

# Transitioning to Sustainable Life on Land—Introduction to SDG 15 and the Volume

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## 1. Introduction

Land constitutes only 29.3% of planet Earth's surface area but harbors 86.1% of the global biomass (Bar-On et al. 2018). Out of the 8.7 million species estimated to exist globally, 75% live in terrestrial ecosystems (Mora et al. 2011). Some scholars even found biodiversity on land was 25 times higher than in the sea (Benton 2001). Although numbers of species and levels of biodiversity are still subject to significant scientific uncertainty, there is no doubt that life on land is essential for life on Earth, global biodiversity, and humans.

Over history, humans have transformed land, other species, and ecosystems to an unprecedented magnitude. During the past 12,000 years, anthropogenic land use increased tremendously on a global scale (Ellis et al. 2020). It is estimated that 75% of the land surface area has been directly affected by human activities (Riggio et al. 2020). Almost all terrestrial areas and part of the sea are claimed today by the 193 United Nation Member States as territory under sovereignty control, leaving Antarctica and the High Sea as the only partly unclaimed areas on Earth. Human life, economic activities, and many critical human institutions, such as states, public administration, property, or residency are related to land. Agricultural land use currently covers up to 50% of the habitable land (34% of the total terrestrial area), followed by forests and shrubs, used to different degrees. However, settlements still cover only 1% of the habitable land (Ritchie and Roser 2019). The Great Acceleration of human land use began in 1750, whereas land use intensity has increased in particular since 1950 (Steffen et al. 2015). Today, the biomass of livestock by far exceeds the biomass of all wild living mammals and birds (Bar-On et al. 2018). In 2020, the total human-made mass for the first time in history has exceeded the biomass of all forms of life (Elhacham et al. 2020). In the Anthropocene, humans have become a force of geological significance (Lewis and Maslin 2015).

In fact, human impact has risen to a level that endangers the survival of many species on planet Earth and human welfare itself. It has become increasingly evident that human impacts exceed the planetary boundaries in multiple dimensions,

particularly the effects on biodiversity, nutrient cycles, and greenhouse gas emissions (Rockström et al. 2009). Additionally, other indicators, such as Earth Overshoot Day, clearly signal that current use levels are unsustainable (Wackernagel and Pearce 2018). As regards biodiversity, scientists claim that Earth is in the middle of an anthropogenically caused Sixth Great Extinction, with the risk of losing 75% of all species (Ceballos et al. 2020). According to a report by IPBES, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, humanity is at the risk of driving 1 million species to extinction, mainly due to the extension and intensification of agriculture (IPBES 2019).

It must be noted that these developments occurred despite significant conservation efforts, which began in the 18<sup>th</sup> and 19<sup>th</sup> century with the first establishment of conservation organizations and the creation of the Yellowstone national park in 1872 (Dyke 2008). The development of protected areas “exploded” since 1980th (Naughton-Treves et al. 2005), and today almost 16% of the terrestrial area is protected to different extents (Protected Planet 2021). However, the effectiveness of protected areas to halt biodiversity loss is questioned (Geldmann et al. 2019). Although there is some indication that biodiversity in protected areas is higher inside than outside (Gray et al. 2016), protected areas are also affected by surrounding human activities (Hallmann et al. 2017), not least by human-induced climate change (Thomas and Gillingham 2015). According to the 20 Aichi targets proposed by the Convention on Biological Diversity (CBD), there is an agreement that worldwide societies must expand protected areas on land and sea (Lewis et al. 2019). However, this will likely not be enough to hold biodiversity decline and sustain life on land (Venter et al. 2018). Conservation must be integrated into all human activities and must be an integral part of the sustainable use of resources.

The Sustainable Development Goals (SDGs) agreed in 2015 by the United Nations offer in principle such an integrative perspective and include Life on Land as one among 17 goals. This editorial provides a brief introduction to SDG 15, also relating to other SDGs, and reflects mainly on the contributions to this volume.

