Indonesia's Experiences on Ecosystem Accounting for Biodiversity and Climate Change

SEEA In-depth Study 2023: Biodiversity & Climate Change

Presented at The Training on Ecosystem Accounting in Support of the Sustainable Development Goals and Global Biodiversity Framework

SEEA Implementation Team
BPS – Statistics Indonesia

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BADAN PUSAT STATISTIK

SENSUS EKONOMI 2026

KERANGKA PAPARAN

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01 Introduction

SEEA IMPLEMENTATION IN INDONESIA

ASSET ACCOUNTS

- Covers **land, timber, energy, and mineral** resources
- Asset Accounts are compiled in **physical and monetary** units
- Generates derived indicators such as: availability of natural resource stocks, GDP adjusted for natural resource depletion (Green GDP), and several SDG indicators

FLOWS ACCOUNTS

- Covers energy flow and greenhouse gas emission accounts
- Generates indicators by sector/industry such as: energy use intensity, emission intensity, and several SDG indicators
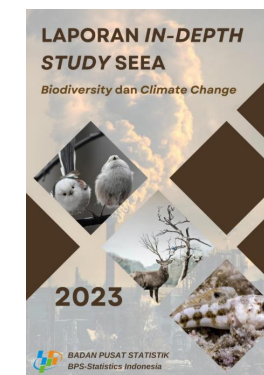
SEEA IN-DEPTH STUDY

- Thematic studies in the form of in-depth studies to explore natural resource and environmental issues
- **Topics in 2020-2026:**
  - ❖ *Biodiversity (2026)*
  - ❖ **Green economy(2024)**
  - ❖ **Biodiversity and climate change (2023)**
  - ❖ *Ocean Accounts* (2021-2022),
  - ❖ *Sustainable Tourism* (2020)

SEEA IN-DEPTH STUDY ON BIODIVERSITY AND CLIMATE CHANGE (2023)
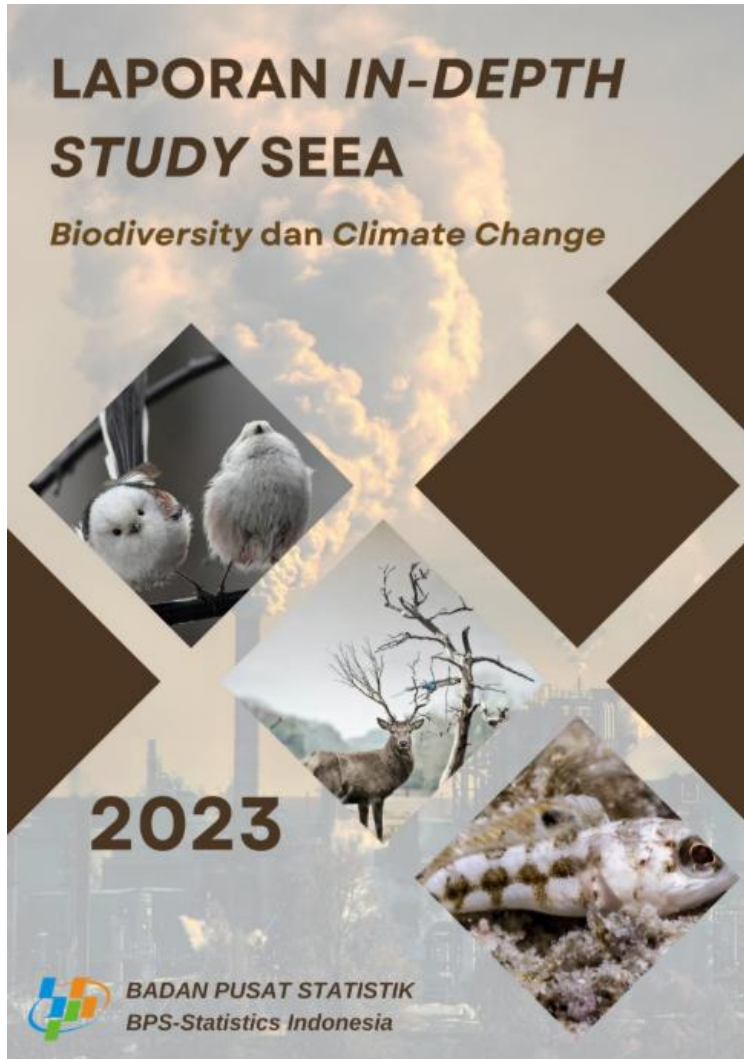
Rationale for Selecting Biodiversity as the 2023 In-Depth Study Topic

