# Wild and Alien Plant Species as Food and Livelihood Support in Southern Java, Indonesia

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## Introduction

**🌏 Global dependence**
1.2 billion people rely on natural areas for basic needs, especially in the tropics.

**📈 Poverty in Indonesia**
20% live below the poverty line, many concentrated in Java.

**�"‍ Semi-natural landscapes**
Act as livelihood buffers, providing food, income, fodder, medicine, and cultural services.

**🌿 Wild vs. Alien species**
•Wild = naturally occurring native species.
•Alien = introduced (feral/naturalised), growing without cultivation.
Both are collected from **semi-natural areas, not cultivated fields**.
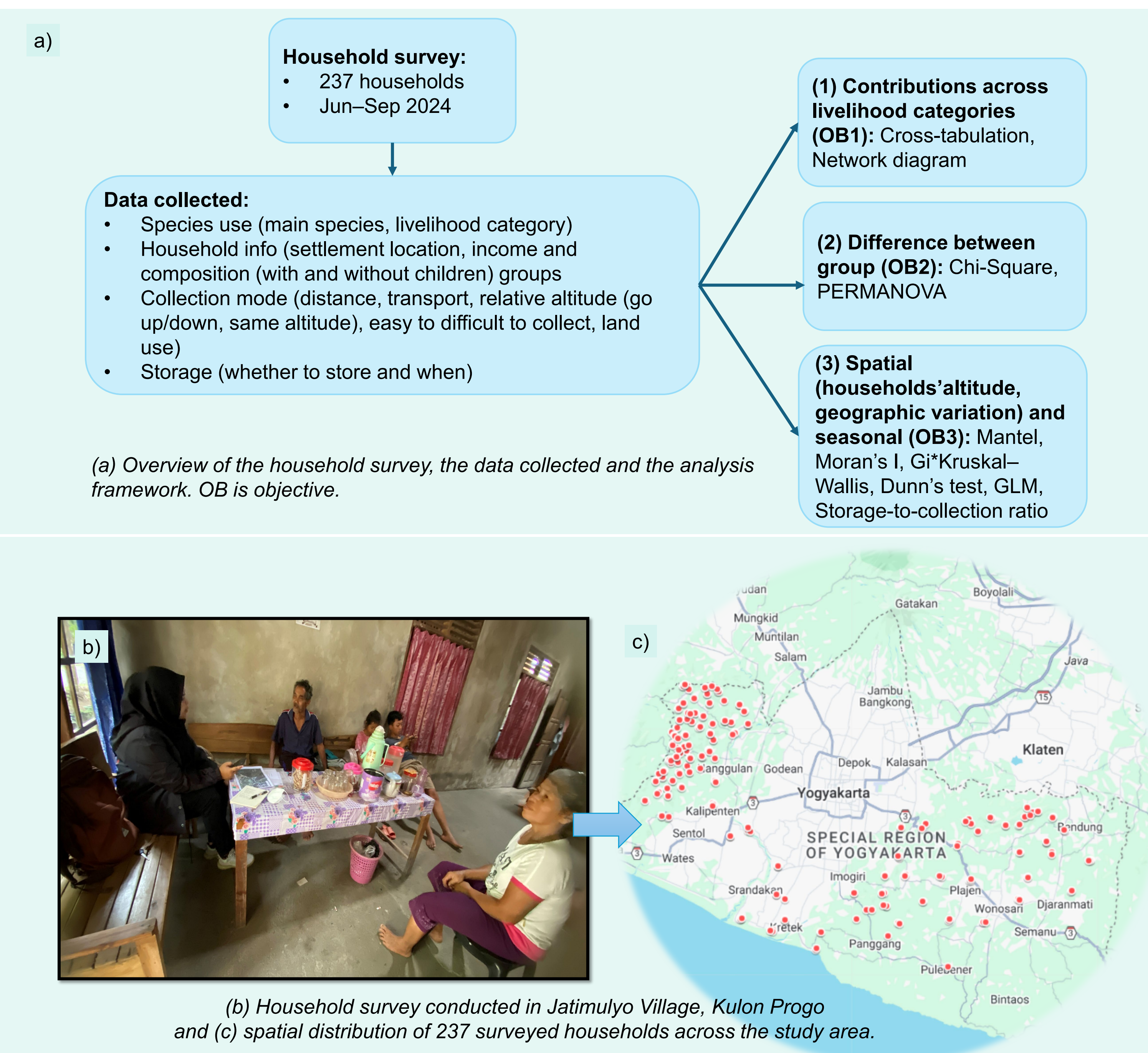
**❓ Knowledge gap**
Limited research on **multi-purpose use** and spatial/seasonal variation, especially in Southern Java.

