

Selecting the best pre-crop for winter wheat

Problem

Using high levels of nitrogen fertilizers in wheat crops can cause negative environmental impacts, such as nutrient leaching and contamination of local and ground water supplies or greenhouse gas emission. Additionally, nitrogen fertilizers are costly for farmers. However, nitrogen stress can cause problems with yield losses and lower quality grains.

Solution

A pre-crop is any crop grown before a succeeding crop within a rotation. Pre-crops can be selected to improve nitrogen nutrition and soil structure for the subsequent crop. Using appropriate pre-crops can reduce the need for water and nitrogen fertilizer inputs by fixing atmospheric N (in the case of legume pre-crops) and building soil organic matter for moisture retention and better soil structure.

Benefits

Multiple benefits can come from using appropriate pre-crops. Firstly, they can provide nitrogen to the following crop reducing costs for nitrogen fertilizers; in some cases, they may require less tillage, bringing the financial burden down for farmers. Pre-crops that keep the soil covered for longer can build soil organic matter, and roots from pre-crops may provide a better, more friable structure and porosity to soils benefiting the subsequent winter wheat crop. Improvements in soil structure from pre-crops can improve soil water holding capacity, building resilience to drought into the system. Lastly, some pre-crops can act as a forage source for livestock.

Practical recommendation

Benefits from pre-crops will depend on environmental factors and multiple variables are associated with choosing appropriate pre-crops for wheat (Figure 1). The criteria set out in Figure 2 can help with selecting an appropriate pre-crop for winter wheat.

Figure 2. Criteria for selecting an pre-crop for winter wheat

Perennial legume-grass ley <ul style="list-style-type: none"> Reducing tillage intensity and problems of soil erosion Increasing soil carbon content, soil structure and fertility
Grain legume or perennial legume-grass ley <ul style="list-style-type: none"> In low-input and organic systems Improving soil structure and fertility, with increased availability of nitrogen (N) and phosphorus (P) to wheat Improving yield and grain quality of wheat Reducing N emissions and losses, fossil energy use and cost of production

Oil crop or other non-cereal <ul style="list-style-type: none"> Reducing problems of weeds, pests and diseases in wheat If legumes are already present in crop rotation, or if legume cultivation is not feasible due to market constraints or pressure of legume pathogens/pests
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Grain legume, perennial ley, oil crop or other non-cereal <ul style="list-style-type: none"> If the current crop rotation is dominated by cereals
Grain legume <ul style="list-style-type: none"> Reducing problems of pests or diseases damaging wheat Depends on economic feasibility: market demand or policy support for grain legumes

Applicability box

Theme

Crop efficiency, resource use, cropping system, reduced fertiliser, bread wheat, durum wheat