- Biodiversity was selected in 2023 to enrich the narrative on biodiversity statistics, particularly through ecosystem accounting.
- At that time, the **Indonesian Biodiversity Strategy and Action Plan (IBSAP)** was in the process of being finalized.
- The study was therefore designed to provide statistical inputs and potential indicators that could support and strengthen the IBSAP framework.
- This alignment ensured that the results would not only contribute to SEEA implementation, but also to national biodiversity policy development.

PURPOSE & METHODOLOGY OF SEEA IN-DEPTH STUDY 2023

- *SEEA In-depth Study 2023: Biodiversity and Climate Change aims to* obtain data or information on biodiversity and climate change in Indonesia, particularly those related to economic and environmental dimensions.

Purpose of SEEA In-depth Study 2023:

Identify flora/fauna stock and changes (**Compiling species accounts**)

Understand biodiversity's role in the economy

Assess energy product provision

Analyze fuel use and GHG emissions

Methodology of SEEA In-depth Study 2023:

▶ **Sample Target**

3400 samples in 34 provinces in 2023

▶ **Sampling Techniques**

Non-probability sampling (purposive). Selected sample should represent the population (generally have a large business scale and legal entity) and carry out environmental activities

▶ **Unit Statistics**

Establishment

▶ **Data Collection Method**

✓ Direct interview method with Computer Assisted Personal Interviewing (CAPI)

✓ Self-filling by respondents through Computer Assisted Web Interviewing (CAWI)

METADATA SEEA INDEPTH STUDY ON BIODIVERSITY & CLIMATE CHANGE

Variables Collected:

- **Type of Industry**
- **Compensation of Employees (Rupiah)**
- **Expenditure (Rupiah)**
- **Income (Rupiah)**
- Energy Product Usage (Joules)
- Total Quantity of Fuel Loaded for International Routes (Liters)
- Quantity of Fuel Loaded Abroad (Liters)
- Use of Non-Energy Products from Fuels and Solvents (kg)
- Quantity of Biogas Raw Materials (kg)
- Quantity of Biogas Production (cubic meters)
- Quantity of Renewable Energy Sources (various units)
- Electricity Production (kWh)
- Volume of Biofuel Raw Materials (liters)
- Volume of Biofuel Production (kiloliters)
- **Number of Species (individuals/trees)**

Indicators Produced:

- **Energy intensity per gross value added**

  Ratio between energy used in the production process and gross value added

- **International bunker fuel export percentage**

  Ratio of fuel purchased from non-residents to total fuel used by transportation industries serving international routes

- **Shannon Diversity Index**

  Index measuring species biodiversity in a particular community

- **Species Evenness**

  Indicator providing information on species evenness

- **Intensity of non-energy fuel/solvent use**

  Ratio between non-energy products from fuels and solvents used in the production process and gross value added

02 Results of SEEA In-depth Study: Biodiversity & Climate Change

RESULTS SEEA IN-DEPTH STUDY 2023: SPECIES ACCOUNTS

The most opening stock

Most stock addition

	Hewan/Animals						Plants	Others
	Mammals	Birds	Reptiles	Amphibians	Fish	Insects	Plants	Others
Stok Awal/*Opening Measure*	1.140.925	240.810.537	36.363	76	2.208.016.312	679.410	118.785.595	1.699.760.628
Penambahan Stok/*Addition*	14.106.109	23.213.330	39.240	5	587.472	8.732.855	86.409.266	57.901.931
Penambahan Alami/ *Natural Addition*	43.290	35.638	36.688	5	95.867	542.855	44.225.864	6.102.089
Pembelian/*Purchase*	29.304	2.263.502	44	0	179.455	8.190.000	37.869.252	34.851.457
Penambahan Lain/ *Other Addition*	14.033.515	20.914.190	2.508	0	312.150	0	4.314.150	16.948.385
Pengurangan Stok/*Reduction*	14.761.942	260.692.148	9.299	0	2.208.131.240	9.319.950	58.328.584	1.217.518.812
Pengurangan Alami/ *Natural Reduction*	10.400	1.107.389	4.533	0	92.108	544.950	2.170.663	2.762.680
Penjualan/*Sale*	14.746.699	259.561.459	470	0	2.207.925.707	8.775.000	52.290.496	1.204.789.357
Pengurangan Lain/ *Other Reduction*	4.843	23.300	4.296	0	113.425	0	3.867.425	9.966.775
Stok Akhir/*Closing Measure*	485.092	3.331.719	66.304	81	472.544	92.315	146.866.277	540.143.747

