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The effect of stripcropping on yield quantity and quality on two locations in the Netherlands

A multi-year data analysis

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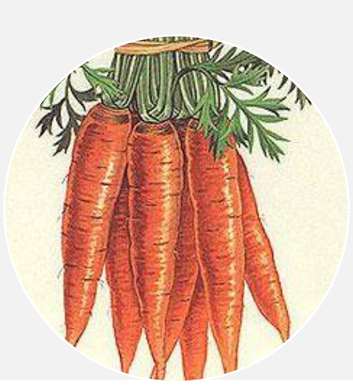
Dit stripcropping onderzoek analyseerde meerjarige data van twee locaties in Nederland. De gewassen binnen het onderzoek zijn geanalyseerd op verse opbrengst, droge stofopbrengst en op verschillende kwaliteitsindicatoren afhankelijk van het gewas. Vervolgens is stripcropping vergeleken met de monocultuur door middel van de Land Equivalent Ratio (LER). Resultaten laten een verhoogde aardappelopbrengst zien voor stripcropping op gewasniveau. De gewascombinaties aardappel—gras en suikerbiet--gerst resulteerde in een hogere opbrengst in vergelijking met de monocultuur. Witte kool—tarwe leverde een hogere opbrengst in vers gewicht maar een lagere opbrengst in droge stofgewicht. Stripcropping pompoen—gerst leverde duidelijk minder op dan de monocultuur. Er is nauwelijks een verschil in opbrengst kwaliteit tussen de verschillende behandelingen.

Background and aim of the study

The use of monoculture systems causes major undesirable environmental externalities. A system change is needed towards a more diversified extensive agricultural system. Diversification can be achieved by using stripcropping, a system where multiple crops are grown alternated, allowing interaction between crops.
The aim of this study is to analyse the effect of stripcropping on crop yield quanity and quality.
To adress the aim of the study, three spatial levels were analysed:

Crop	Crop combination	System

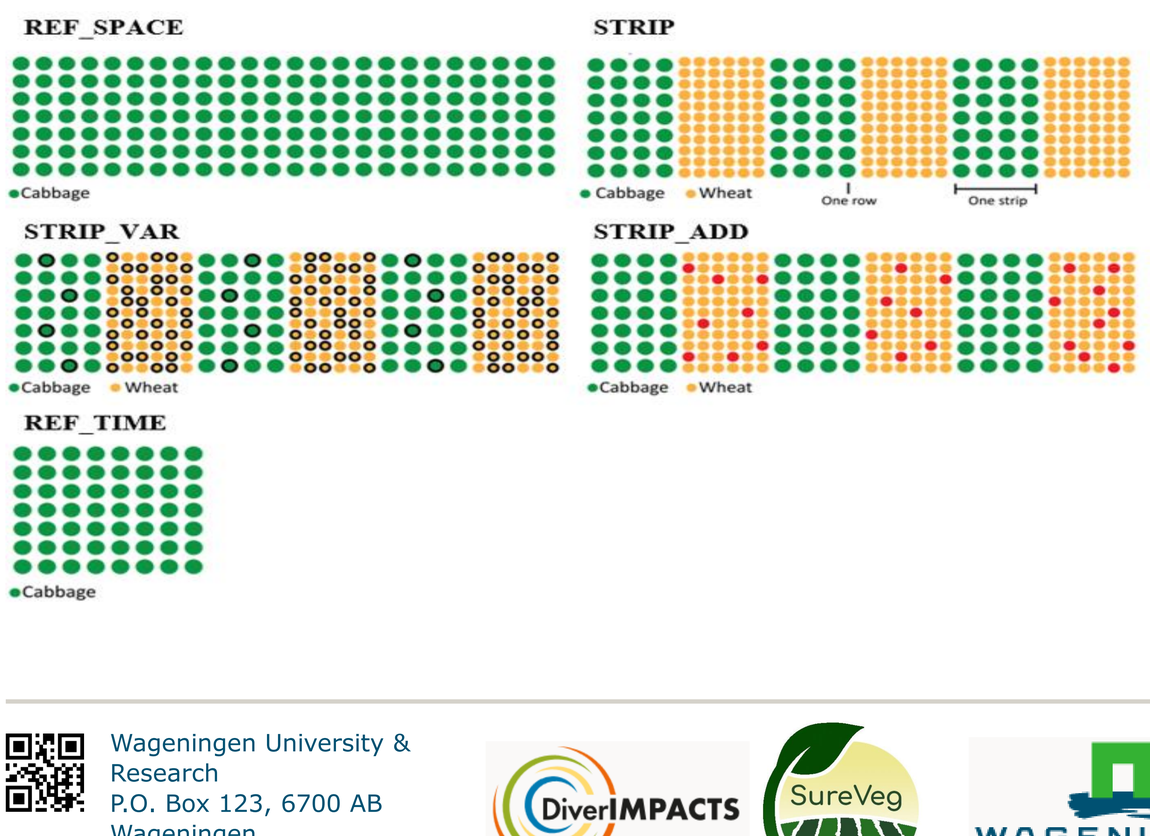


Methods

The following crop combinations were included in the study:
carrot—onion, sugar beet—barley, potato—grass, cabbage—wheat, pumpkin—barley & cabbage—oats
Multiple stripcropping treatments were analyed on the following:

