

## Session 3A. Organic production and nutrient flows

### Towards nitrogen self-sufficiency in mixed crop organic dairy systems: legumes and protein-rich plant contributions

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Nitrogen is known to be the limiting factor of productivity in organic systems. In low-input organic, mixed-crop dairy systems (MCDS) at the Mirecourt INRA station, studies are conducted on the contribution of associated cereal/protein-rich plant crops and concentrate mixes to the nitrogen self-sufficiency of the system. An agronomic and zootechnical analytical trial was established with nine types of cereal and protein-rich plants, and associated cereal/protein rich plant crops were compared in plot trials in 2006 and 2007. The valorization of three cereal/protein concentrate mixes by 24 lactating dairy cows was tested in a zootechnical experiment during winter 2007. Dairy cows were each fed 4 kg d<sup>-1</sup> of the mix, 8 kg DM d<sup>-1</sup> of lucerne/cockfoot hay, and permanent grassland hay *ad libitum*. Associated cereal/protein rich plant crops produced a greater and more stable yield (3.0 t ha<sup>-1</sup>) than pure cereals (2.2 t ha<sup>-1</sup>) but the proportions of protein-rich grains in the mixes were highly variable (26 to 62%). Dairy cows' feed requirements were satisfied by the three diets. Cereal/protein concentrate mixes had a low impact on dairy cows' performance because of the high contribution of forages to the diet.

### Effects of different stocking rates with dairy cows on herbage quality in organic farming

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In order to identify the effects of stocking rate of grazing dairy cows on herbage quality in organic farming, grazing experiments were conducted from 2004 to 2006. All lactating Holstein cows of one herd were divided into two groups during vegetation periods. The paddocks of the rotational pasture were split in a way that the low stocking rate group (LSR) had 15% more pasture area than the high stocking rate group (HSR). Post-grazing sward height for HSR was decisive for the simultaneous change of the sub-paddocks. Annual stocking rates for HSR were between 2.0 and 2.3 cows ha<sup>-1</sup>. At regular intervals two grass strips per stocking rate were cut and sampled in the paddock to be grazed next. No differences were revealed concerning the strongly varying pre-grazing herbage mass with 1,235 (HSR) and 1,165 kg DM ha<sup>-1</sup> (LSR). In the offered herbage mass for the LSR group, significantly lower ash, crude protein, absorbable protein in the duodenum based on energy or nitrogen available in the rumen, net energy for lactation, as well as higher neutral detergent fibre and acid detergent fibre contents were detected. Sugar values were unaffected. Referring to herbage mineral concentrations, only the potassium concentration was significantly lower in herbage for the LSR group. The allocation of a larger grazing area without pasture topping leads to a lower pasture quality, mainly from mid June to the end of August.