Largest stock reduction

The most closing stock

Species Account
Stock addition and reduction

Stock addition by class

Chart: Stock addition by class (horizontal 100% stacked bars)
Categories: Plants, Insects, Fish, Amphibians, Reptiles, Birds, Mammals
Legend:
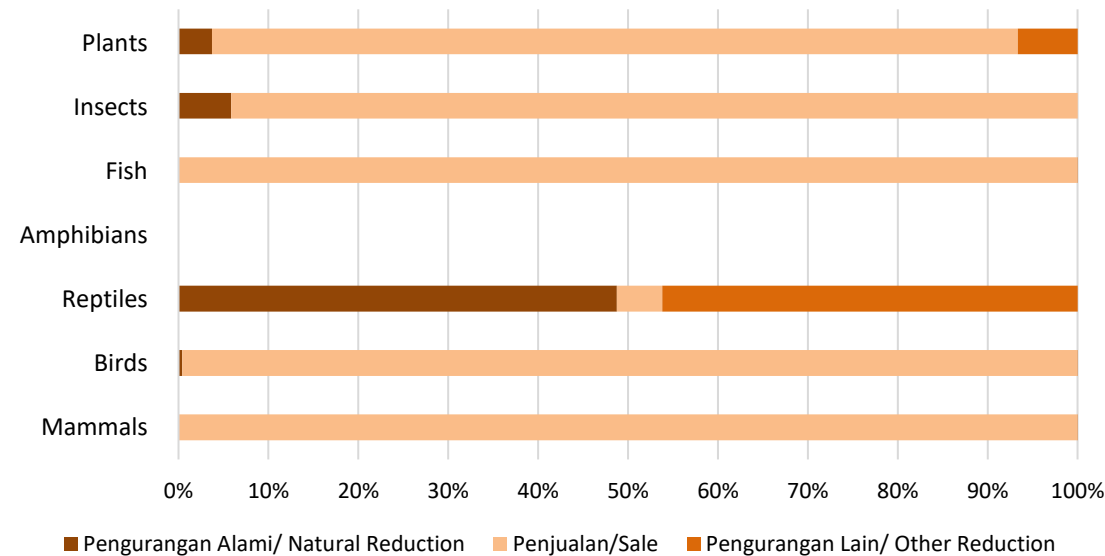- Penambahan Alami/ Natural Addition
- Pembelian/Purchase
- Penambahan Lain/ Other Addition
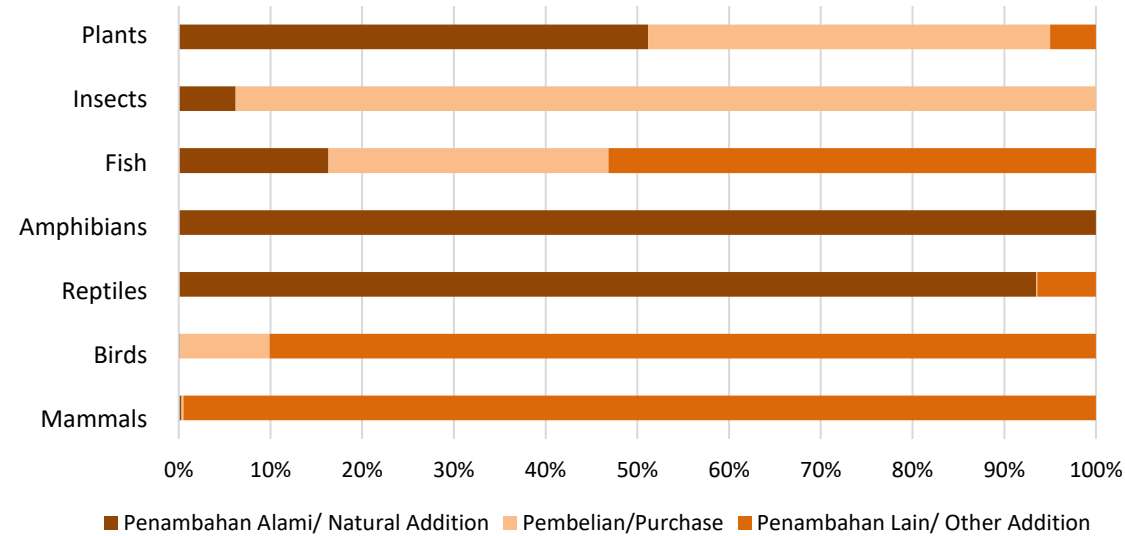
> The stock addition in **plants** is dominated by natural addition, with 44.22 million trees, followed by purchases, with 37.87 million trees, and other additions, with 4.31 million trees.

