest.

ADEQUATE FUNDING FOR IMPLEMENTATION

All the case studies emphasize the importance of adequate funding for implementing policies and promoting sustainable agriculture and forestry through legal and institutional frameworks and instruments. Sources of funds include the domestic private sector, the state, foreign direct investment, and ODA. Despite a lack of comprehensive information, there appears to have been a general shift in case-study countries towards encouraging private-sector investment and access to credit aimed at improving agricultural productivity, establishing forest plantations and developing processing industries.

In addition to allocations from national budgets, government funding for forests may be derived from para-fiscal sources such as the sale of products from publicly owned forests, royalties, licence fees, taxes on forest products, and export levies. Costa Rica introduced its PES scheme in the mid-1990s, in which a proportion of a tax on fossil fuels is allocated to forest-related activities. Viet Nam also introduced a PES scheme in 2010 to support sustainable forest management, improve livelihoods and protect the environment. The case studies showed that such government expenditure is often targeted at wider government priorities, such as providing employment in poorer parts of the country, or at environmental goals such as watershed protection and conservation. However, this may lead to funding gaps for more routine forest-related activities that are also essential but which have lower profiles. REDD+ was identified in a number of the case-study countries as a potentially important future source of funds.

ODA can be influential in the development and implementation of policies related to agriculture, forests and land-use change. In Tunisia, for example, the government was able to harness ODA (even though it was decreasing) because it identified forest development as a strong priority. In Ghana, ODA has had a significant impact by strengthening institutional capacity and supporting policy reform. The Viet Nam case study identified technical assistance from the international community as a key factor contributing to positive trends.

The case studies demonstrated the importance of simultaneous public-sector investment in the agriculture sector, the forest sector and rural development in order to achieve food security while maintaining or increasing forest cover.

DEVOLVING FOREST MANAGEMENT RIGHTS TO LOCAL COMMUNITIES

Several case studies highlighted the importance of devolving forest management rights to local communities. They noted that the effective implementation of forest policies is difficult without stakeholder support and community involvement. The Ghana case study demonstrated the importance of policies that safeguard the interests of communities, including small and medium-sized forest enterprises, and the value of collaborative forest management in improving community access to forest benefits. The Viet Nam case study showed that a shift from state forestry to multistakeholder forestry with the active participation of local people was a key factor in achieving positive trends; forest protection contracts with households are being used to involve local people in forest-related activities and to develop community-based forest management. In the Gambia, the state has recognized the value of participatory forest management and is transferring parts of its forest reserves to local communities (with the aim of ultimately putting 75 percent of its forest land in community hands) in the expectation that this will increase community appreciation of the importance of sustainable forest production. In Tunisia, local communities, non-governmental organizations and the private sector are engaged in the co-management of forest resources under a system of devolving responsibility for forestry activities. The case studies of Ghana and

Viet Nam show that care is needed to define clearly the respective responsibilities of government and local communities when entering into community-based forest management arrangements. In Viet Nam, the staff of the forest administration may need support to develop their capacity for facilitating participatory processes in ways that take into account the rights and interests of all actors.

PROMOTING INTEGRATED LAND USE

An integrated landscape-scale approach to agriculture, forests and other land uses can bring valuable synergies. Several case studies outline measures taken to encourage the integration and coordination of land uses in production landscapes. Viet Nam has a system of land-use master plans that must be followed when allocating land uses. Tunisia also has a strategic approach: forwwest land there is considered unsuitable for agriculture, both for environmental reasons and because of its low agricultural potential, and the forest area is expanding in marginal areas of limited agricultural value or where it can bring benefits for farmers, for example by fixing sand dunes, creating windbreaks and increasing forage production for livestock. In Chile, plantation development has mainly taken place on poorer land that was previously used for extensive farming and had become degraded, while intensive agricultural production is concentrated on irrigated land. Integration between agriculture and forestry is encouraged in Chile through close collaboration between agricultural and forest institutes providing research and extension services. Costa Rica has encouraged agroforestry as a way of providing shade for coffee cultivation and livestock (and thereby increasing productivity); and the promotion of cocoa certification has increased the extent of cocoa agroforestry in Ghana. Another example of effective integration, also in Ghana, is the allocation of land in degraded parts of forest reserves to farmers for reforestation and agroforestry, including intercropping in the first few years. Despite the benefits of integrated approaches, a lack of tenure security can be an obstacle to them: the tenure reform in Viet Nam demonstrates that secure long-term tenure arrangements are essential for assuring farmers that they (or their successors) will be able to harvest the trees they grow. ■

CHAPTER 5

TOWARDS BETTER GOVERNANCE OF LAND USE FOR FORESTS AND AGRICULTURE

YEMEN
Managing woodlands is an important part of a local FAO project that includes sand-dune stabilization, watershed management and institution strengthening.
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CHAPTER 5

TOWARDS BETTER GOVERNANCE OF LAND USE FOR FORESTS AND AGRICULTURE

5.1 KEY CONCLUSIONS

Global forest area has declined by 129 million hectares (3.1 percent) in the period from 1990 to 2015 and is now just under 4 billion hectares. Although the rate of global net forest loss slowed from an average of 7.3 million hectares per year in the 1990s to 3.3 million hectares per year in 2010–2015 (FAO, 2015a), deforestation remains a matter of deep concern (UN, 2015b). Halting the loss of forests will benefit hundreds of millions of people, including many of the world's poorest people, whose livelihoods depend on forest goods and environmental services. It will also help combat climate change, protect habitats for 75 percent of the world's terrestrial biodiversity, and maintain ecosystem resilience – thereby supporting sustainable agriculture.