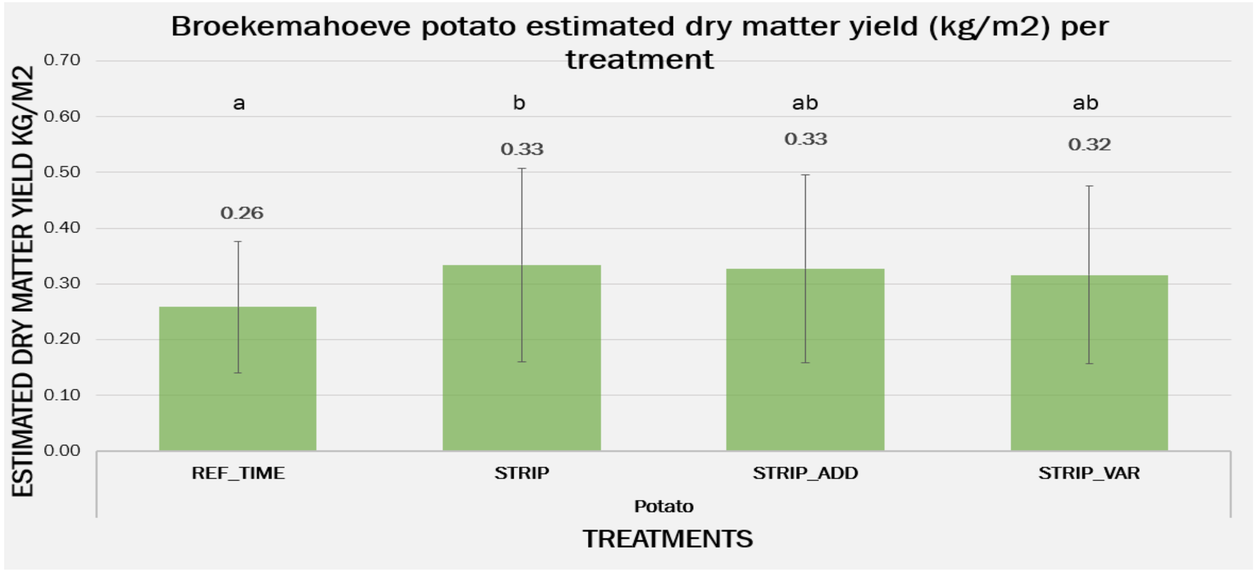
- Yield quantity in fresh and dry matter yield
- Yield quality that consists of different quality indicators dependent on the crop
- Land Equivalent Ratio (LER) for crop pairs and system yield performance compared with monoculture system

Below, you see a visualization of the different treatments with cabbage—wheat as an example



Results: individual crops

- Broekemahoeve: potato yielded significant higher in STRIP compared with REF_TIME
- Broekemahoeve: Other crops no significant difference between the treatments
- Droevendaal: potato yielded higher in STRIP compared with REF_SPACE but not significant
- Droevendaal: Other crops no significant difference between the treatments



Crop combinations with a clear yield increase compared with monoculture:

- Potato—grass , sugar beet—barley & cabbage—wheat (fresh yield)

Crop combination with a clear yield decrease compared with monoculture:

- Pumpkin—barley

The most striking results of the yield quantity of the crop combinations based on LER				
Crop combination	Treatment	Broekemahoeve (REF_TIME)	Droevendaal (REF_TIME)	Droevendaal (REF_SPACE)
Potato—grass	STRIP fresh	+12.9%	+4.8%	+8.0%
	STRIP dry	+14.7%	+8.1%	+9.2%
Sugar beet—barley	STRIP fresh	+6.5%	-	-
	STRIP dry	+4.7%	-	-
Cabbage—wheat	STRIP fresh	+2.5%	+2.7%	+1.6%
	STRIP dry	-2.4%	-16.0%	-9.9%
Pumpkin—barley	STRIP fresh	-	-33.7%	-23.2%
	STRIP dry	-	-35.4%	-27.2%

Results: System performance

- At system level, all treatments at the Broekemahoeve yielded higher than the monoculture
- At system level, all treatments at Droevendaal yielded lower than the monoculture
- Negative yield values of the treatments at Droevendaal mainly caused by low yield of the pumpkin—barley combination

Yield quantity system performance of the different treatments based on LER				
		Broekemahoeve	Droevendaal	Droevendaal
		REF_TIME	REF_TIME	REF_SPACE
Treatment				
STRIP	Fresh yield	+5.2%	-8.7%	-6.6%
STRIP_ADD	Fresh yield	+5.9%	-21.1%	-15.7%
STRIP_VAR	Fresh yield	+4.6%	-7.6%	-5.6%
STRIP	Dry matter yield	+3.0%	-16.0%	-9.9%
STRIP_ADD	Dry matter yield	+2.1%	-32.1%	-21.6%
STRIP_VAR	Dry matter yield	+1.8%	-19.3%	-12.7%

Conclusions

- Stripcropping does not have to be less productive compared with monoculture systems
- Important to choose the right crops and crop combinations regarding yield
- STRIP_VAR is not inferior to STRIP, meaning an extra level of crop variety diversification within the strip often does not affect fresh and dry matter yield in a negative way
- Little to no effect of the treatment on yield quality

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