Stock reduction by class

Chart: Stock reduction by class (horizontal 100% stacked bars)
Categories: Plants, Insects, Fish, Amphibians, Reptiles, Birds, Mammals
Legend:
- Pengurangan Alami/ Natural Reduction
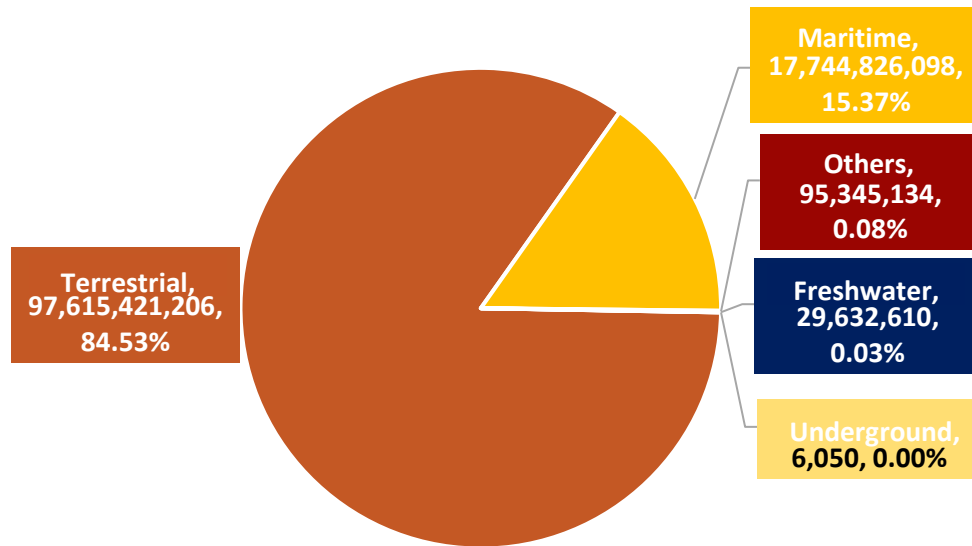- Penjualan/Sale
- Pengurangan Lain/ Other Reduction

> The stock reduction in **fish** is dominated by sales, with 2.21 billion individuals, followed by other reductions, with 113.42 thousand individuals, and natural reductions, with 92.11 thousand individuals.

Area by Ecosystem Type and *Shannon Index*

Area (m^2)

- **Maritime, 17,744,826,098, 15.37%**
- **Others, 95,345,134, 0.08%**
- **Freshwater, 29,632,610, 0.03%**
- **Underground, 6,050, 0.00%**
- **Terrestrial, 97,615,421,206, 84.53%**

Shannon Index

Region	Shannon Index Flora	Shannon Index Fauna
Jawa	2.02	2.07
Sumatra	1.24	0.14
Kalimantan	1.51	1.71
Sulawesi	2.94	0.08
Bali dan Nusa Tenggara	3.09	1.82
Maluku	3.53	1.89
Papua	2.07	1.76
Indonesia	2.83	0.40

