令 和 4 年 度 特 色 入 試 問 題

《 農学部 森林科学科 》

小 論 文 試 験

200 点 満 点

(注　意)

1. 問題冊子および解答冊子は係員の指示があるまで開かないこと。
2. 問題冊子は表紙のほかに 14 ページある。
3. 解答冊子は表紙のほかに 12 ページある。なお，別に下書き用紙 12 ページを配布する。
4. 試験開始後，解答冊子の表紙所定欄に受験番号・氏名をはっきり記入すること。
   表紙には，これら以外のことを書いてはならない。
5. 解答はすべて解答冊子の指定された箇所に記入すること。
6. 解答に関係のないことを書いた答案は無効にすることがある。
7. 解答冊子は，どのページも切り離してはならない。
8. 問題冊子および下書き用紙は持ち帰ること。解答冊子は持ち帰ってはならない。
9. 解答は日本語で記入すること。

問題１　世界森林資源評価（Global Forest Resources Assessment：FRA）は、国際連合食糧農業機関（FAO）が作成・公表する、世界各国の森林・林業に関する報告書である。FRA2020 は、世界の森林面積の 2020 年における現況および 1990 年から 2020 年にかけての推移を報告している。この報告書中の第 2 章「森林面積の推移」および第 3 章「森林の特徴」から抜粋した以下の英文を読んで、問１～３について、解答用紙の所定の欄に収まるように答えなさい。（100 点）

A. 森林面積の推移

Changes in forest area over time reflect changes in demand for land for other uses. But, on its own, this parameter[*1] is insufficient to describe and explain complex land-use dynamics. Additional information is needed to understand how much forest has been lost due to conversion to other land uses and how much has been gained due to natural expansion and afforestation.

・・・・・・・・・・・・・・・・・・（中 略）・・・・・・・・・・・・・・・・・・

Deforestation is the conversion of forest to other land uses, such as agriculture and infrastructure. On the other hand, forest area can increase when trees are planted on land that was not previously forested (“afforestation”) or when trees grow back on abandoned agricultural or other land (“natural forest expansion”). Over a given period, the sum of all losses due to deforestation and all gains due to afforestation and natural forest expansion results in ①forest area net[*2] change. Depending on whether forest expansion or deforestation prevails, forest area net change can be positive, meaning there has been an overall gain in forest area, or negative, meaning an overall loss of forest area.

・・・・・・・・・・・・・・・・・・（中 略）・・・・・・・・・・・・・・・・・・

An estimated 420 million ha of forest was lost through deforestation between 1990 and 2020, although the rate slowed over the period. More than 90 percent of deforestation in 1990–2020 was in the tropical domain.

・・・・・・・・・・・・・・・・・・（中 略）・・・・・・・・・・・・・・・・・・

The world has lost 178 million ha of forest since 1990, which is an area about the size of Libya. The rate of net forest loss decreased substantially over the period 1990–2020 due to a reduction in deforestation in some countries, plus increases in forest area in others through afforestation and the natural expansion of forests.

B. 森林の特徴—天然林（natural forest）と人工林（planted forest）

②Forests encompass[*3] a wide range of ecosystems that vary considerably in their characteristics, such as in species composition, structure and the extent of modification by humans and by non-human factors. Thus, forest area is an insufficient parameter, on its own, for identifying important trends and assessing progress towards sustainable[*4] forest management.

FRA identifies two broad categories of forest: naturally regenerating forest, and planted forest. FRA 2020 collected information on both these categories.

③There is ongoing debate on the functions and values of naturally regenerating versus planted forests. Naturally regenerating forests (also called natural forests) generally contribute more to biodiversity conservation and provide a wider range of benefits and certain ecosystem services compared with planted forests. When sustainably managed, planted forests can help reduce harvesting pressure on natural forests, and some may also provide important ecosystem services.

・・・・・・・・・・・・・・・・・・・（中 略）・・・・・・・・・・・・・・・・・・・

Ninety-three percent (3.75 billion ha) of the forest area worldwide is composed of naturally regenerating forests and 7 percent (290 million ha) is planted. The area of naturally regenerating forests has decreased since 1990 (at a declining rate of loss), but the area of planted forests has increased by 123 million ha. The rate of increase in the area of planted forest has slowed in the last ten years.