Agronomic conditions

Boreal, continental and Mediterranean climates in Europe

Application time

Autumn or spring

Required time

One growing season or a whole year

Period of impact

Preceding and succeeding crop

Best in

Winter wheat

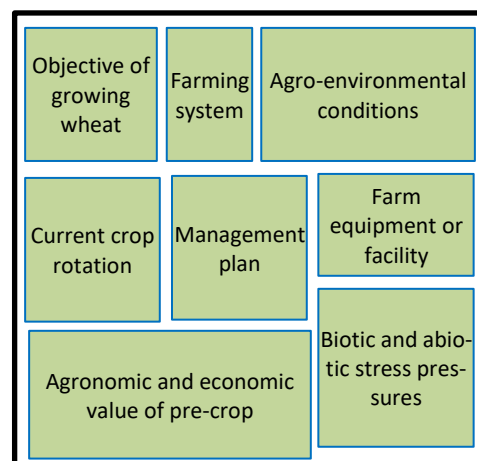
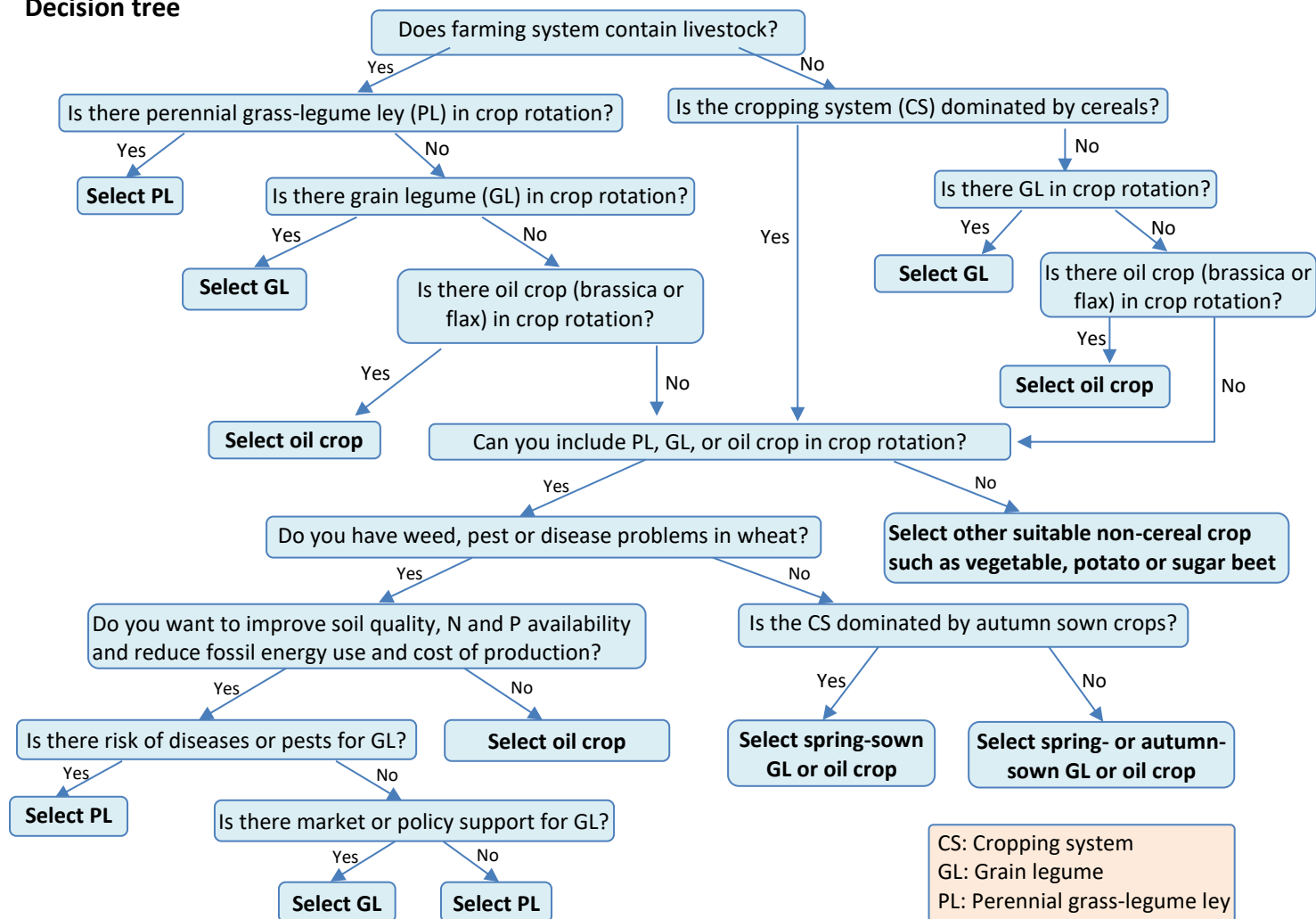


Figure 1. Factors to consider when choosing pre-crops for wheat.

Use the Decision Tree (Figure 3) as a guide in selecting pre-crops suitable for specific farming contexts. This guide breaks down decisions problem by identifying relevant criteria in Figure 2 to choose an appropriate pre-crop for a specific farming context, increasing the chances to improve crop yield and optimize resource use efficiency.

Decision tree



Further information

Further readings

- S. Preissel et al. Field Crops Research 175 (2015) 64-79
- J. F. Angus et al. Crop and Pasture Science 66 (2015) 523-552

About this practice abstract and SolACE

Publisher:

Swedish University of Agricultural Sciences (SLU)

Department of Biosystems and Technology

SLU Alnarp, PO Box 190, SE-23422, LOMMA

Authors: Nawa Raj Dhamala, Georg Carlsson

Contact: nawaraj.dhamala@slu.se; georg.carlsson@slu.se

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