

Future sustainability of organic and low-input milk production:
Challenges and solutions
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Adapted breeds for productivity in organic and low input dairy systems

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Introduction (1)

- ◆ **Milk yield potential** of conventional breeds (HF) has **increased dramatically** during the last 3 decades (primary selection focus)
- ◆ However, the **health, fertility** and **longevity** has **declined**
 - ✧ Functional traits not included in breeding programmes until recently
- ◆ Additionally, "top" sires have been selected within **high concentrate input** systems
- ◆ The **suitability** of **modern genotypes** for organic and low input systems (OLIS) is often **questioned**



Introduction (2)

◆ Requirements of cows for OLIS:

- ✧ Excellent health and fertility traits, "robustness"
- ✧ Ability to produce high yields of milk solids from forage based diets

◆ Many breeds are **perceived to be adapted** to OLIS, but mostly **little evidence** exists of how they actually perform within OLIS

◆ SOLID-project: Understanding **how contrasting genotypes adapt to a systematic restriction** of nutrient and energy supply

- ✧ Three different geographical regions with specific systems, differing in concentrate inputs
- ✧ Conventional and "adapted" genotypes examined in each region



Overview

Country	Austria (BOKU)		Northern Ireland (AFBI)		Finland (Luke)	
Region	Alpine		Western European Grassland		North European Grassland (confined)	
Genotype	Conventional	"Adapted"	Conventional	"Adapted"	Conventional	"Adapted"
	Brown Swiss (n = 21)	Local HF (n = 29)	HF (n = 34)	(SR x J x HF) (n = 34)	HF (n = 32)	Nordic Red (n = 14)
Systems examined	Low vs. moderate input 280 vs. 620 kg conc. DM		Low vs. moderate input 740 vs. 1,840 kg conc. DM		Moderate vs. high input 1,250 vs. 3,020 kg conc. DM	