C. 森林の特徴—原生林（primary forest）

Primary forests are naturally regenerated forests of native tree species, where there are no clearly visible indications of human activities and ecological processes are not significantly disturbed. Primary forests – especially primary tropical moist forests – are highly species-rich, diverse ecosystems, and their extent is an important environmental indicator.

・・・・・・・・・・・・・・・・・・・（中 略）・・・・・・・・・・・・・・・・・・・

The world still has at least 1.11 billion ha of primary forest. Combined, three countries – Brazil, Canada and the Russian Federation – host more than half (61 percent) of the world's primary forest. The area of primary forest has decreased by 81 million ha since 1990, but the rate of loss more than halved in 2010–2020 compared with the previous decade.

出典：

FAO. 2020. Global Forest Resources Assessment 2020: Main report. Rome.
(https://doi.org/10.4060/ca9825en、2021 年 5 月 18 日参照) P12-34 より一部改変・抜粋

FAO. 2020. Global Forest Resources Assessment 2020: Key findings. Rome.
(https://doi.org/10.4060/ca8753en、2021 年 5 月 18 日参照) P2-7 より一部改変・抜粋

語注： *1 parameter：パラメーター、変数　*2 net：正味の、純　*3 encompass：含む　*4 sustainable：持続可能な

問１　下線部①に関連して、以下の設問（１）および（２）に答えなさい。

（１）‘deforestation’、‘afforestation’、‘natural forest expansion’の３つの用語の意味を日本語で説明し、‘forest area net change’の算出方法を述べなさい。

（２）1990 年から 2020 年の間の世界の森林面積の変化について、‘deforestation’、‘afforestation’、‘natural forest expansion’に着目して、「A. 森林面積の推移」の英文中に記載されている数値情報を使い、棒グラフなどの図を用いて説明しなさい。

問２　下線部②を日本語に訳しなさい。

問３　下線部③に関連して、以下の設問（１）～（３）に答えなさい。

（１）原生林を含む天然林の機能や価値について、複数の具体例を挙げて説明しなさい。

（２）人工林の機能や価値について、複数の具体例を挙げて説明しなさい。

（３）森林は日本の国土面積の 67%を占め、また人工林はその森林面積の 41%を占めている。日本は、人工林面積が世界第 8 位で、人工林が非常に多い国である。このような特色をふまえて、今後、日本の森林をどのように保全・管理・利用していくべきか、あなたの考えを述べなさい。

白　紙

問題２　以下は、国際連合食糧農業機関（FAO）主催のある会議についての報道記事および関連した発表のスライド資料から抜粋したものである。これらを読んで、問１～３について、解答用紙の所定の欄に収まるように答えなさい。
（100 点）

記事

FAO forestry newsroom

Sustainable wood - environmentally friendly, socially responsible - contributes to achieving SDGs, global experts conclude

©FAO/Roberto Cenciarelli

Rome, Italy, 7 November 2017 – Sustainable wood value chains[*1] that are environmentally friendly, socially responsible, and economically sound are an integral[*2] part of sustainable landscapes and key to making progress towards the Sustainable Development Goals (SDGs[*3]), according to experts at the Sustainable Wood for a Sustainable World global meeting at FAO Headquarters[*4] in Rome.

Sustainable wood value chains and products are especially relevant to SDG8 (decent work and economic growth), SDG12 (responsible consumption and production), SDG13 (climate action), and SDG15 (life on land).

Meeting participants agreed that to enhance local livelihoods[*5] there is a need to connect global, regional, and local value chains and to diversify[*6] forest products beyond wood to make effective use of "baskets of value chains". Sustainable forest management was repeatedly cited[*7] as a significant component of sustainable landscape management.

The contribution of sustainable wood value chains to climate change mitigation[*8] was also emphasized. According to Thaís Linhares-Juvenal, Senior Forestry Officer, "Sustainable wood value chains are critical to mitigating climate change in several ways which include carbon storage in standing forests and in harvested wood products, as well as for the substitution of fossil[*9]-based raw materials and products." The contribution to mitigation in the construction sector was also highlighted.