Most of the loss of forest area in the last 25 years has been in the tropical climatic domain, where populations are still growing, including in rural areas. In contrast, there have been gains in net forest area in the temperate domain, where rural populations are generally decreasing. There are clear associations between forest loss and national income: in 2000–2010, high-income countries registered an overall increase in forest area, while the upper-middle, lower-middle and low-income country categories all showed overall decreases in forest area (and the largest decreases were in the low-income group).

The conversion of forest land to agricultural use remains the main driver of deforestation. In 2000–2010 the loss of forest in the tropical domain (7 million hectares per year) was similar to the increase in agricultural area (6 million hectares per year). Most of this forest loss, and increase in agricultural area, occurred in South America, sub-Saharan Africa and South and Southeast Asia. It is estimated that, in the tropics and subtropics, large-scale commercial agriculture accounts for 40 percent of deforestation; local subsistence agriculture accounts for 33 percent; and urban expansion, infrastructure and mining account for 27 percent.

Large-scale agricultural developments are often export-focused and contribute relatively little to local food supplies, although they can bring wider economic benefits. Commercial agriculture accounts for almost 70 percent of deforestation in Latin America; in the Amazon region, cattle ranching, soybean farming and oil-palm plantations have been major drivers of deforestation since 1990. Oil-palm plantations are replacing substantial areas of natural forest in Southeast Asia. Social and environmental safeguards are needed to avoid negative consequences; voluntary measures by the private sector, such as certification schemes and moratoria on the purchase of products grown in deforested areas, have been helpful in achieving positive outcomes (e.g. a reduction in deforestation in the Amazon).

Large-scale commercial agriculture accounts for one-third of deforestation in Africa. Subsistence agriculture is important for the livelihoods of many poor households in Africa; opportunities to improve the efficiency of this form of agriculture, such as the strengthening of farmer organizations, need to be combined with wider rural development and social protection programmes. Some case studies provided examples of support programmes aimed at, for example, the co-financing of agroforestry and agricultural investment projects; the strengthening of producer organizations; skills development; and access to microcredit, financial incentives, soft loans and price guarantees. Such measures often form part of wider socioeconomic

development and poverty alleviation programmes targeted at vulnerable groups and areas with special difficulties.

Underlying factors affecting forest conversion include population growth, agricultural development, land tenure, and the governance of land-use change. As illustrated by the case studies, the significance of particular drivers depends on the circumstances of each country. Global population has grown by 37 percent since 1990, and food consumption has increased by 40 percent. Food consumption will continue to increase as the population grows and also as food consumption patterns change; demand for land to produce other products such as biofuels is also likely to increase. Food security is increasingly tied to international trading relationships, as is the vulnerability of forests, as agriculture in lower-income countries often develops in response to the demands of higher-income countries.

Although food security, sustainable agriculture and sustainable forest management are all global priorities, the analysis of policy documents presented here suggests that decisions on land use and natural-resource priorities are not always addressed in an integrated way at the national level. There is a need to improve coordination between policies on forests, agriculture, food, land use, rural development and national development. For example, agriculture policies should be more explicit about the potential implications of food production strategies for forests and sustainable land management. Several case studies highlighted the importance of recognizing the value of forests, as well as the importance of agriculture and food security, in wider national economic development, rural development and poverty reduction strategies.

Problems arise where the legal framework governing land-use change is fragmented and inconsistent. This can occur where national policies on land use are weak or non-existent, or if there is inadequate coordination when drafting legal instruments. Such fragmentation and inconsistency can make it more difficult to enforce laws effectively and increase the likelihood of forest loss, including through the illegal conversion of forests to agriculture or other land uses. Law enforcement is likely to be more effective when legal requirements are understood and supported by all stakeholders. Other prerequisites for sustainable land management are land-tenure security, the formal recognition of customary rights to the use of land and forest goods, and the strengthening of the rights of vulnerable groups, such as poor, forest-dependent women.

Selecting the right tools to support policy implementation is vital. For example, if large-scale commercial agriculture is a principal driver of land-use change, important policy tools include effective processes for regulating land-use change, such as the use of social and environmental impact assessments, to ensure that such change does not lead to undesirable deforestation. On the other hand, where local subsistence agriculture is a principal driver, policy tools may include wider measures to address poverty, together with actions to improve local agricultural and other land-use practices. In some of the case-study countries, analysis of the causes of deforestation helped inform the design of appropriate policy instruments.

Forest loss is often associated with low levels of investment in agriculture and forests. Encouraging agricultural investment may involve research and extension, as well as measures to improve distribution and marketing, address inefficiencies

in value chains, and increase access to appropriate forms of finance. Innovative investment in forests can help achieve wider social and environmental public policy goals; examples include major afforestation and landscape-scale forest rehabilitation programmes and the integration of forestry into poverty reduction and rural development strategies. Some countries have created successful enabling environments for private-sector investment in forestry and pioneered innovative funding mechanisms, such as PES. In a number of the case-study countries, public-sector support has shifted away from production support towards research and development, rural finance, export promotion and the strengthening of producer organizations. Direct public-sector investment is often targeted at environmental priorities such as soil restoration and tree planting; social priorities, including social protection programmes; and catalysing private-sector investment.