## **2. The Sustainable Development Goals and SDG 15**

The Sustainable Development Goals (SDGs) and the Agenda 2030 are a milestone in a long journey of humankind recognizing its joint responsibility for planet Earth and identifying sustainability as a guiding principle for economic and political development (Shi et al. 2019). The key idea of sustainable development translates into 17 goals, 169 targets, and 231 indicators (United Nations 2015, 2017). Although the goals can be best interpreted as a political compromise which cannot be expected

to be free of contradictions, it is the first time that at a global level development goals were formulated for all nations (Sachs 2012). The SDGs can be divided according to the three pillars of sustainable development into social (SDG 1–5, 7, 11, 16), economic (SDG 8–10, 12, 17), and environmental objectives (SDG 6, 13–15), but more common is the division in the 5P’s, people (SDG 1–6), planet (SDG 11–15), prosperity (SDG 7–10), peace (SDG 16), partnership (SDG 17) (Tremblay et al. 2020). Life on Land, SDG 15, is clearly classified as a planet or environmental objective and calls to “protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss” (United Nations 2015) (see Table 1).

**Table 1.** Sustainable Development Goal 15 and its targets and indicators.

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.		
Target		Indicator
SDG 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.	15.1.1 Forest area as a proportion of total land area 15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type
SDG 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.	15.2.1 Progress towards sustainable forest management

**Table 1. Cont.**

SDG 15.3	By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.	15.3.1 Proportion of land that is degraded over total land area
SDG 15.4	By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development.	15.4.1 Coverage by protected areas of important sites for mountain biodiversity 15.4.2 Mountain Green Cover Index
SDG 15.5	Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species.	15.5.1 Red List Index
SDG 15.6	Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed.	15.6.1 Number of countries that have adopted legislative, administrative and policy frameworks to ensure fair and equitable sharing of benefits
SDG 15.7	Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products.	15.7.1 Proportion of traded wildlife that was poached or illicitly trafficked

**Table 1. Cont.**

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SDG 15.8	By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species	15.8.1 Proportion of countries adopting relevant national legislation and adequately resourcing the prevention or control of invasive alien species
SDG 15.9	By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.	15.9.1 (a) Number of countries that have established national targets in accordance with or similar to Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011–2020 in their national biodiversity strategy and action plans and the progress reported towards these targets; and (b) integration of biodiversity into national accounting and reporting systems, defined as implementation of the System of Environmental-Economic Accounting
SDG 15.A	Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems.	15.a.1 (a) Official development assistance on conservation and sustainable use of biodiversity; and (b) revenue generated and finance mobilized from biodiversity-relevant economic instruments

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**Table 1. Cont.**

SDG 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.	15.b.1 (a) Official development assistance on conservation and sustainable use of biodiversity; and (b) revenue generated and finance mobilized from biodiversity-relevant economic instruments
SDG 15.C	Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities.	15.c.1 Proportion of traded wildlife that was poached or illicitly trafficked

Source: United Nations (2015, 2017), with refinements United Nations (2021a).

SDG 15 divides into 12 targets and 15 indicators. They concern ecosystem conservation, restoration, and sustainable use in particular of soils, forests, mountains, and genetic resources (SDG 15.1–15.4, 15.6), the protection of biodiversity, natural habitats, and endangered species (SDG 15.5, 15.7, 15.8, 15.C), and policy improvements by better integrating biodiversity into planning and enhancing financial resources for conservation and sustainable use (SDG 15.9, 15.A, 15.B). Thus, the targets combine conservation and sustainable use, support the development of clear property rights in natural resources and species and request improved governance and financial resources. It should be noted that the indicators only partly reflect the targets and continue to be disputed and adjusted (Janoušková et al. 2018).

Since the SDGs provide an integrative set of goals, complex interactions among goals and targets in terms of synergies and trade-offs can be expected. Pradhan et al. (2017) identified SDG 15 as one of the SDGs with the highest number of trade-offs and the lowest number of synergies. Fonseca et al. (2020) identified the most pronounced trade-offs between SDG 15 and SDG 2 “Zero hunger—End hunger, achieve food security and improved nutrition, and promote sustainable agriculture”. That is because the expansion and intensification of agricultural land use are considered a prominent cause of biodiversity loss, deforestation and land degradation. The

most considerable synergies occur between SDG 15 and SDG 14 “Life under Water—Conserve and sustainably use the oceans, seas and marine resources for sustainable development” (Fonseca et al. 2020). However, the relationships between SDGs and the possibility and constraints to reach them simultaneously within the envisioned timeframe are debatable and require context-specific analysis and actions.

### **3. The Contributions to This Volume**

This volume is about transitioning to SDG 15 specifically and to sustainable life on land more generally. Transitioning can be understood in different ways. In a narrow sense, transitioning is about reaching the specific targets of SDG 15 by using the particular indicators of SDG 15. This view is mainly the policy, reporting, and monitoring perspective. In a more general sense, transitioning is about broader changes in policy, economies, and societies at different levels towards integrating the protection, restoration, and sustainable use of terrestrial ecosystems into the general agenda of sustainable development. The latter is the central perspective of this volume.