"The terrestrial ecosystem has the largest area, covering 97.62 million m², while the underground ecosystem (caves, aquifers, etc.) has the smallest area, measuring 6.05 thousand m².
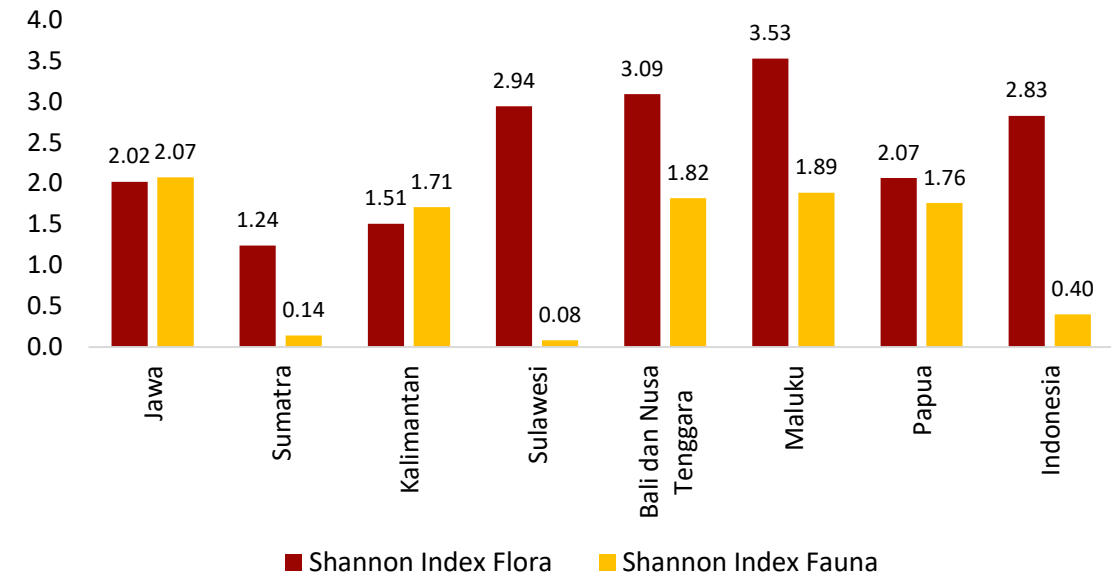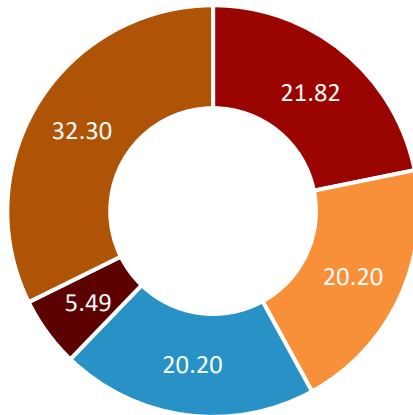
The Shannon index value (0.08-3.53) indicates that the diversity of flora and fauna in a region ranges from very low to high. The Maluku Islands have the highest Shannon index for flora (3.53), while Java Island has the highest Shannon index for fauna (2.07).

Utilization of Natural Inputs by Business Units/Enterprises
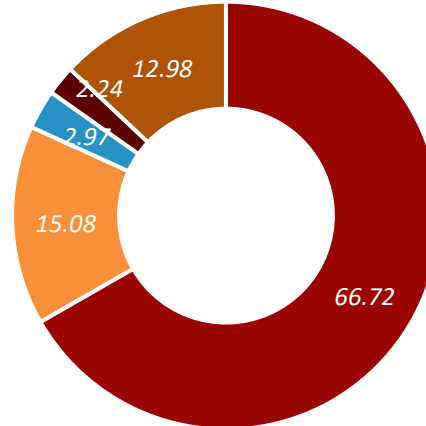
Flora (%)

- Rimba Campuran
- Adinandra Dumosa
- Cattleya sp
- Amaranthus tricolor
- Lainnya

The highest: Rimba Campuran (mixed forest)