There is an opportunity to mainstream integrated land-use planning as a tool for achieving sustainable land management and improving ecosystem resilience, enhancing synergies and complementarities among land uses at various scales, and addressing potential conflicts. Integrated land-use planning can create a strategic framework within which to balance competing land uses and to bring together relevant government bodies and stakeholders to assess technical information on, for example, land capability, natural resource availability and expected future needs. Another tool for improving consistency in land-use management is the unification of maps and databases that combine authoritative land-based information from different agencies. Measures taken in case-study countries to achieve integrated approaches to land use at different scales include the development of overarching strategic land-use frameworks to inform decisions, improved cooperation between agricultural and forest research institutes, and the promotion of agroforestry systems.

Partnerships with civil society and the private sector are a key part of institutional arrangements. Stakeholder commitment is essential for effective policy implementation. There is potential to further develop private governance initiatives, such as voluntary certification schemes, moratoria and commitments to "zero-deforestation" supply chains, by strengthening partnerships between the private sector, civil society organizations, national and local government bodies, and international organizations.

Devolving forest management rights to local communities and smallholders can improve access to, and recognition of, forest benefits through collaborative forest management. In the case-study countries this has also led to greater recognition among local communities of the value of forests. Effective collaborative forest management requires clear definition of the respective roles and responsibilities of public bodies and community organizations and ensuring that they have the capacity to deliver.

A multipronged approach is needed to achieve multiple land-use and natural-resource goals involving coordinated policy development and land-use planning; the effective legal protection of forests; greater tenure security; strong stakeholder engagement; improved monitoring of deforestation; strong cooperation with the private sector and civil society on voluntary initiatives; and the use of well-designed and targeted financial instruments. The case studies provide illustrations of how this can be achieved but also demonstrate the importance of adopting different approaches in different contexts and the need to adapt to changing circumstances. ■

5.2 POLICY IMPLICATIONS

In order to meet global priorities, including those set out in *Transforming our world: the 2030 Agenda for Sustainable Development* and the Paris Agreement on climate change, there is an urgent need to accelerate progress towards achieving sustainable agriculture, food security and sustainable forest management. Such progress will be important in achieving SDG 2, SDG 15 and Article 5 of the Paris Agreement, as well as the five Strategic Objectives of the FAO Strategic Framework (FAO, 2013d).

The 2030 Agenda for Sustainable Development reaffirms that "every State has, and shall freely exercise, full permanent sovereignty over all its wealth, natural resources and economic activity", and it states that each government will decide how global targets should be incorporated into national planning processes, policies and strategies. The 2030 Agenda for Sustainable Development notes that all SDGs and targets "are integrated and indivisible": this has crucial implications for policy development because of the linkages between SDG 2 and SDG 15 and also because of the need to make progress towards several other SDGs in order to achieve sustainable agriculture, food security and sustainable forest management. For example, achieving gender equality (SDG 5), sustainable economic growth (SDG 8) and peaceful and inclusive societies with effective, accountable and inclusive institutions (SDG 16) is essential for creating the macro-framework necessary for achieving SDGs 2 and 15. The policy implications described in this section should be read in this context.

Based on the material analysed for this report, the recommendations presented here aim at improving the governance and management of land-use change through: better cross-sectoral coordination of policies on agriculture, food and forests; greater public investment in agriculture and forests; policy instruments to promote sustainable agriculture and sustainable forest management; improvements in tenure rights and the legal framework; stronger institutions and stakeholder engagement; and integrated land use. Significant information gaps that need to be filled to improve the governance and management of land-use change are also identified.

BETTER CROSS-SECTORAL COORDINATION OF POLICIES ON AGRICULTURE, FOOD AND FORESTS

High-level national economic, social and environmental policies should recognize the importance of sustainable agriculture, food security and sustainable forest management, including their contributions to relevant SDGs and associated targets and to actions in the Paris Agreement on climate change. Such recognition would constitute a first step in improving policy coordination, and would also help in identifying policy tensions so that further analysis of potential conflicts can inform political decisions on priorities. Where there is concern about the implications of population growth (for example) for agriculture, food and forests, analyses could examine the extent to which agricultural intensification and improved agroforestry can meet food-security needs as a basis for developing explicit targets on land-use conversion.

PUBLIC INVESTMENT IN AGRICULTURE AND FORESTS

There is a need for concurrent public investment in sustainable agriculture and sustainable forest management as part of, or complementary to, wider rural development programmes. Such investment should focus on measures that: catalyse private investment; improve processing, distribution and marketing infrastructure; promote innovation and best practices through research, development and extension; and develop the capacity of producer and community organizations. Direct public investment in, for example, afforestation programmes should aim to achieve wider social and environmental benefits, such as climate-change mitigation, combating land degradation, enhancing the resilience of agriculture, and improving livelihoods. Funding

is likely to come from a range of sources, such as levies, income from state-owned forests, PES mechanisms, REDD+, voluntary partnerships with the private sector and civil society, government budgets, and ODA.

Social and environmental safeguards through, for example, cross-compliance measures should be put in place to mitigate potential adverse consequences of investments in agriculture and forests.

USING THE RIGHT POLICY INSTRUMENTS TO PROMOTE SUSTAINABLE AGRICULTURE AND SUSTAINABLE FOREST MANAGEMENT

In any given country, the choice of policy instruments to support sustainable land use should reflect the circumstances and be targeted accordingly. This requires careful analysis of the underlying causes and consequences of the identified problems. For example, if large-scale commercial commodity production is a significant driver of deforestation, appropriate instruments may include measures to regulate land-use change, including the need for environmental impact assessment; measures to prevent conflict with existing land-tenure rights; and cross-compliance measures related to financial support. Where the expansion of small-scale subsistence farming is causing deforestation, the deployment of policy instruments, for example to improve farming practices and promote agroforestry, should be considered in the wider context of rural development, livelihood diversification and poverty alleviation programmes.