The contributions to this volume are structured into four parts. The first section reflects more broadly on goals and trade-offs as well as on values and ethics of conservation and restoration. The second part provides specific cases of ecosystem restoration in cultivated landscapes such as agriculture, forestry, and peatlands. The third part is devoted to studies focusing on land property rights and governance issues and how they relate in different contexts to land degradation and biodiversity loss. The final part addresses political and social challenges connected with the transition to SDG 15. Thus, the structure does not follow the SDG targets but addresses more underlying and cross-cutting issues.

Altogether, the papers provide an overview of some of the transitions in policy, economies, and societies needed to achieve SDG 15 and the trade-offs and synergies within and with other SDGs from different social science disciplines, including economics, philosophy, political science, administration science, sociology, anthropology, and landscape ecology. The geographical focus is mainly on Europe, Central Asia, East and South East Asia, with some studies addressing Africa and America. Moreover, this volume mainly focuses on the protection, restoration, and sustainable use of cultural ecosystems, not on the conservation of “wilderness”. The usual tool to protect life on land, establishing protected areas, will not be investigated explicitly. This perspective is elaborated extensively elsewhere (Dudley et al. 2017; Ansari et al. 2021). Thus, this volume is less about the separation of use and conservation but its integration.

### *3.1. Goals, Trade-Offs, Values, and Ethics*

SDGs govern by goals. This is considered as a major institutional innovation in international sustainability governance, from rules based to goal based (Kanie et al. 2019). However, as already mentioned, multiple goals are usually interconnected, sometimes with synergies but more often with trade-offs. Tisdell (2021), in this volume, provides an excellent introduction to the specific targets of SDG 15 concerning biodiversity and its possible contradictions both within SDG 15 and with other SDGs. He argues that the targets are pretty vague and that trade-offs are not specified. Moreover, Tisdell criticizes that the main drivers of biodiversity loss are not addressed, and biodiversity loss in cultural landscapes is not sufficiently recognized. He observes that economic principles and valuation methods did not play a significant role in formulating the SDGs and requests a better integration of targets and a recognition of opportunity costs. Tisdell sees that there is a continuous need to “evaluate biodiversity in its contributions to anthropocentric economic goals and to allow for the felt obligation to conserve the web of life even when there is little or no apparent material economic value to humankind” (p. 39).

In a world of limited resources, pursuing multiple goals require decisions to be made. Goals need to be prioritized, trade-offs to be evaluated. In this volume, Ott and Reinmuth (2021) discuss the importance of environmental valuation in decision-making. In reflecting on economic approaches to valuation, such as the Ecosystem Service (ESS) perspective and the Total Economic Value (TEV) concept, and combining them with ideas from environmental ethics, they argue for an integrative approach that appreciate the heterogeneity of values. They request economists to think about the scarcity of nature in close connection to environmental ethics, distributional justice, and sustainability sciences. Many decisions require ethical disputes over property rights, which economists often try to avoid. Ott and Reinmuth state that, in particular, existence and option values open the doors for reflections about environmental ethics.

Environmental ethics is a mainly normative discipline (Palmer et al. 2014) and discusses the way people should behave and the values people should hold. Ziegler (2021), in this volume, offers such a normative discussion. He raises questions about the transformative change of fundamental values to achieve the SDGs in general and SDG 14 and 15 in particular. He reflects on values of what he calls “nature-respecting sufficiency”. Sufficiency, as Ziegler shows, can be viewed as a standard, requirement, or limit defining a morally legitimate space of actions and outcomes. In further distinguishing weak, strong, and transformative sufficiency, the concept of nature-respecting sufficiency is developed as the latter. It calls for a focus

on “both agents and patients, and the thresholds and principles required for leading a life in dignity” (ibid., p. 96). Most fundamentally, however, nature-respecting sufficiency requires “to recognize us as one species among others” (ibid., p. 97).

