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Realising biomass supply: farmers' perspectives on straw and short-rotation forestry

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Background

Southern Sweden has high theoretical biomass potential in straw & poplar/ aspen, but actual supply is lower.

Understanding farmers' attitudes, expectations, and practical barriers is key for policy and energy system planning.

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Aims

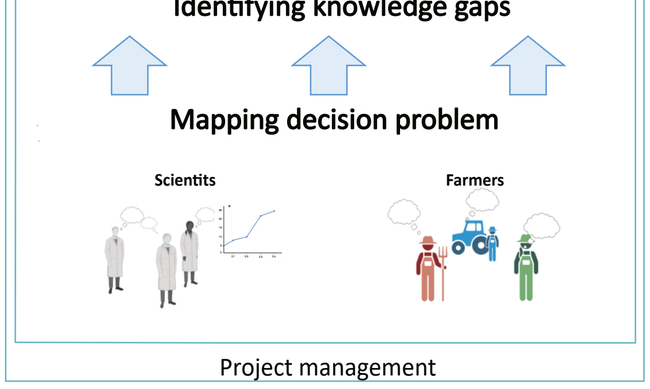
Empirically revise biomass supply estimates

Identify barriers and enablers for straw and tree biomass

Identify communication needs

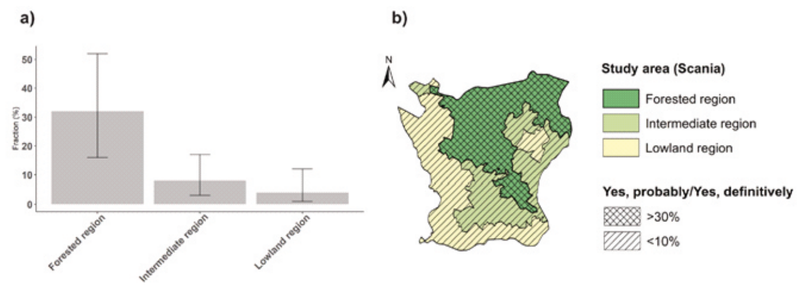
Develop farmer-centered communication standards

Methods

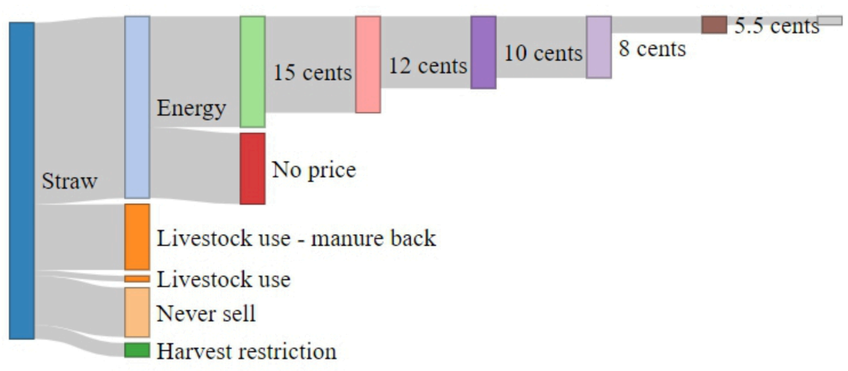


Net Value of Expected Impact (NVEI) as a measure of expectd utility

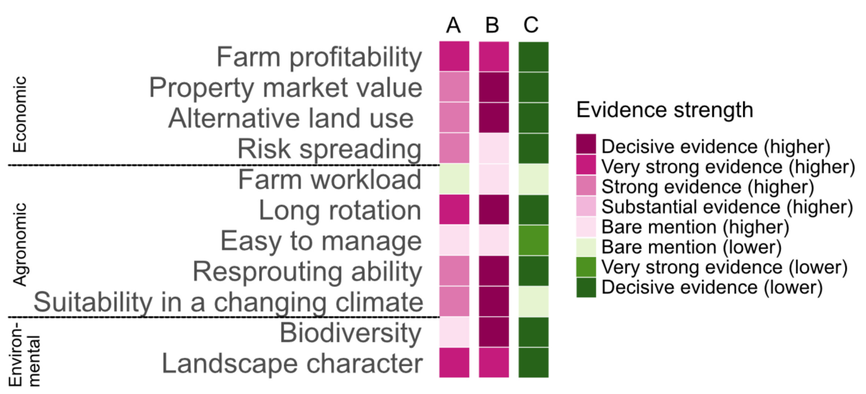
As with many similar studies, the response rate was relatively low.



Proportion of farmers who answered *Yes, definitely* or *Yes, probably* to the question of whether they would consider cultivating hybrid aspen or poplar on agricultural land during the period 2021–2030. Reproduced from Anander et al. 2024.