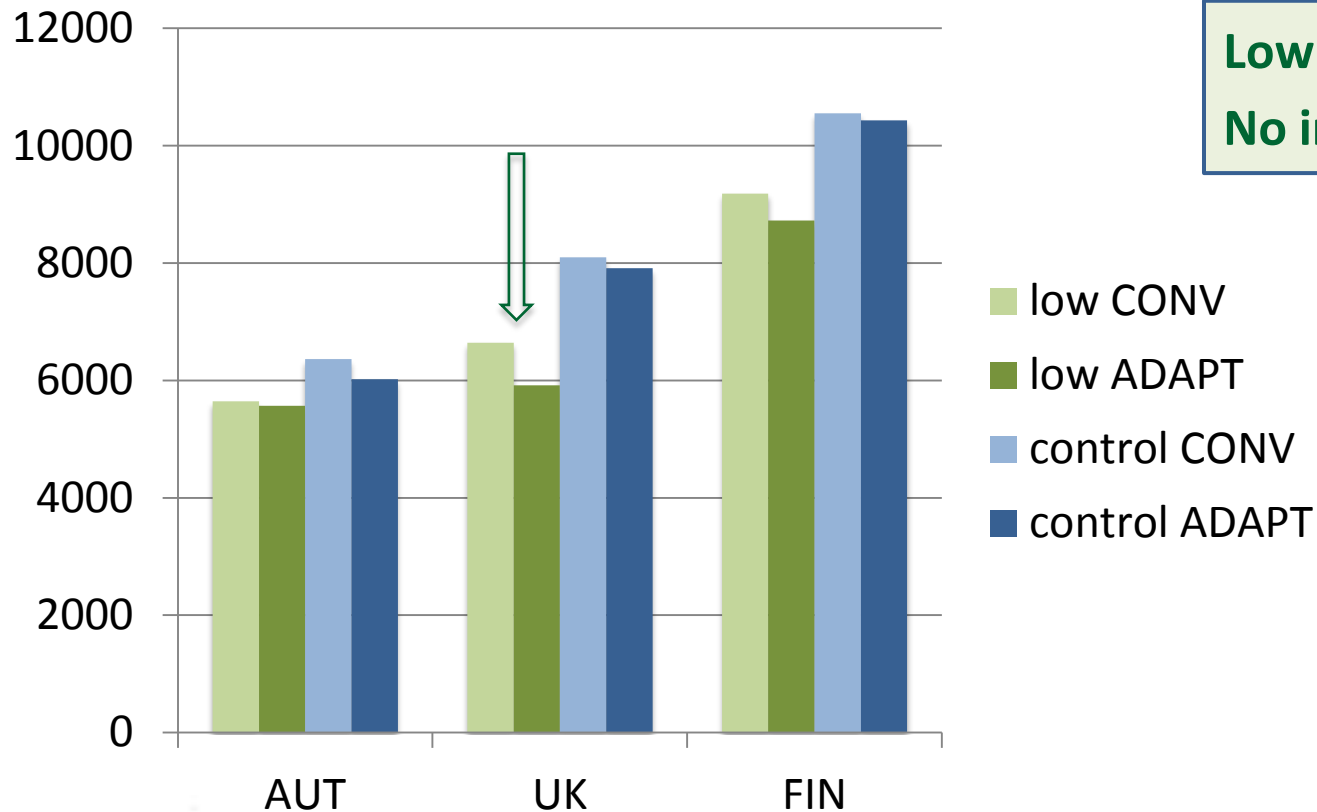


Feed intake

System	Low		Control		Significance		
Breed	Conv	Adapt	Conv	Adapt	Breed	Conc	B x C
Total concentrate intake, kg DM							
AUT	281	278	642	539	NS	<0.001	NS
UK	719	680	1879	1887	NS	<0.001	NS
FIN	1277	1216	2979	3040	NS	<0.001	NS
Total intake, kg DM/d							
AUT (7 weeks)	15.9	15.5	18.2	16.6	NS	0.038	NS
UK (9 weeks)	14.8	13.6	20.0	18.3	NS	<0.001	NS
FIN (7 weeks)	16.8	17.2	18.4	17.5	NS	NS	NS