### 3.2. *Ecosystem Restoration in Cultural Landscapes*

Cultivated or cultural landscapes dominated by agriculture and managed forests cover a significant part of the terrestrial area. Sometimes the cultivated landscapes have existed for centuries, or millennia and have profoundly shaped the past and current biodiversity (Jouffroy-Bapicot et al. 2021). Hampicke (2021), in this volume, reviews the history of German agriculture and shows how biodiversity in Central Europe was largely related to cultural landscapes that developed over centuries. The intensification of agriculture in Germany since 1950, like in other countries worldwide, increased yields impressively but, among others, caused a decline of biodiversity. Most of the biotope types related to the Red List of extinct and endangered species in Germany are agricultural biotopes, such as dry grassland. Hampicke discusses alternatives to the current system, e.g., organic farming and the reduction in agricultural output and exports, and suggests a conservation program covering 13 % of the agricultural land in Germany at an annual cost of EUR 2 billion. This program would promote semi-cultured landscapes, set aside for the least productive croplands, and add structural elements in highly productive agricultural regions. For the case of Germany, he argues that it should be easily possible to finance the necessary restoration, given the wealth of the country and the possibilities to reallocate funds of the Common Agricultural Policy (CAP).

For the mountainous regions of the alps, also Zerbe (2021), in this volume, argues that the current agricultural system is unsustainable and a primary cause of biodiversity loss. He further reasons for the need to diversify agriculture by supporting different farming systems, particularly agroforestry and social farming approaches. Both systems offer advantages in terms of the ecosystem services they provide. They reduce the intensity level and increase the contribution to social and ecological objectives. Zerbe, like Hampicke, suggests restoring nature in a cultural landscape mainly by lowering the land-use intensity and increasing the structural diversity of cultivars and landscape elements.

Thevs (2021), in this volume, adds to this discussion by moving to forest landscape restoration and sustainable biomass utilization in Central Asia. Central Asia is relatively poor in forests, but according to Thevs, it offers multiple opportunities for forest restoration in the mountains and the lowlands, steppes, drylands, and wetlands. He argues that forest restoration should also provide income opportunities

for local people. Forest restoration efforts can contribute to the transition to a sustainable bioeconomy. Thevs suggests, among others, the protection and restoration of Tugai forests along the river systems and wetlands. He develops opportunities for agroforestry systems, mainly the plantation of wind-breaks or the plantation of salt-tolerant trees. As alternative biomass resources, Thevs also mentions the vast amount of reeds that grow in Central Asia's wetlands, which could develop into a valuable source of the bioeconomy.

For centuries, wetlands and peatlands in Europe have been drained to expand agricultural land (Swindles et al. 2019). Today, the restoration of peatlands is considered a necessity mainly because drained peatlands are a large emitter of GHG emissions, and wet peatlands can serve as an effective sink for carbon (Schwieger et al. 2021). Ewert and Abel (2021), in this volume, show how in this context, the concept of paludiculture was developed and arrived overtime on the political agenda of the European policy. Paludiculture is the idea that wet peatlands, while reducing emissions of GHG and restoring nature, can also be used in a sustainable way to produce diverse biomass, e.g., reed, cattail, for the bioeconomy. Ewert and Abel apply the Multiple Stream Approach of policy science and argue that a combination of restoration and innovative use turned paludiculture into an attractive concept for political entrepreneurs. The restoration of peatland contributes not only to SDG 15, but as well to SDG 6 (clean water), SDG 13 (climate action), and SDG 9 (innovation).

### *3.3. Land Property Rights and Governance*

Over history, different property rights systems and governance structures related to land and terrestrial ecosystems emerged (Kavanagh et al. 2021; Ellickson 1993). Open access regimes, which often lead to resource overuse and degradation, were increasingly replaced by state, communal and private property regimes (Lerch 1998). In particular, the private property of land, animals, and plants governed by markets has resulted in investments and innovation fueling economic growth. At the same time, conservation used to be connected with state ownership and public governance. However, increasingly it is recognized that conservation must be better integrated into the diversity of land tenure systems (Robinson et al. 2018; Kamal et al. 2015).

For more than 40 years, China's land property rights system attracted a lot of attention since it combines state and collective ownership of land with individual and tradable use rights. Zhang and Tan (2021), in this volume, review the evolution of the land consolidation system in China. Land consolidation, that is, the reallocation and readjustment of land parcels in rural and urban areas, has for a long time been an instrument to improve farming and settlement efficiency, but often at the

expense of the environment. Zhang and Tan show that land consolidation in China developed from a policy focusing purely on increasing farmland area and reclaiming undeveloped land into an approach that aims to maintain and improve farmland, rearrange construction land, and improve ecological protection and restoration. However, according to the authors, there are still contradictions and leakages in the system, and better integration of ecosystem and biodiversity conservation in the Chinese land consolidation system is warranted.