All the most widely used flora species have a conservation status of not protected and are intended for extraction, except for Amaranthus tricolor (red spinach), which is intended for other purposes.
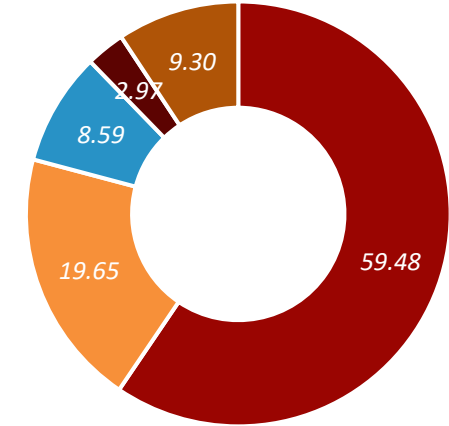
Fauna (%)

- *Chiroptera*
- *Stolephorus sp*
- *Caridea*
- *Sardinella longiceps*
- *Lainnya*

The highest: *Chiroptera/Kelelawar*

All the most widely used fauna species have a conservation status of not protected and are intended for extraction (Chiroptera & Stolephorus sp) or for other purposes (Caridea & Sardinella longiceps).

Others (%)

- *Puri dan Ebi*
- *Amphiprion percula*
- *Poeceae*
- *Xiphias sp dll*
- *Lainnya*

The highest: Puri dan Ebi

All other most widely used species have a conservation status of not protected, with varied purposes, such as Amphiprion percula, which is 9.56% for extraction, 71.9% for conservation, and 18.54% for other purposes.

Production Inputs from Biodiversity Utilization

Flora

Y-axis: Pohon/Juta Rupiah
X-axis categories: A.1, A.2, A.3, O, R
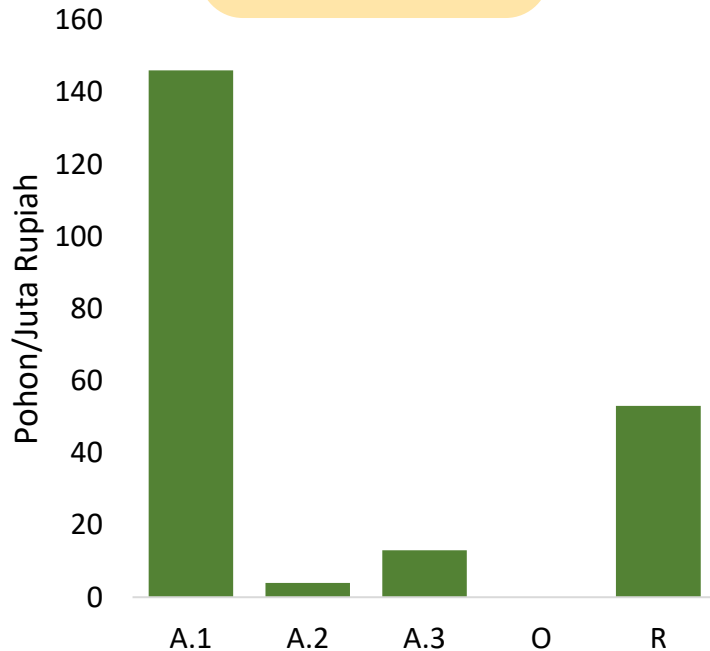
Sector A1 most commonly uses production inputs from flora.

Sector A1 requires 146 trees to generate a GVA of 1 million rupiah. The plants used include Bryophyta, Poaceae, Manihot utilissima Crantz, and Ipomoea aquatica.
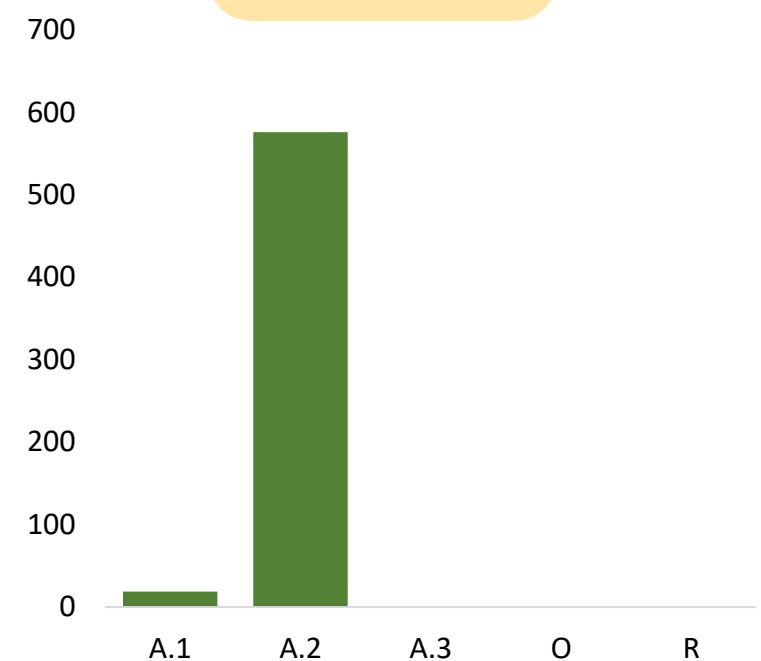
Fauna