・・・・・・・・・・・・・・・・・・(後 略)・・・・・・・・・・・・・・・・・・

出典：

FAO forestry newsroom (http://www.fao.org/forestry/news/93799/en/、2021 年 5 月 17 日参照) 一部改変・抜粋

語注：*1 value chain：バリューチェーン［原材料を調達してから商品やサービスが顧客に届くまでに企業が行う活動を、モノの連鎖（サプライチェーン）だけではなく、価値の連鎖として捉えたもの］ *2 integral：不可欠の、肝要な *3 SDGs (Sustainable Development Goals)：国連の持続可能な開発目標（2015 年 9 月に定められ 2030 年までに達成することが掲げられた SDG1～17 の 17 項目からなる持続可能な開発目標） *4 headquarters：本部 *5 livelihood：生計、暮らし
*6 diversify：多様化させる *7 cite：引用する *8 mitigation：緩和 *9 fossil：化石

スライド資料（スライド 6, 7 および 14 以降省略）

ENABLING A SUSTAINABLE BIOECONOMY THROUGH WOOD VALUE CHAINS

Thaís Linhares-Juvenal
Pierre Bouillon

Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

SUSTAINABLE WOOD for a SUSTAINABLE WORLD

BIOECONOMY

"The bioeconomy is the production, utilization and conservation of biological resources, including related knowledge, science, technology, and innovation, to provide information, products, processes and services across all economic sectors aiming toward a sustainable economy.

Global Bioeconomy Summit, 2018

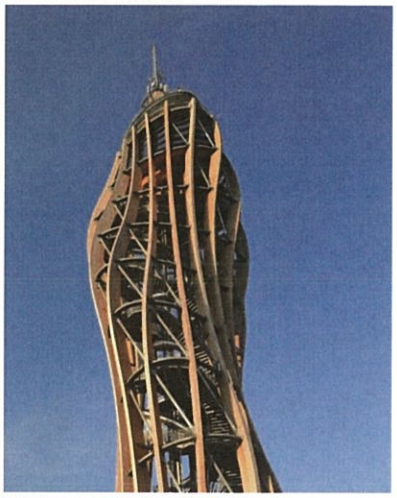
Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

2

Food and Agriculture Organization of the United Nations | SUSTAINABLE DEVELOPMENT GOALS

WHAT IS BIOECONOMY?



- ✓ Normally includes agriculture, fisheries, agro-food industries, forests and wood industry, all the other processing of bio-based materials, from construction to textiles, chemicals, pharmacy, cosmetics, energy, etc.
- ✓ No international definition of bioeconomy
- ✓ No international convention or agreement
- ✓ No international statistics*10

3

Food and Agriculture Organization of the United Nations | SUSTAINABLE DEVELOPMENT GOALS

"WHY DEVELOPING A SUSTAINABLE BIOECONOMY IS URGENT ?

- Limited amount of natural resources
- Quantity of extracted raw materials multiplied by 10 during 20th century
- Urgently tackle climate change
- Reduce waste

→ **BIOECONOMY ENABLE NATURE-BASED SOLUTIONS TO CLIMATE CHANGE AND ;**

4

Food and Agriculture Organization of the United Nations | SUSTAINABLE DEVELOPMENT GOALS

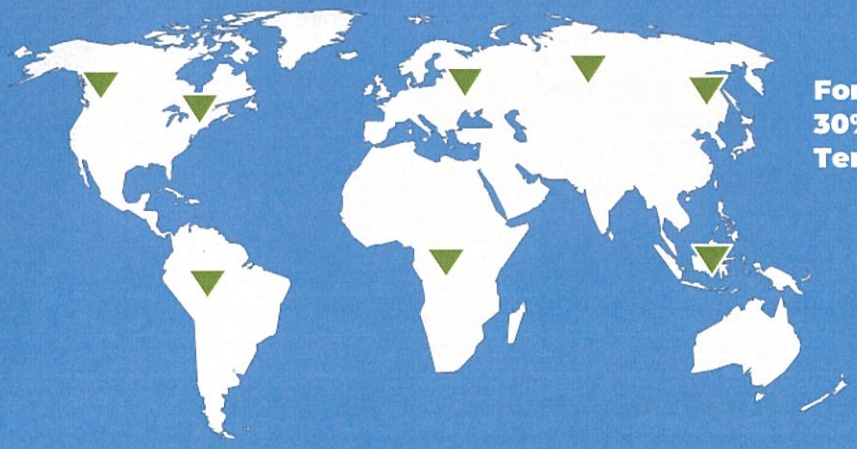
SUSTAINABLE BIOECONOMY

- Use of renewable materials
- Inclusion of small and medium producers
- Processing and reuse of residues
- Cascading[*11] and circularity