IMPROVING TENURE RIGHTS AND THE LEGAL FRAMEWORK

Laws and regulations on land-use change should be clear and consistent with policy objectives. This may require considerable effort, especially where there are inconsistencies between, for example, legal provisions dealing with land rights, environmental protection, wildlife conservation and forests.

The legal framework should provide certainty on land tenure and the rights to the use of land and forest resources. The Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of Food Security (FAO, 2012d) set out principles and internationally accepted standards for practices for the responsible governance of tenure and provide a framework for countries in developing strategies, policies, legislation, programmes and activities.

STRENGTHENING INSTITUTIONS AND STAKEHOLDER ENGAGEMENT

Good governance requires effective institutions as well as a sound policy and legal framework. The institutional framework should encompass local communities, civil-society organizations and responsible private-sector interests, as well as government departments and agencies. It may require building the capacity of organizations that support indigenous peoples, local communities and smallholders as well as the strengthening of public-sector organizations (including their capacity to facilitate participatory approaches).

The right of stakeholders (including women) to be consulted during the development and implementation of land-use policies, programmes and plans should be formalized so that such policies, programmes and plans fully take into account the needs of, and are supported by, forest users and other stakeholders. Gender considerations should be mainstreamed in national forest policies, programmes and institutions, which should actively promote the equal access of women to the ownership of land and other resources.

Partnerships between the public sector, the private sector and civil society should be encouraged as a way of promoting sustainable land management through, for example, voluntary measures such as certification, voluntary guidelines for sustainable management, and corporate social responsibility programmes.

Consideration should be given to opportunities for devolving public-forest management rights to local communities and smallholders where this is likely to improve forest management and give local people greater access to forest benefits. The rights and responsibilities of all parties should be set out clearly.

PROMOTING INTEGRATED LAND-USE APPROACHES AND LANDSCAPE MANAGEMENT

Integrated land-use planning provides an opportunity to develop a strategic framework for balancing competing land uses among stakeholders. At a national, subnational or landscape scale, this may also include climate-change adaptation measures aimed at increasing ecosystem resilience. Integrated land-use planning requires technical data on land and natural resources as well as collaboration among relevant public bodies and the active engagement of stakeholders.

Integrated management approaches such as agroforestry, agroecology, climate-smart agriculture and the adaptation of livestock grazing regimes should be promoted, for example through collaborative research, development and extension among agricultural and forest research institutes and through forest and farm producer organizations.

PROVIDING MORE COMPREHENSIVE INFORMATION TO MEET EVIDENCE NEEDS

The collection, analysis and interpretation of data and information are essential for informed evidence-based decisions. There is a need for more systematic and comprehensive evidence at the global level on the effectiveness of governance, law enforcement and compliance mechanisms related to land-use change from forests to agriculture; and on the economic, social and environmental values of forests. There is potential to build on the analysis in this report with more detailed work at the international level on law enforcement and compliance mechanisms, and to add to the analysis presented in *State of the World's Forests 2014* (FAO, 2014a) with more information on the economic, social and environmental values of forests. ■

ANNEX
DEFINITIONS AND METHODOLOGY

SENEGAL
An acacia tree.
©FAO/Pietro Cenini

ANNEX

DEFINITIONS AND METHODOLOGY

DEFINITIONS

Afforestation is the establishment of forest through planting and/or deliberate seeding on land that, until then, was not classified as forest (FAO, 2012a).

Agricultural land includes arable land, land under permanent crops (such as cocoa and coffee), and permanent meadows and pastures (FAO, 2016b).

Agriculture Orientation Index is the ratio of the agriculture share of government expenditures to the agriculture contribution to the economy (FAO, 2015b).

Cropland includes arable land and land under permanent crops (FAO, 2016b).

Deforestation is the conversion of forest to other land uses or the permanent reduction of the tree canopy cover below the minimum 10 percent threshold (FAO, 2012a).

Forest is land spanning more than 0.5 hectares with trees higher than 5 metres and a canopy cover of more than 10 percent, or trees being able to reach these thresholds *in situ*. It does not include land that is predominantly under agricultural or urban land use (FAO, 2012a).

Forest degradation is the reduction of the capacity of a forest to provide goods and services (FAO, 2012a).

Government expenditure on agriculture includes projects and programmes related to the administration, supervision and regulation of agriculture; agrarian reform, agricultural land settlement, development and expansion; flood control and irrigation; farm price and income stabilization programmes; extension, veterinary, pest control, crop inspection and crop grading services; production and dissemination of general and technical information on agriculture; and compensation, grants, loans or subsidies to farmers (FAO, 2012c; FAO, 2015b).

Gross domestic product is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for the depreciation of fabricated assets or for the depletion and degradation of natural resources.

Gross national income is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad.

Human Development Index is a composite index measuring average achievement in three basic dimensions of human development: 1) a long and healthy life; 2) knowledge; and 3) a decent standard of living (further details are available in Technical Note 1 at http://hdr.undp.org/en).

Investment is generally defined to include activities that result in the accumulation of capital that yields a stream of returns over time. Determining whether expenditure constitutes an investment can be difficult both conceptually and empirically, and in some cases it is not clear-cut. Investment in agriculture can be categorized as public or private, and foreign or domestic (FAO, 2012c).

The **land-tenure system** is the relationship, whether legally or customarily defined, among

people, as individuals or groups, with respect to land and associated natural resources (including water, trees, minerals and wildlife). Rules of tenure define how property rights in land are allocated within societies and may determine who can use what resources, for how long, and under what conditions (FAO, 2002).

