

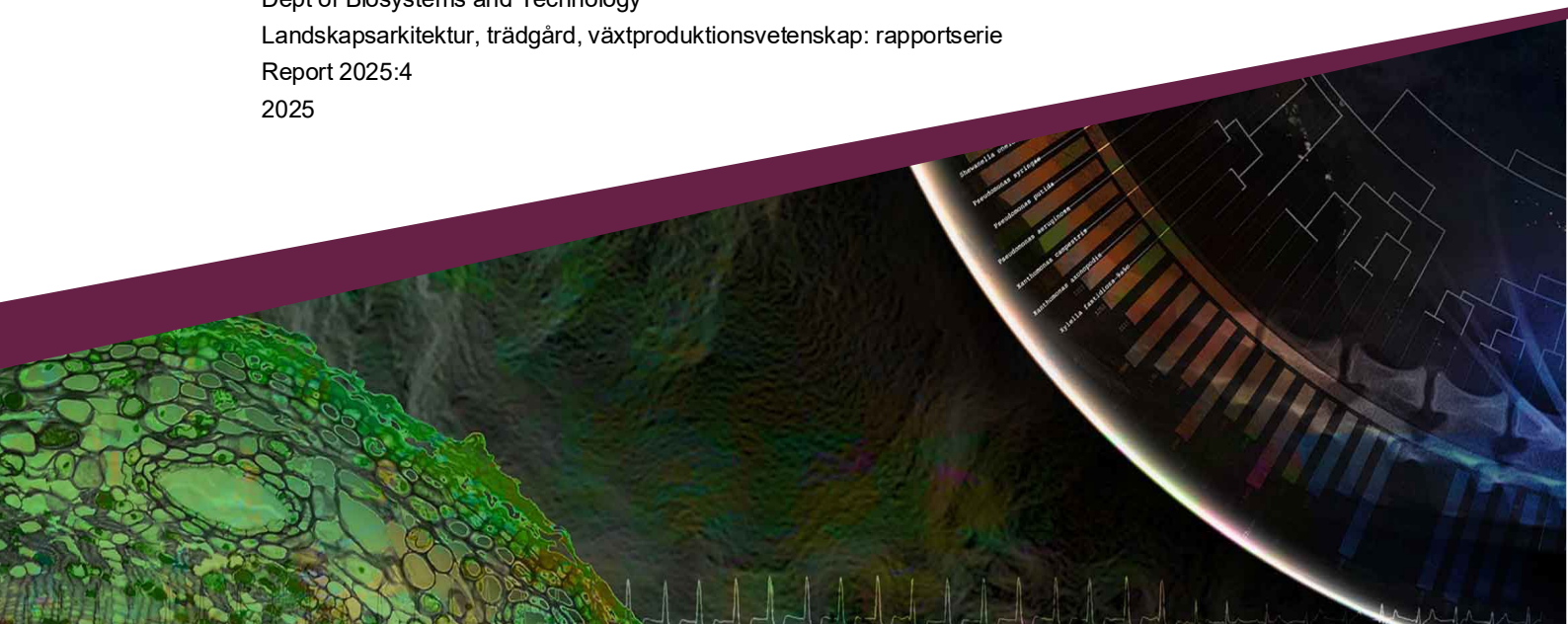


The 2024/2025 Subject Area Revision at the Department of Biosystems and Technology

Executive summary on the Research Strategic
Perspective

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Abbreviations

AI	Artificial intelligence
BT	Department of Biosystems and Technology
HoD	Head of Department
LTV	Faculty of Landscape Architecture, Horticulture and Crop Science
RSC	Research Strategic Consortium
SLU	Swedish University of Agricultural Sciences

1. Executive summary

As a part of the reorganization process at the SLU LTV-faculty to build strong future research areas, the Research Strategic Consortium (RSC) at the Department of Biosystems and Technology was assigned by the head of department (HoD) in December 2024 to screen future research areas. Five candidate key areas were defined, namely (in alphabetical order) agroecology, animal-centred environments, horticulture, integrated crop production, technology/biosystem engineering. Future realities, research needs and gaps of knowledge were identified through recent and current national and international documents.

The analysis conducted within the framework of the RSC mandate exclusively considered the research strategic focus; it did not consider the rationale of human resources nor the needs for education and teaching.

January 9, 2025 was used as the baseline for the analysis. The process was assisted by AI-tools (ChatGPT 4.0). It considered each of the candidate key areas individually and was based on

- Identification of key terms from the national and international documents,
- Analysis of internal and external forces that may create opportunities or risks for an organization (SWOT analysis), followed by SWOT-pairings
- Consequence and risk analysis.

Scoring was done with respect to a short- (1.5 years) and long-term (15 years) horizon, mirroring the time span until SLU's upcoming Quality and Impact evaluation and until the next reorganization. Actions for risk mitigation were suggested.