Neudert (2021), in this volume, exemplifies the diversity of property rights and governance structures for pastures in Central Asia and the Caucasus. With about 30% of the terrestrial area classified as grasslands, grassland ecosystems have a significant share in the terrestrial land area. Central Asia and the Caucasus share a common history of being part of the Soviet Union and the socialist heritage. All these countries have vast grasslands degraded to a different extent. Neudert argues that different paradigms of rangeland governance exist: (a) the classical economic theory recommending privatization, (b) the legacy of the Soviet Union perspective arguing for strong state control, (c) the common property scholars arguing for common management, and the (d) new rangeland science in favor of open property regimes. The empirical analysis of ten countries shows that all four paradigms are present and offer advantages and disadvantages. Thus, no blueprint approach is appropriate for achieving sustainable land governance and use. Instead, governments should adjust a general approach to the specific socio-ecological conditions within the respective country.

Turning the attention to the case of Ethiopia, the second most populous country in Africa., Azadi et al. (2021), in this volume, focus on tenure security and its relationship with land degradation and unsustainable land use. The authors introduce the history of land tenure in Ethiopia, which turned from diverse and complex ownership, including concepts of private land property, into a mainly state-owned land tenure system. According to the constitution, ownership of land and all-natural resources is with the state and the people of Ethiopia, while private ownership of land is prohibited. However, peasants, pastoralists, and semi-pastoralists are granted free access and use rights (Agegnehu 2020). Azadi et al. argue that this system has created tenure insecurity and, connected with population growth, caused land degradation, biodiversity loss, and unsustainable use. The conversion of forest land, protected areas, and wetlands for agricultural investments are considered as the main problem. Therefore, they argue for more effective land administration, including the official demarcation, mapping and registration of public lands, and better implementation of the existing laws.

Theesfeld and Curtiss (2021), in this volume, refer to a completely different setting, the land tenure and ownership structure in Germany. Private property is dominating, and tenure security is often not regarded as an issue there. Still, access to agricultural land, biodiversity loss, and land degradation due to highly intensive agriculture on private land are of concern. Moreover, also land grabbing for for-profit occurs. Theesfeld and Curtiss report the results of an investigation into new types of community-supported ownership, thus cases where owners provide financial capital to support ecological outcomes and not primarily financial returns. All over Germany, such new cooperative initiatives emerged. In detail, two initiatives are analyzed. They show that the organizations “adopt the right of defining land use conditions in exchange for long-term tenure and below-market price rental conditions for farmers” (ibid., p. 329). Thus, these are compelling cases of private initiatives for supporting SDG 15 when public policy is considered to fail.

### *3.4. Political and Societal Challenges*

Transition to the SDGs and to SDG 15 specifically create many political and societal challenges. Dealing with diverse, complex and conflicting structures of land ownership is one of them. Others are related to the policy process or the acceptance of different technology. Policy has multiple and often conflicting objectives, it is affected by powerful actors and ideologies. Policy might be difficult to change quickly and path dependencies might be prominent. Moreover, there might be tensions between political, economic, technological, and societal processes.

Lakner et al. (2021), in this volume, reflect on the Common Agricultural Policy (CAP) of the European Union (EU) and its link to biodiversity. Although the CAP responded to the increasing negative impact of intensive agriculture on the environment, particularly by introducing Agri-environmental Programs (AEP) since 1992, Cross-Compliance since 2005, and Greening since 2013, the biodiversity loss in agricultural landscapes could not be halted or reversed. Lakner et al. offer a very detailed analysis of the policy cycle and its implementation and show that CAP is difficult to reform. It transforms only slowly, and they conclude that “without including other political and other stakeholders in negotiations on budget allocations and policy design, agricultural interest groups will continue to preserve current trajectories and undermine any initiative for sustainable transformation” (ibid., p. 369). In this regard, Ewert and Abel (2021), in this volume, present a successful case of transformation. They show that paludiculture, which emerged as a concept entirely outside the agricultural cycles, managed to become recognized at the EU agricultural policy level. A policy might also change slowly until a certain momentum is reached,

as the example of supporting organic farming in the EU may exemplify. Although the EU has supported organic agriculture since 1992, it is only since 2020 that the EU Commission declared in its Farm-to-Fork Strategy that the EU-wide organic farming target is 25% of the total agricultural area in 2030 (European Commission 2020).