Land use is characterized by the arrangements, activities and inputs people undertake in a certain land-cover type to produce, change or maintain it (see www.fao.org/nr/land/use/en/).

Natural expansion of forest is the expansion of forest through natural succession on land that, until then, was under another land use (e.g. forest succession on land previously used for agriculture) (FAO, 2012a).

Number of people undernourished is the estimated number of people at risk of undernourishment.

Other land is land that is not classified as forest or other wooded land. It includes agricultural land, meadows and pastures, built-up areas, barren land, and land under permanent ice, as well as areas classified as "other land with tree cover" (FAO, 2012a).

Other land with tree cover is land, not classified as forest or other wooded land, that is predominantly under agricultural or urban land use and has patches of tree cover that span more than 0.5 hectares with a canopy cover of more than 10 percent of trees able to reach a height of 5 metres at maturity (FAO, 2012a).

Planted forest is forest predominantly composed of trees established through planting and/or deliberate seeding (FAO, 2012a).

Poverty headcount ratio at US$1.90 a day is the percentage of the population living on less than US$1.90 a day at 2011 international prices (a more detailed explanation is available at www.worldbank.org/en/publication/global-monitoring-report).

Poverty gap at US$1.90 a day (2011 PPP) is the mean shortfall in income or consumption from the poverty line of US$1.90 a day (counting the non-poor as having zero shortfall), expressed as a percentage of the poverty line. This measure reflects the depth of poverty as well as its incidence (a more detailed explanation is available at www.worldbank.org/en/publication/global-monitoring-report).

Prevalence of undernourishment measures the probability that a randomly selected individual from the reference population is found to consume less than their calorie requirement for an active and healthy life; this is the traditional FAO hunger indicator.

Public-sector expenditure on agriculture includes spending by various units of the public sector, such as government agencies, public-sector institutions and development partners (FAO, 2012c).

Public-sector expenditure on forestry is expenditure on forest activities of all government institutions (including at subnational levels), but excluding publicly owned business entities (nationalized industries or state enterprises). It includes the total budget allocated to forestry and spent by all concerned institutions, including expenditures for administrative functions, reforestation funds, direct support to the sector (e.g. grants and subsidies) and support to other forest-related institutions (e.g. training and research centres) (FAO, 2015a).

Reforestation is defined as the re-establishment of forest through planting and/or deliberate seeding on land classified as forest (FAO, 2012a).

Subsidy is defined by the World Trade Organization as any financial contribution by a government, or agent of a government, that confers a benefit on its recipients. FAO uses a broader definition and classifies subsidies into four main categories: 1) direct financial transfers; 2) services and indirect financial transfers; 3) regulations; and 4) lack of intervention. Other alternatives or euphemisms for subsidies include incentives, fiscal support, aid, assistance, and government financial transfers. The figures for agricultural subsidies reported in this study are drawn from McFarland, Whitley and Kissinger (2015), who use a modified FAO definition of subsidies.

METHODOLOGY

Chapter 2

The analysis of land-use change dynamics presented in Chapter 2 is based on forest resources data reported by countries and published in the *Global Forest Resources Assessment 2015* (FAO, 2015a), and on data on agriculture, income categories and population published by FAO (2016a)[23] and the World Bank.[24] Although the data come from multiple sources and have varying levels of reliability, they provide insight into the scale of land-use change occurring globally.

The analyses reported in Figures 2.1–2.8, and the associated text, cover those countries and territories for which data were available on both agricultural area (FAO, 2016a) and forest area (FAO, 2015a). Countries with significant inconsistencies in the reported data were excluded from the analyses. Figure 2.1 reports on 214 countries. Figures 2.2, 2.5, 2.6 and 2.7 report on 213 countries and Figure 2.3 reports on 234 countries. Figure 2.4 reports on 151 countries.

Figure 2.5 uses income categories as defined by the World Bank[25] and does not take into account changes in income categories over the period 2000–2010. The map in Figure 2.8 and the further detail in Table 2.1 are based on an analysis carried out for 145 countries. Desk studies performed for the *Global Forest Resources Assessment 2015* with forest area data of reduced reliability were excluded (in addition to countries with significant inconsistencies in reported data), and Serbia and Montenegro, and Sudan and South Sudan, were also excluded because disaggregated data on agriculture were unavailable. Changes of less than 1 percent were not considered for the analyses.

The analysis of land use by climatic domain classified countries in more than one climatic domain according to the most dominant climatic domain at the country level. For example, the United States of America has boreal, temperate and subtropical forests, but because the largest forest category is temperate, that country is reported here as in the temperate climatic domain. Figure A.1 shows the classification used.

Chapter 3

Analysis of policy documents

A qualitative and quantitative analysis of official national forest, agriculture, land, food and development policy documents was undertaken using a keyword search. Groups of keywords considered relevant to land-use change involving forests and agriculture were used. These included: land conversion, land planning, abandoned forest and agricultural land, increase of agriculture on forest land and vice versa, conflicts in land-use changes, agroforestry systems, forest products, population growth, climate change, food security, cooperation and coordination between sectors, harmonization between different sectoral policies, afforestation, and deforestation. In countries in which more than three national sector policy documents were available, a deeper analysis was undertaken to examine supporting priorities and inconsistencies among national priorities.