5

Food and Agriculture Organization of the United Nations | SUSTAINABLE DEVELOPMENT GOALS

HIGH POTENTIAL



Forests Cover 30% Of Terrestrial Area[*12]

Forest growing stock is estimated at **531 billion m³** (FAO/FRA 2015)

8

Food and Agriculture Organization of the United Nations | SUSTAINABLE DEVELOPMENT GOALS

"HOW DOES THE FORESTRY SECTOR CONTRIBUTE TO THE BIOECONOMY?

9

Food and Agriculture Organization of the United Nations | SUSTAINABLE DEVELOPMENT GOALS

GLOBAL WOOD MARKETS TRENDS

- Annual growth of wood products' markets between 3 and 6% in 2009-2017
- Rapid increase of production and trade of wood-based panels and wood pellets*[13] (construction and energy sectors)

10

FOREST VALUE CHAINS AND THE SDGs

Food and Agriculture Organization of the United Nations | SUSTAINABLE DEVELOPMENT GOALS

45.000.000 jobs[*14]
SDG 8: Decent Work and Economic Growth

More than 56% of paper recycling in the world
SDG 12: Responsible consumption and production

Up to 75% emission reductions in building sector
SDG 13: Climate action

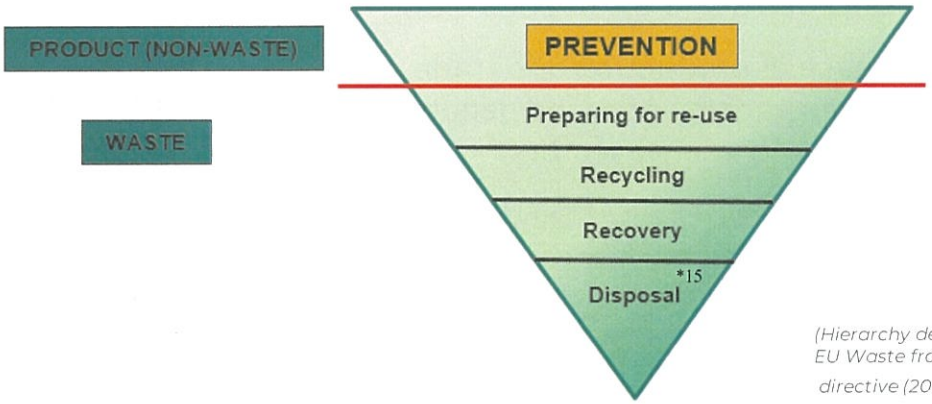
Forest are home of 80% of terrestrial biodiversity
SDG 15: Life on land