In contrast, in Indonesia the share of organic agriculture, according to the available statistics, is still meager, with 0.4% (Willer and Lernoud 2019). In this context, Laksmana and Padmanabhan (2021), in this volume, examine the sustainability of organic farming institutions. The authors show that organic agriculture started in Indonesia, as in many other countries, as a grassroots civil society project in 1983. In 2002, the government started supporting the expansion of organic farming with the “Go Organic” program. The government developed ambitious objectives of developing organic agriculture in Indonesia as an export industry and established a respective certification and monitoring system. This created tension between the organic farming movement and the government. By performing an actor-network analysis, Laksmana and Padmanabhan disentangle the influence of different actors on organic farming regulation in Indonesia. The analysis exemplifies the conflict between central and decentral knowledge, and between governments and civil society. They argue that progress towards SDG depends on the pressure of social movements on governments.

Organic farming seems to be one way to reduce the tension between SDG 15 and SDG 2 by integrating biodiversity conservation within farming systems; however, another is modern biotechnology. In their contribution to this volume, Wesseler and Zilberman (2021), outline the potential of biotechnology for achieving the SDGs. Biotechnology crops require fewer inputs, secure high yields, and reduce land-use pressure by opening up opportunities to set aside land for biodiversity conservation. Moreover, biotechnology also offers new opportunities, like cultured meat, which might reduce livestock numbers and improve animal welfare. Thus, they consider biotechnology is essential for any transformation towards a bioeconomy. The authors also discuss the political economy of plant biotechnology in the EU, where a strict regulatory environment emerged. They show the struggle between proponents of organic farming and proponents of biotechnology and the role of the precautionary principle in EU policy. Additionally, others argue that conservationists overemphasize the risks of new technologies at the expense of missed opportunities (Brister et al. 2021). It is claimed that also organic farming should make use of modern biotechnology (Purnhagen et al. 2021).

The final paper in this volume by Delabre and Nolan (2021) focuses on key issues of deforestation in tropical forests. It takes off from the observation that the SDG target

of zero-deforestation (SDG 15.2) was not met in 2020. They argue that “attention must be paid to the influences of power and politics in forest governance . . . ” (ibid., p. 438). Forest landscape changes do not just happen but are shaped by a complex network of human actors. The authors discuss contested definitions of forests and deforestation and the meaning of “zero” in deforestation, the problem of translating sustainable forest governance into practice, including the measuring, reporting, and verification systems finally, asking the question about who is represented in decision making. According to them, priority is given to agricultural development and the economic growth paradigm, which is in conflict with the zero-deforestation objective. They recommend, among others, that “local actors should be placed at centre stage in decision making, early on in processes related to land use change” (ibid., p. 447).

#### **4. Conclusions**

Transitioning to Sustainable Life on Land requires humanity to protect, restore and promote sustainable use of terrestrial ecosystems. In total, 193 Nation States have committed themselves to moving towards SDG 15 while paying attention to all other 16 SDGs. Trade-offs are unavoidable, and choices need to be made. As Tisdell (2021), in this volume, has put it: opportunity costs are inevitable. It is therefore not surprising that different countries set different priorities in achieving various goals or targets in different time frames (Forestier and Kim 2020).

The contributions to this volume shed light on the transitioning of different societies towards SDG 15, with a focus on four cross-cutting issues: (1) goals, trade-offs, values, and ethics; (2) ecosystem restoration in cultural landscapes; (3) land property rights and governance structures; and (4) political and societal challenges. The contributions offer diverse perspectives and sometimes also conflicting recommendations. Many contributions reflected on one of the most challenging trade-offs between SDG 15 and SDG 2, biodiversity and agriculture. The search for a model of sustainable agriculture is critical. The recommendations range from reducing farming intensity, increasing structural diversity, supporting organic farming to developing high-yield–low-input farming systems and cultured meat based on modern biotechnology. This provides much food for thought.

Given the urgent need to prevent the expected upcoming biodiversity crises, the overall transition towards SDG 15 must be considered to be very slow. Almost none of the SDG 15 targets for 2020 have been reached at the global level (United Nations 2020). Some contributions in this volume show how long it takes to change policies even if the financial resources are available and that severe tensions can occur between policy, business, and society, preventing innovative solutions. Otto et al.

(2020) argue for the case of climate policy that social tipping point interventions are needed to reach momentum for change. Some hints for social tipping elements can be found in this volume, although a systematic analysis of the literature remains to be done. It is now well known that the SDG are pursuing the 5 P's, people, planet, prosperity, peace, and partnership. The latest progress report of the United Nations (2021b) suggested a small change that might make a big difference: "It is time to put the health of the planet at the centre of all our plans and policies" (p. 56).

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