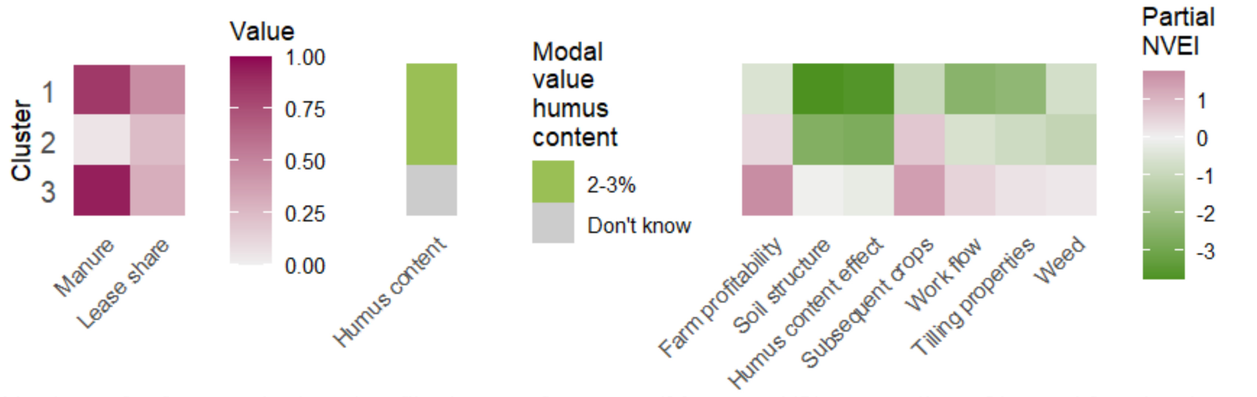


Sankey diagram showing the maximum area from which farmers are willing to sell straw for energy purposes at different minimum prices, accounting for competing uses such as animal bedding and soil amendment. Reproduced from Blennow et al. 2025a.



Difference in expected utility between farmers who have decided (A) or are willing (B) to cultivate hybrid aspen or poplar on agricultural land, and those who have not decided/are not willing. Column (C) shows the difference for farmers who explicitly answered that they are definitely not willing to cultivate, compared to all other responses. For C, calculations were made after excluding missing data for three farmers. Reproduced from Blennow et al. 2025b.

Difference in farmers' expected utility of cultivating hybrid aspen and poplar for various objectives between regions. For each objective and for an aggregate measure (NVEI), the mean expected utility is compared pairwise between regions. Reproduced from Blennow et al. 2025b.



Heatmap for farmer clusters (profiles), use of manure (Manure, 1/0), proportion of leased farmland (Lease share), and humus content in the soil (Humus content), the latter shown as the most common answer within each profile. Partial NVEI is used as the measure of expected utility for each option, where positive values indicate that straw removal is expected to have positive effects, and negative values indicate that straw removal is expected to have negative effects. Reproduced from Blennow and Anander 2025.

Main conclusions

Realistic biomass potential is much lower than theoretical estimates. Actual supply of straw and energy trees is limited by farmers' preferences, practical constraints, and competing uses; n contrast to previous models based only on land area.

Straw is an integrated part of farming, not a generic "residue." Its use for energy is constrained by soil health needs and other farm priorities, with supply being largely insensitive to price alone.

There is a significant gap between farmers' stated attitudes and their actual decisions. Understanding farmer behaviour is key to robust energy systems and building trust.

Economic incentives alone are not enough. Regional differences and prior experience shape farmers' decisions. Tailored support, knowledge exchange, and practical demonstrations are essential for adoption of new biomass crops like poplar and hybrid aspen.

Policy and advisory initiatives must reflect real practices, not just technical resource assessments. Sustainable bioenergy strategies should be grounded in farmers' actual decision-making and agricultural system logic.

Involving farmers, not just suppliers, strengthens both energy systems and trust. Recognizing their knowledge and agency is key for realistic and robust bioeconomic policy.

Guidelines for communications

Short rotation forestry

Principle	*Guidelines based on study results*
Adapt to region	*Forest regions:* Focus on comparisons with spruce (growth, management, biodiversity). *Plains regions:* Emphasise environmental and landscape values, complemented by practical considerations.
Consider decision status	*Willing*: Provide support to translate willingness into practice (seedlings, management, advice, market). *Unwilling*: Keep communication neutral and comparative.
Reduce knowledge gaps	Explain workload, machinery needs, and ecological effects, which are often underestimated.
Address goal conflicts	Highlight trade-offs, e.g., between cultivation for energy and food production.
Build on experience	Use examples from farmers and field trials to increase understanding.

Ceral and oilseed straw

Principle	*Guidelines based on study results*
Profile 1 Knows soil humus content; applies manure	Communicate safe levels of straw removal. Explain how manure mitigates negative effects. Emphasise preserving humus, soil structure, and long-term fertility while acknowledging profitability and crop establishment considerations.
Profile 2 Knows soil humus content; does not apply	Communicate the increased risks to soil health when manure or supplements are not used. Stress the need to balance manurestraw removal with practices that maintain humus levels and support workable soil structure.
Profile 3 Often unaware soil humus content; applies manure	Focus on why knowing humus status is important before making decisions. of Highlight how monitoring humus levels supports long-term soil health, even when short-term productivity gains (e.g., crop establishment) are expected.

Next Steps

Integrate biophysical and farmer-driven data for better potential estimates

Support region- and profile-specific advice and demonstration efforts

Develop policy that respects farmer autonomy and fosters sustainable solutions for energy, food, and ecosystem services

Societal Impact

Results may help avoid over-promising for bioenergy, enable more trustworthy policymaking, and promote balanced land use that values production, soil, climate, and biodiversity.

References

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