23 See http://faostat3.fao.org/home.

24 See http://databank.worldbank.org/data/home.aspx.

25 See http://data.worldbank.org/news/new-country-classifications.

The documents were obtained primarily from FAO's Legal Service, Food and Agriculture Policy Decisions Analysis (FAPDA) and forest policy databases. Some documents were also received from FAO regional, subregional and country offices. The full qualitative analysis was based on policy documents in English, French, Spanish and Russian available in PDF or Word format. Where necessary, supplementary information was obtained from regional and subregional FAO offices, USAID country reports on land use, FAPDA analyses, country reports for the *Global Forest Resources Assessment 2015*, REDD+ reports, other literature and a web search. Table A.1 shows the number of documents analysed for the report (and the total number of documents in the total number of documents obtained (Table A.1).

Relevant documents were selected from the databases when the results of the keyword search related specifically to land-use change from forest to agriculture or from agriculture to forest. Each selected document was read, and relevant text was selected and compiled as two-sentence summary statements into a results table. Where possible, statements were direct quotations with citations. A note was made of strongly conflicting or incomplete data.

Table A.2 shows the countries used for the analyses presented in Figures 3.1–3.5.

Analysis of legal frameworks

A generic analysis of relevant national legal and regulatory frameworks was conducted to assess the clarity and exhaustiveness of the rules governing forest conversion and land-use change. The analysis used a sample of countries in various regions of the world. A sampling approach was necessary because of the very specific nature of legal texts (a keyword search is insufficient because the whole text needs to be studied) and because the necessary information is contained in a large number of regulations and bylaws as well as in primary legislation.

A more in-depth study of the legal framework was conducted in a small number of countries in the Congo Basin and Latin America.

Analysis of investments in agriculture and forestry

This analysis focused on investment in agriculture and forestry and its effect on land use across all countries. Due to a lack of comprehensive data suitable for making systematic comparisons, best use was made of existing databases and information. This presented a number of challenges because the available data sources used different definitions, different levels of aggregation and different reporting terminologies. In general, data on forests are less reliable than those on agriculture, especially where there is a high proportion of informal or illegal economic activity. Accordingly, this analysis used proxies to make comparisons between the two sectors and to indicate general trends and impacts on land use.

Chapter 4

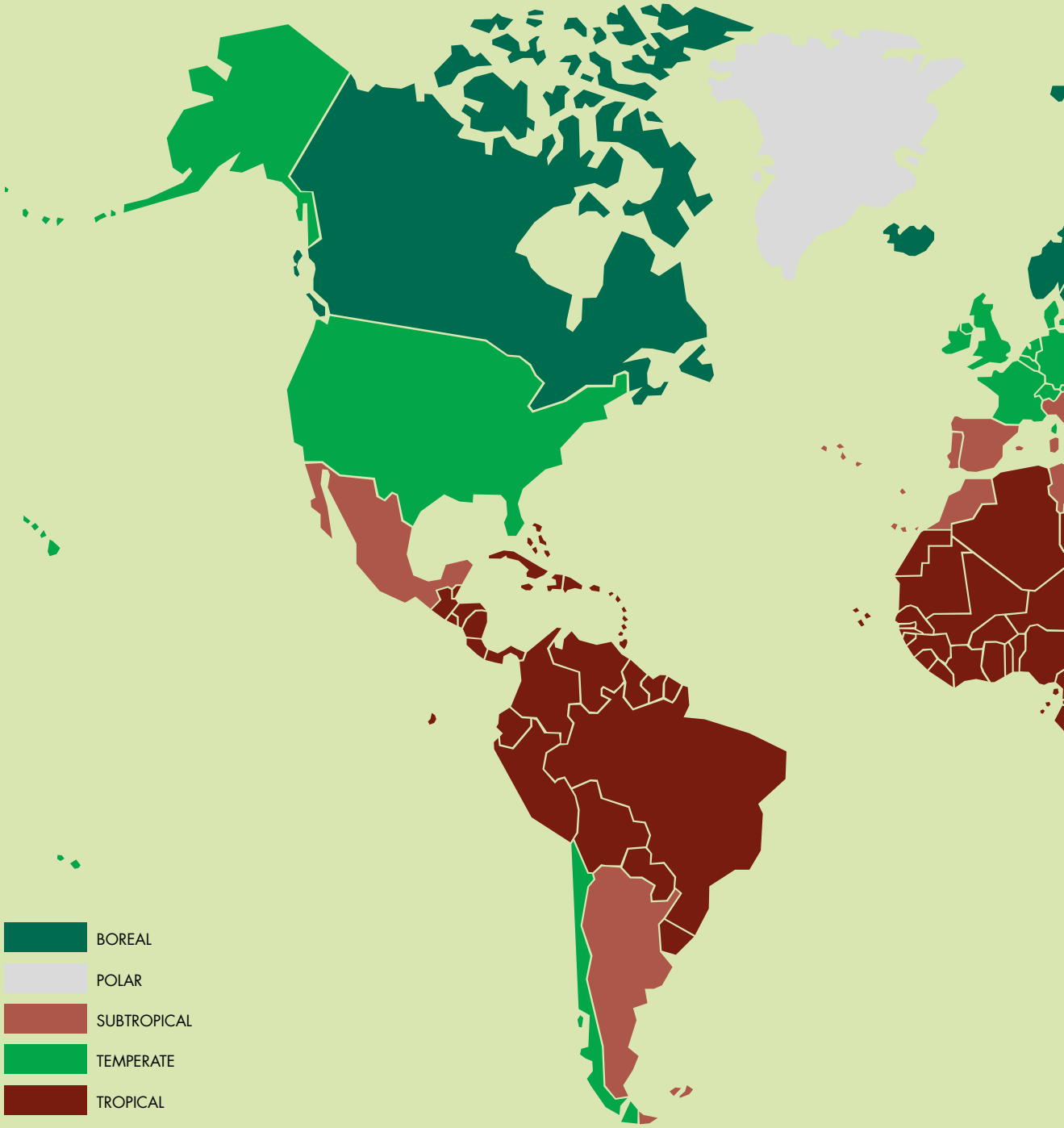
Criteria for identifying potential case-study countries

Potential case-study countries were identified using data from official UN sources, namely the *Global Forest Resources Assessment 2015* (FAO, 2015a), FAOSTAT3 (FAO, 2016a), and the World Bank DataBank (World Bank, 2016).

