

The need for breeding for cereal legume combinability: experiences in The Netherlands

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The advantages of mixed cropping Particularly for organic farming, mixed cropping of cereal and legume crops can provide advantages in terms of nutrient use efficiency, weed suppression and more stable yields. Cereals benefit from the nitrogen fixing ability of legumes, which also result in higher protein levels in the cereal crop, improving its quality as fodder and potentially also as food (baking quality). Grain legumes benefit from the better weed suppression capacity of cereal crops and the support against lodging (eg peas).

The pitfalls of mixed cropping Despite the advantages of mixed cropping, cereal-grain legume mixtures are not often used in Dutch agriculture other than for whole crop silaging. The reason is that crop mixtures also introduce cropping risks: Non-synchronised ripening, suppression of one crop by the other due to large differences in crop length and an increased susceptibility to diseases or lodging of one crop due to the mixed cropping with another crop. These are reasons that can make the cultivation of crop mixtures unattractive for farmers compared to mono-cropping.

Breeding for crop mixtures To optimise crop mixtures, each combination requires specific traits of the cereal and legume crop. So far, breeding has focused on mono-cropping. Incorporating important traits for mixed cropping will improve the potential of mixed cropping. In this poster we describe the advantages of each cereal-legume combination and the traits for which breeding is needed to optimise its potential.



Mixture spring peas - spring barley/wheat

- + early ripening of peas
- + simultaneous ripening in the mixture peas / barley
- + higher protein level in cereal that increases feed quality (barley) and baking quality (wheat)
- peas and barley are prone to lodging
- peas are prone to pod shattering
- wheat matures later than peas
- > breeding for lodging resistance in peas and/or barley
- > breeding for resistance to pod shattering in peas
- > breeding for an earlier ripening wheat or a later ripening pea.



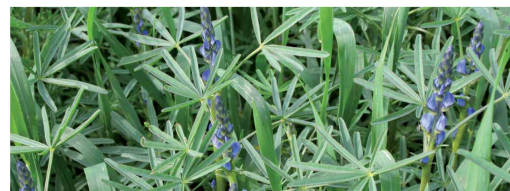
Mixture winter pea – winter triticale

- + higher protein content in triticale
- + good feed quality
- low winter hardiness of winter peas in Dutch mild winters (wet and alteration of thawing and freezing)
- undetermined growth of winter peas (very late ripening if weather in late summer is favourable)
- high risk of lodging of the whole crop due to the abundant growth of winter peas (1,5-2 m)
- > breeding in winter peas for winter hardiness and determined growth.



Mixture spring faba beans – spring wheat

- + higher protein content in wheat
- + highest overall yield
- + the difference in seed size makes separation easy and the wheat can be used for food
- faba beans has undetermined growth which results in non-synchronised ripening in some years.
- faba bean can shade the wheat
- > breeding for a somewhat taller and later ripening wheat
- > breeding for determined growth in faba bean.



Mixture blue lupin – spring wheat

- + higher protein content in wheat
- + better weed suppression
- non-branching blue lupins have harvesting times that coincide with wheat but their crop length is too little in comparison to wheat which seriously reduces their production
- branching blue lupins have the right crop length, but are too late in ripening compared to wheat
- > breeding for higher non-branching blue lupins or earlier ripening branching blue lupins.