Filling caveats in yield gap analysis

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Groups ¹Plant Production Systems, ²Crop Systems Analysis and ³Animal Production Systems
Production ecological principles

Why yield gap analysis

- Benchmark land productivity
- Identify regions with unlocked yield capacity
- Benchmark resource (incl. water) use efficiencies
- Identify regional causes of yield gaps
- Develop options to reduce yield gaps and/or improve RUEs
Global Yield Gap Atlas

With University of Nebraska, ICRISAT, AfricaRice, CIMMYT and many regional and national partners:

- Major food crops in the world
- Global protocol with local application
- Local data and evaluation
- Strong agronomic foundation

www.yieldgap.org
Yield gap analysis: protocol

- Climate zones
- Crop-specific harvested areas
- Weather station buffer zones
- Soil types and cropping systems
- Crop model simulations
- Actual yields
- Yield gaps

Grassini et al., 2015; Van Bussel et al., 2015, Field Crops Research
Relevance of strip intercropping in the world

- Maize/potato
- Maize/bean
- Wheat/maize
- Wheat/buckwheat
- Wheat/millet
- Wheat/tobacco
- Wheat/soybean
- Maize/soybean
- Maize/peanut
- Maize/potato
- Wheat/broomcorn millet
- Maize/potato
- Maize/bean
- Wheat/maize
- Wheat/cotton
- Wheat/garlic

Maize/bean (sorghum) in rotation with wheat
Maize/potato/wheat
Wheat in rotation with maize/soybean
Maize/beans in rotation with wheat
Maize/wheat
Wheat in rotation with maize/sesame
Maize/sweet potato

Mean LER = 1.22

(Knörzer et al., 2009 and Yu et al., 2015)
**Land equivalent ratio**

\[ LER = pLER_w + pLER_m = \frac{Y_w}{M_w} + \frac{Y_m}{M_m} \]

![Graph showing LER for different crops and years with respective data points for 2013 and 2014.](image)

Strip intercrop model

See poster: Fang Gou, Martin K. van Ittersum, Wopke van der Werf

*Simulating potential growth in a relay-strip intercropping system: model description, calibration and testing*
Yield gaps of perennial crops
Fig. 1. Schematic overview of PALMSIM. Dashed boxes represent standing biomass.
‘Yield gap analysis’ for Livestock systems

Van Ittersum and Rabbinge, 1997; Van de Ven et al, 2003; 
Van der Linden et al., 2015
Yield gap – beef production

Breed: Charolais
Climate: France

Diet under potential production: 65% wheat, 35% hay, *ad libitum*

Diet under feed-limited production: Grass-based, 5% barley, *ad libitum*

Van der Linden et al., Agricultural Systems, 2015
Yield gap – beef production

Van der Linden et al., Agricultural Systems, 2015
Yield gap analysis for crop-livestock systems

5% concentrates, 95% grass-based

Feed efficiency (kg beef t⁻¹ DM feed)

60
50
40
30
20
10
0

0 2 4 6 8 10 12

Feed crop production (t DM ha⁻¹ year⁻¹)

Yield gap

631 kg beef ha⁻¹ year⁻¹

133 kg beef ha⁻¹ year⁻¹

18% concentrates, 82% grass-based

Feed efficiency (kg beef t⁻¹ DM feed)

60
50
40
30
20
10
0

0 2 4 6 8 10 12

Feed crop production (t DM ha⁻¹ year⁻¹)

Yield gap

634 kg beef ha⁻¹ year⁻¹

180 kg beef ha⁻¹ year⁻¹

Data: Reseaux d’Elevage Charolais, 2012

Van der Linden et al., 2015
Thank you!

Future harvest

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