**🎯 Aim of the study**
Assess contributions of wild & alien plants across 5 livelihood categories; examine spatial and seasonal variation.



a) Study location, b) semi-natural area, c) livelihood categories

## Objectives and Methods (Data & Analysis)



**Household survey:**
- 237 households
- Jun–Sep 2024

**Data collected:**
- Species use (main species, livelihood category)
- Household info (settlement location, income and composition (with and without children) groups
- Collection mode (distance, transport, relative altitude (go up/down, same altitude), easy to difficult to collect, land use)
- Storage (whether to store and when)

**(1) Contributions across livelihood categories (OB1):** Cross-tabulation, Network diagram

**(2) Difference between group (OB2):** Chi-Square, PERMANOVA

**(3) Spatial (households'altitude, geographic variation) and seasonal (OB3):** Mantel, Moran's I, Gi*Kruskal–Wallis, Dunn's test, GLM, Storage-to-collection ratio

(a) Overview of the household survey, the data collected and the analysis framework. OB is objective.



(b) Household survey conducted in Jatimulyo Village, Kulon Progo and (c) spatial distribution of 237 surveyed households across the study area.

## Results

### 1) Contribution across livelihood categories



*Amorphophallus paeoniifolius (elephant foot yam)*

- *Curcuma spp.* – medicinal
- *Gnetum gnemon* – food & income
- *Calliandra houstoniana* – fodder only
- 28 species – single-category use only
- 78 species recorded: 26 wild, 51 alien, 1 unknown
- *Musa spp.* – income & food
- *Carica spp.* – food
- *Cocos spp.* – income & culture
- Plant collection was most frequently for food (41%), followed by income (22%), fodder (17%), medicinal (14%), and cultural (6%), with food also serving as the main overlap across categories.

**Plant collection connectivity across livelihood categories**



"Dark red species are used only in one category"

*Calliandra (Tree Calliandra)*

*Dioscorea esculenta (lesser yam)*

*Gnetum gnemon (melinjo)*

### 2) Difference between groups

- No group effect: Plant collection did not differ by income or household type.
- Shared use: All groups relied on plants in similar ways.

### 3) Spatial and seasonal

- Most species collected nearby.
- Collection mainly on foot at same altitude (72–80%); uphill (11%) and downhill (13%) less common.
- Ease of collection & land use:
  Income, food, fodder → easy, mainly in shrubland (16–22%).
  Medicinal → harder to find, often in woodland (14%).
- Species examples:
  Easy in shrubland: *Musa spp.* (banana), *Carica spp.* (papaya), *Amaranthus spp.* (amaranth)
  Difficult in woodland: *Curcuma spp., Zingiber spp., Boesenbergia rotunda* (Fingerroot).

**Plant collection across categories and landscape conditions.**



Easiest to collect: Mostly in shrubland and woodland, with common species such as *Musa spp., Cocos spp.,* and *Carica spp.* Most difficult to collect: Often rhizomatous species (*Curcuma spp., Zingiber spp.*), especially in woodland

- Households at different altitudes collected different sets of species.
- Some plants were preferred by households at higher or lower elevations (not plant growing sites).
- Examples: *Calliandra houstoniana, Gnetum gnemon, Carica spp.* showed distinct household-altitude patterns.

**Nearby households share similar collected species**
Colored links = strongest 10% of similarities (k = 3)



Jaccard similarity

- Species peak in different months (*Musa*–Dec, *Cocos*–Jan, *Gnetum*–Jun).
- Variation is shaped by category, not season.
- Storage differs: food & income stored more; fodder & medicinal less.
- Storage-to-collection ratio = how much is saved vs. collected (high = more saving, e.g., Gnetum).

- Nearby households often collected the same species → significant spatial clustering (Mantel test, r ≈ 0.033, p = 0.005).
- Map shows links to 3 nearest neighbors; only strongest 10% similarities are drawn (colored lines = clustering).

## Conclusion and Key Message

**Conclusion**: Wild and alien plants support rural livelihoods in Southern Java. 78 species were recorded (26 wild, 51 alien, and 1 unknown). Most plants are collected for food. Multipurpose species such as *Musa spp.* and *Cocos spp., both are feral,* provided food and income, reducing effort and helping resilience. Collection patterns were similar across household groups, while storage of food and medicinal plants showed adaptive strategies to secure access. Semi-natural areas serve as livelihood buffers, which need to be recognised in policy and conservation planning.

**Key message**: Safeguarding semi-natural areas means safeguarding everyday survival and biodiversity conservation.

BEASISWA PENDIDIKAN INDONESIA

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**References:**