The criteria for demonstrating an improvement in food security were based on two indicators, namely the prevalence of undernourishment – PoU – and the number of undernourished people – NoU (FAO, 2013b). PoU is the traditional FAO hunger indicator, and NoU is the official 1996 World Food Summit indicator. Millennium Development Goal 1C was to halve the proportion of people who suffer from hunger, or reduce it below 5 percent, over the period 1990–2015, and the World Food Summit target was to halve the number of undernourished people over the period 1990–1992 to 2015. The criteria used here to identify countries with improved food security were the achievement of both Millennium Development Goal 1C and the World Food Summit target, or the achievement of Millennium Development Goal 1C by reducing the PoU below 5 percent.

FIGURE A.1

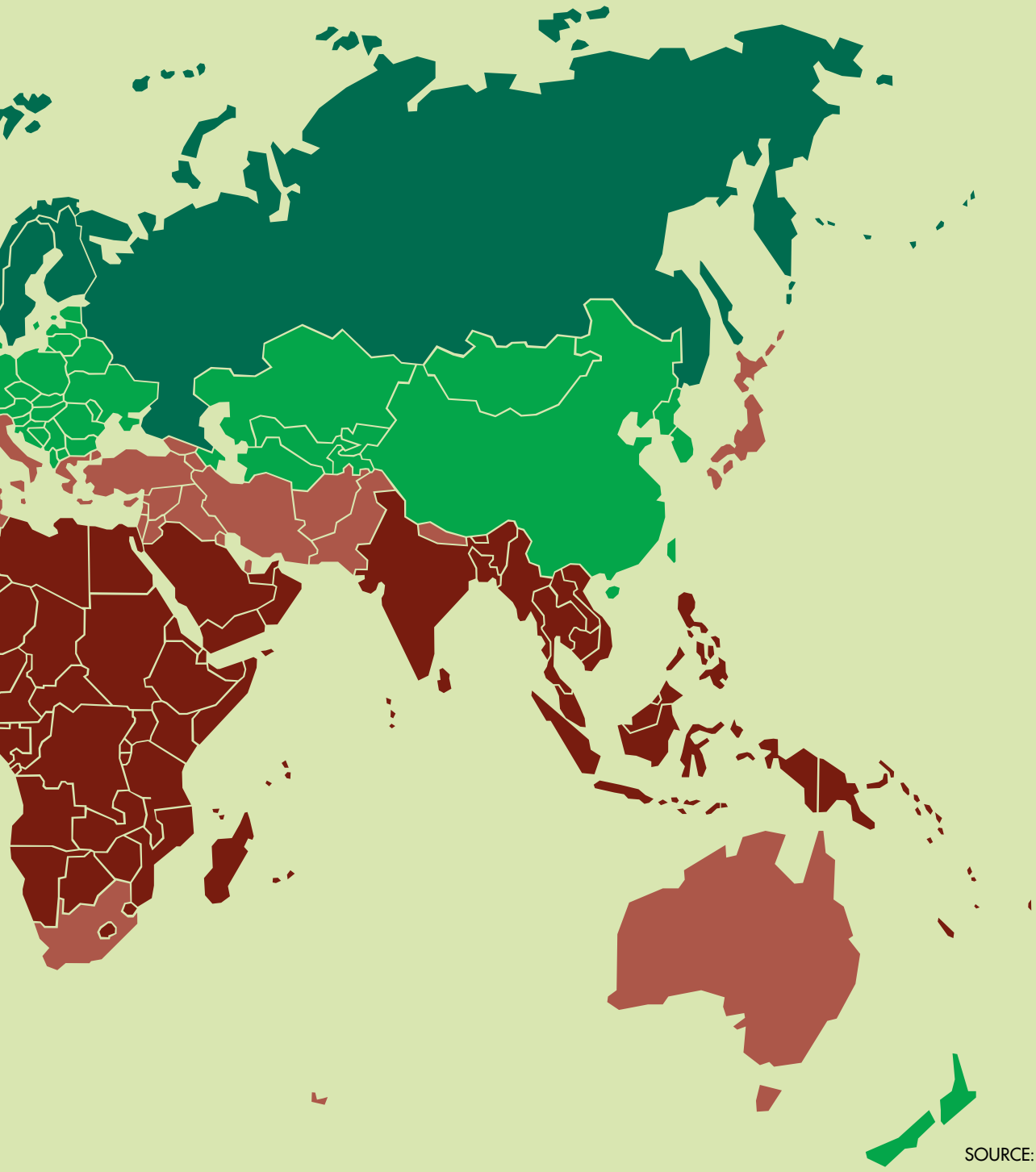
COUNTRIES CLASSIFIED ACCORDING TO DOMINANT CLIMATIC DOMAIN



The criteria for demonstrating an increase in, or maintenance of, forest area in a country were either an increase in forest area, or a forest loss of no greater than 5.5 percent over the period 1990–2015.

To facilitate case-study selection, the analysis was restricted to countries with a land area of between 650 000 hectares and 900 million hectares and a percentage of forest area (in 2015) of 6–80 percent.