11

CASCADING USE

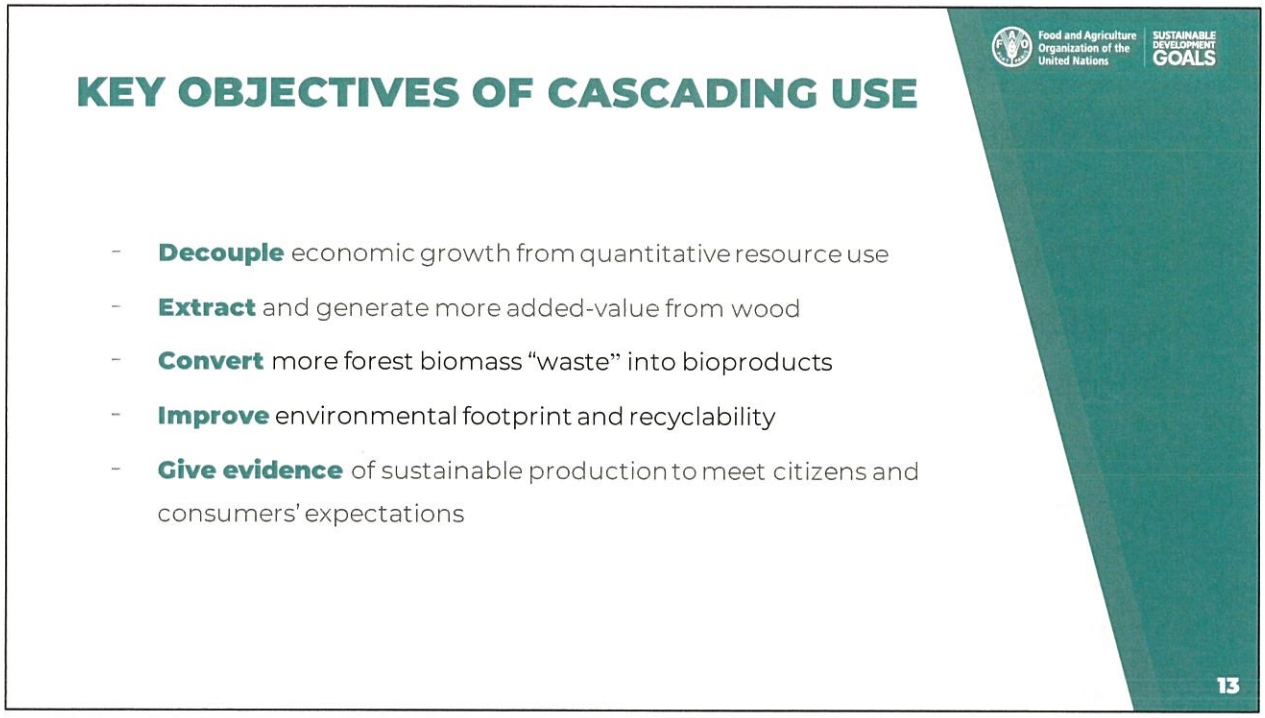
Food and Agriculture Organization of the United Nations | SUSTAINABLE DEVELOPMENT GOALS

Cascading use: **more** products with the **same amount of wood**.



(Hierarchy defined by EU Waste framework directive (2008/98/EC)

12



出典：

Thaís Linhares-Juvenal and Pierre Bouillon, ENABLING A SUSTAINABLE BIOECONOMY THROUGH WOOD VALUE CHAINS

(http://www.fao.org/forestry/48809-0fa08567d60a5c43d146a9333d10ab41f.pdf、2021 年 5 月 17 日参照) 一部抜粋

語注：*10 statistics：統計　*11 cascade：カスケード、小さな滝、（小さな滝のように）段々と流れ落とす

*12 terrestrial：陸上の、陸生の　*13 wood pellets：木質ペレット、木粉や残渣を燃料用に固めたもの

*14 decent：適正な、ふさわしい　*15 disposal：廃棄、処分

問１　記事では、持続可能な木材の有効利用は地球の温暖化防止・緩和に貢献するとし、その理由として主に以下の（１）～（３）の３点が挙げられている。それぞれについて、どのように温暖化防止・緩和に貢献することができるのか、説明しなさい。

（１）伐採前の森林として

（２）伐採後の木材製品として

（３）化石資源に由来する原料や製品の代替物として

問２　スライド資料では、以下の（１）～（３）のそれぞれの観点についてどのように述べられているか説明しなさい。

（１）持続可能なバイオエコノミーの発展を急ぐべき理由

（２）木材の資源としての量や市場の動向

（３）木材の利用がSDGsに対してどのような効果があるかの具体的な例

問３　カスケード型の利用とは、一般に資源やエネルギーを１回だけの使いきりにするのではなく、利用したことで形状や性質が変わった資源や、利用時に出る廃棄物を別の用途に使い、その後もさらに別の用途に活かす、というように、高レベル・高価値の利用から低レベル・低価値の利用へと、多段階（カスケード）に活用することを指す。

スライド資料には、木材をカスケード型で利用することの重要な目的が記載されている。これらについて以下の設問（１）～（３）に答えなさい。

（１）‘Extract and generate more added-value from wood’とは、具体的にどのような木材の利用を指すか、思いつく例をできるだけ多く挙げなさい。

（２）‘Improve environmental footprint and recyclability’とは、どのようなことを意味しているか説明しなさい。

（３）‘Decouple economic growth from quantitative resource use’（経済成長と資源の利用量を切り離す）とはどういうことか、またそれがなぜ持続可能なバイオエコノミーの発展に貢献するのか、あなたの考えを述べなさい。

白　紙