Given their alignment to the SLU's mission, the Swedish Government's research proposition 2024/25 and global relevance, as well as their clear potential for excellence, societal impact and global partnerships, the following top three future research areas (2025-2040) were identified from the perspective of the research strategic considerations:

1. Agroecology: Lead in participatory, sustainable, tech-integrated food systems.
2. Animal-Centred Environments: animal welfare and production science using advanced technologies and ethical insights enabling holistic, sustainable, and future-ready agricultural systems.
3. Horticulture: Advanced resilient, circular, horticultural food systems for strengthened food and nutrition security and dietary needs.

The key area Technology/Biosystems Engineering is considered as an enabler, supporting through cross-cutting support tools. The key area “Integrated Crop Production” does not show any potential as a future research area (see table 1 and 2).

Agroecology, the scientific investigation of sustainability and practical feasibility of diversified food production systems, makes use of field and on-farm-experiments as well as participatory approaches to design, evaluate and implement solutions for sustainable and resilient food systems. Agroecology critically evaluates environmental and social problems associated with industrial agriculture and uses transdisciplinary and multicriteria approaches to improve sustainability.

Animal-centred environments combine animal production and welfare science with advanced technologies that incorporate physiological, digital, ecological, and ethical insights. The integration of AI, sensor technologies, and biophilic design facilitates holistic approaches to animal welfare and system sustainability. It has a distinct normative focus and interdisciplinary reach, opening new avenues in climate resilience, ethical farming, and land use for future-ready agricultural systems.

Horticulture embraces both ornamental and edible horticultural systems. Given the urge of food and nutrition security, food systems for edible horticulture (in- and outdoors; commercial small-scale, large-scale/industrial, hobby scale; rural, peri-urban, urban) are prioritized. Acting on the intersection of biology, technology and economy, edible horticulture must focus on the current national and international transformative trends for transition and integrate sustainability and resilience needs as well as systems approaches, incl. modelling, machine learning as well as sensor technologies along, and in horticultural food systems (production, processing, distribution and their environments) and in the light of the grand global challenges. Transdisciplinary and multicriteria approaches are key.

All three prioritized areas from the perspective of research strategy embrace technology and systems analysis. The LTV-faculty started to support platforms for monitoring technology (e.g., drones, sensors) and sustainability assessment of animal- and plant-based systems, which is central to forthcoming activities and deserves continuous support for update. However, involvement of technology and biosystems research is not limited to the platforms today supported by the LTV faculty.

The structure addresses the grand global challenges to secure safe and sustainable food systems, viewing sustainability as guiding principle, resilience as an enabler and food and nutrition security as an outcome dimension to prevail current and future strains and shocks (e.g., climate change, market and financial disruptions, geopolitical threats).

Table 1. Evaluation matrix (✓ indicates positive alignment with the evaluation parameters. The number of ✓ displays the strength of alignment. ✗ depicts absence of alignment. Prioritized key areas are mentioned in alphabetical order, in bold font). ROI: return of investment.

Area	Academic Excellence	Innovation	Internationalization	Uniqueness	Short-Term ROI	Long-Term Potential
Agroecology	✓✓✓	✓✓	✓✓✓	✓✓✓	✓✓	✓✓✓
Animal-centred environments	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓
Horticulture	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓	✓✓✓
Integrated crop production	✓✓	✓	✓	✗	✗	✓
Technology (as stand alone)	✓✓	✓✓	✓	✗	✗	✓ (as support)

Table 2. Strategic synthesis for the prioritized and non-prioritized key areas from the perspective of the LTV-faculty's strategy 2022-2025. (✓ indicates positive alignment with the evaluation parameters. The number of ✓ displays the strength of alignment. ✗ depicts absence of alignment.) ICP: Integrated Crop Production

Strategic Focus	Agroecology	Animal-centred environments	Horticulture	ICP	Technology
Multidimensional sustainability	✓✓✓	✓✓✓	✓✓✓	✓	✓
Digital society integration	✓✓	✓✓✓	✓✓	✗	✓✓
Transdisciplinarity and co-creation	✓✓✓	✓✓✓	✓✓	✗	✓ (supportive)
Unique SLU identity	✓✓✓	✓✓✓	✓✓✓	✗	✗
Cohesive research and teaching environment	✓✓	✓✓	✓✓✓	✗	✗
Strategic leadership potential	✓✓✓	✓✓✓	✓✓	✗	✗

As depicted in detail in the full report, the next steps to be leveraged by the LTV-faculty and strategic allocations on the level of the Department of Biosystems and Technology are:

- Launch platforms/centres of excellence.
- Invest in infrastructure and digital innovation.
- Strengthen communication and visibility in national and global policy spaces.