The analysis identified the following 22 countries that had maintained or increased forest area, and improved food security over the period 1990–2015: Chile, Costa Rica, the Dominican Republic, Fiji, Gabon, Georgia, Ghana, Guyana, the Islamic Republic of Iran, Lebanon, the Republic of Korea, Malaysia, Mexico, Morocco, Peru, South Africa, Thailand, Tunisia, Turkey, Uruguay, Uzbekistan and Viet Nam. These countries were clustered according to region and the World Bank



SOURCE: FAO, 2015a.

income-level country classification.[26] As there were no low-income countries in this list, low-income countries that met the forest area criteria and Millennium Goal 1C but not the World Food Summit criteria were considered for case studies; they were Bangladesh and the Gambia.[27]

The countries selected for case studies were Chile, Costa Rica, the Gambia, Georgia, Ghana, Tunisia and Viet Nam. The case-study summaries are based on the case-study reports and other data from FAO and World Bank sources (FAO, 2013a; FAO, 2015a; FAO, 2016a; World Bank, 2016). ■

26 World Bank, http://data.worldbank.org/news/new-country-classifications-2015.

27 Since this analysis was undertaken, Bangladesh has been reassigned to the lower-middle-income group.

TABLE A.1

NUMBER OF POLICY DOCUMENTS ANALYSED AND CONTENTS OF POLICY DATABASES

REGION	COUNTRY	POLICY TYPE					
		FOREST	FOOD	NATIONAL DEVELOPMENT	AGRICULTURE	LAND	COUNTRY REPORT
South America	Argentina	2		1	1	1	
South America	Bolivia (Plurinational State of)	1		1	2		
Africa	Burkina Faso		1	1	1		
Africa	Burundi	1			1		
Asia	Cambodia	1		1		3	
Africa	Cameroon	1					
North America	Canada	1		1			
South America	Chile						1
South America	Colombia	1	1	1		1	
Central America	Costa Rica	1	2	1	2		1
Europe	Croatia	1		1			
Africa	Egypt	1		1	2		
Africa	Ethiopia		1	1			
Africa	The Gambia						1
Europe	Georgia	1		1	1		1
Europe	Germany	1		1			
Africa	Ghana	2	1		1		1
Caribbean	Grenada		1				
Africa	Kenya	1		1	1	1	
Asia	Kyrgyzstan			1			
Africa	Malawi		1				
Africa	Mali						1
Europe	Moldova			1			
Asia	Myanmar		1				
Africa	Niger	1	1		1		
Africa	Nigeria	1					
South America	Peru	1	1	1			
Europe	Romania	1		1	1		
Africa	Rwanda	1		1	2	1	
Africa	Senegal	1		2	1		
Africa	United Republic of Tanzania	1					
Africa	Tunisia						1
Africa	Uganda	1		1	1	1	
Asia	Viet Nam						1
Africa	Zambia	1			1		
Total number of documents analysed		25	11	21	19	8	8
TOTAL NUMBER OF DOCUMENTS IN DATABASE		107	19	26	34	10	N/A

Note: Documents are official national-level policy documents written in English, French, Spanish or Russian available in either Word or PDF format. In addition to analyses of policy documents from these 35 countries, policy priorities were examined in policy documents from the following 5 countries: Brazil, El Salvador, Guatemala, the Lao People's Democratic Republic and Paraguay.

TABLE A.2

COUNTRIES USED FOR THE ANALYSES PRESENTED IN FIGURES 3.1–3.5

FIGURE 3.1	FIGURE 3.2	FIGURE 3.3	FIGURE 3.4	FIGURE 3.5
Burkina Faso	Cambodia	Argentina	Burundi	Egypt
Burundi	Peru	Bolivia (Plurinational State of)	Egypt	Georgia
Cambodia	Niger	Brazil	Georgia	Ghana
Cameroon	Senegal	Cambodia	Ghana	Kenya
Canada	Uganda	Costa Rica	Kenya	Romania
Croatia	United Republic of Tanzania	Egypt	Romania	Rwanda
Egypt	Zambia	El Salvador	Senegal	Senegal
Ethiopia		Georgia	Rwanda	Uganda
Georgia		Ghana	Uganda	Zambia
Germany		Guatemala	Zambia	
Ghana		Kenya		
Grenada		Niger		
Kenya		Nigeria		
Kyrgyzstan		Paraguay		
Lao People's Democratic Republic		Romania		
Malawi		Rwanda		
Mali		Senegal		
Moldova		Uganda		
Myanmar				
Niger				
Nigeria				
Romania				
Rwanda				
Senegal				
United Republic of Tanzania				
Uganda				
Zambia				
27 COUNTRIES	7 COUNTRIES	18 COUNTRIES	10 COUNTRIES	9 COUNTRIES

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2016
STATE OF THE WORLD'S FORESTS

FORESTS AND AGRICULTURE: LAND-USE CHALLENGES AND OPPORTUNITIES

Forests and trees support sustainable agriculture. They stabilize soils and climate, regulate water flows, give shade and shelter, and provide a habitat for pollinators and the natural predators of agricultural pests. They also contribute to the food security of hundreds of millions of people, for whom they are important sources of food, energy and income. Yet, agriculture remains the major driver of deforestation globally, and agricultural, forestry and land policies are often at odds.

State of the World's Forests (SOFO) 2016 shows that it is possible to increase agricultural productivity and food security while halting or even reversing deforestation, highlighting the successful efforts of Costa Rica, Chile, the Gambia, Georgia, Ghana, Tunisia and Viet Nam. Integrated land-use planning is the key to balancing land uses, underpinned by the right policy instruments to promote both sustainable forests and agriculture.

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