Y-axis: Ekor/Juta Rupiah
X-axis categories: A.1, A.2, A.3, O, R
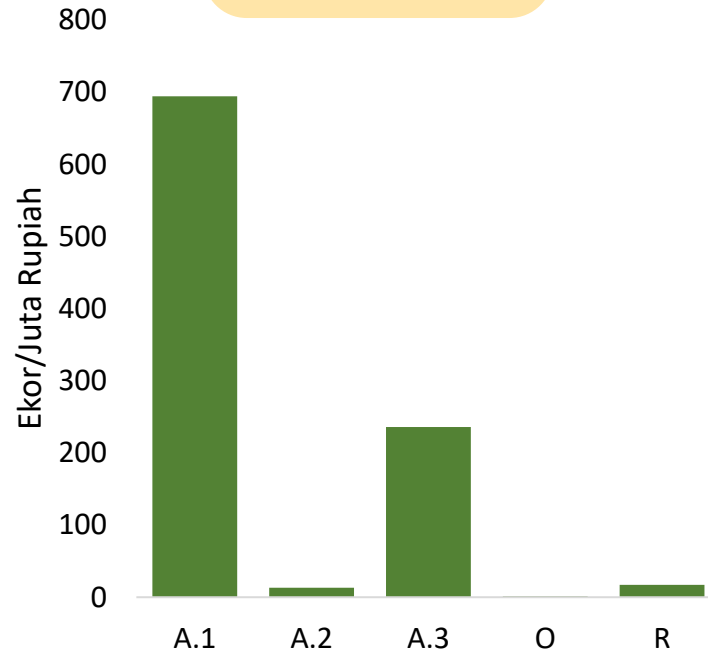
Sector A1 most commonly uses production inputs from fauna.

Sector A1 requires 694 individuals to generate a GVA of 1 million rupiah. The animals used include Gryllus bimaculatus, Gallus Domesticus, Capra aegagrus hircus, and Sphyraena.

Others

X-axis categories: A.1, A.2, A.3, O, R

Sector A2 most commonly uses production inputs from others.

Sector A2 requires 576 other species to generate a GVA of 1 million rupiah. The plant used is grass (Poaceae).

03 Issues and challenges

ISSUES AND CHALLENGES

Coordination, discussions, and cross-checking of data with relevant Ministries/Agencies regarding the results of the In-depth Biodiversity Study need to be carried out to confirm and enrich the biodiversity data produced.

The type of biodiversity assessed in the 2023 in-depth study is species diversity, considering the difficulty in collecting data on genetic diversity.

For future in-depth studies, it is considered necessary to improve the quality of data collection instruments while maintaining their simplicity and ease of understanding for respondents.

The SEEA in-depth study conducted by BPS until 2024 used purposive sampling, prioritizing large-scale business respondents in regions, so the results cannot be used to estimate population values. In 2026, probability sampling will be used.

FUTURE PLAN FOR IN-DEPTH BIODIVERSITY 2026

Main Variables and Indicators to Be Produced

Ecosystem diversity based on land cover maps

- Indicator 1: Land cover area at the beginning of the period
- Indicator 2: Increase and decrease in land cover area
- Indicator 3: Land cover area at the end of the period

Species diversity based on the IUCN Red List

- Indicator 1: Number of endangered species listed in the IUCN Red List at the beginning of the period
- Indicator 2: Increase and decrease in the number of endangered species listed in the IUCN Red List
- Indicator 3: Number of endangered species listed in the IUCN Red List at the end of the period

Ecosystem quality based on information derived from Variables 1 & 2

- Indicator: The Shannon Index

Terima Kasih
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