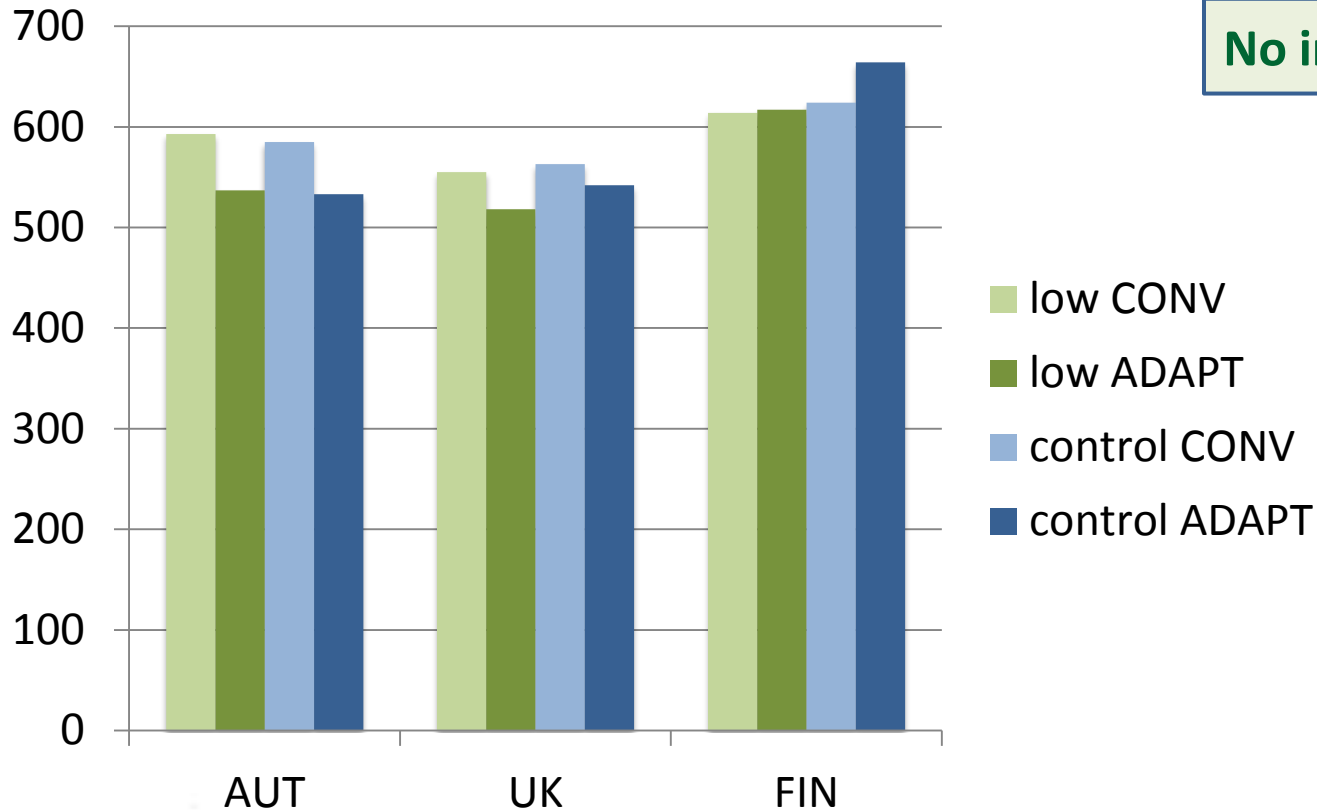


ECM yield



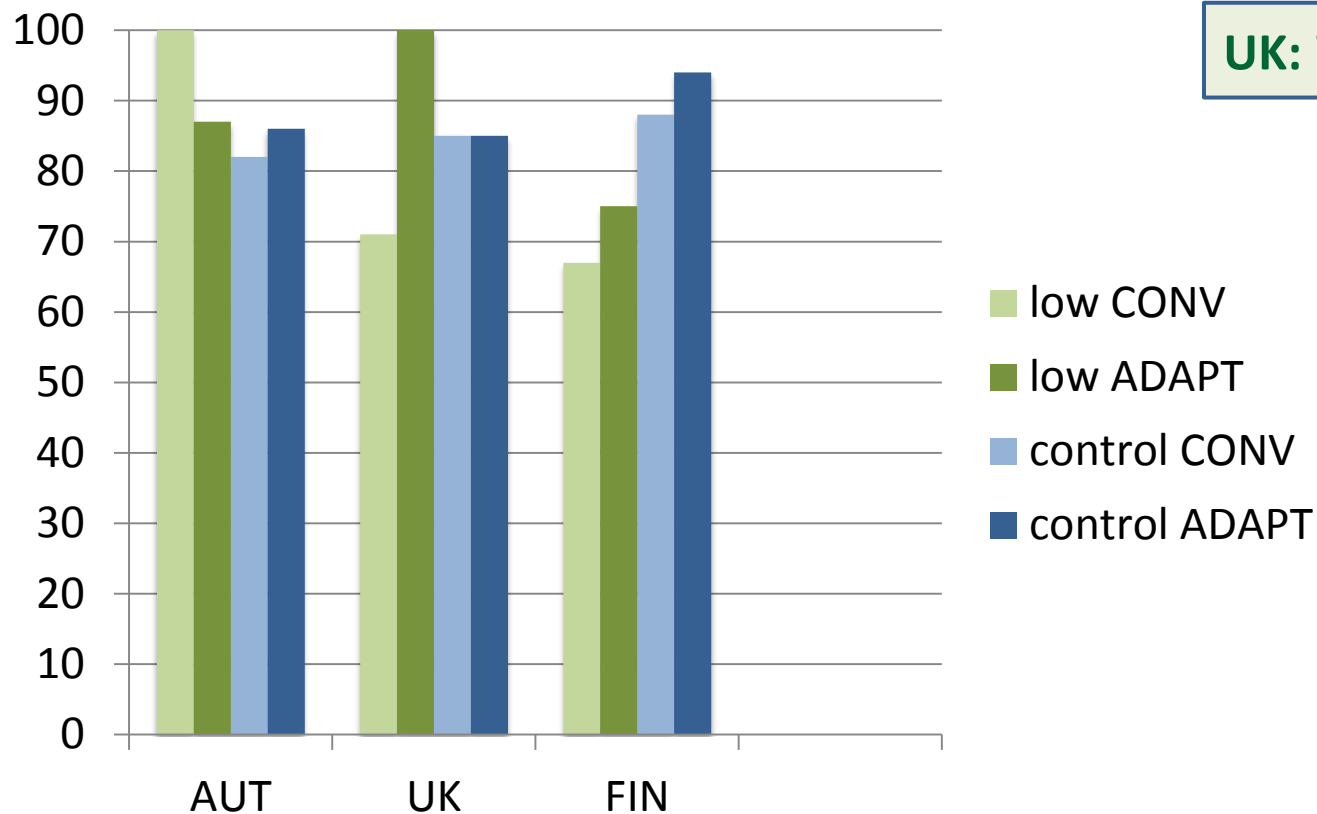
Body weight

No interactions!



Pregnancy (%)

UK: interaction!



Other traits

◆ Health

- ✧ UK: Adapted breed lower incidences of mastitis & ovarian disorders
- ✧ FIN: Adapted breed less metabolic diseases & lameness in moderate feeding regime

◆ Biomarkers (blood)

- ✧ AUT: Breeds reacted differently to concentrate reduction, i.e. different mobilization of body tissues
- ✧ UK: Adapted breed higher BOHB (no differences in NEFA), but higher glucose (energy status improved?)
- ✧ FIN: Adapted breed lower BOHB



Conclusions (1)

- ◆ **Reduction** in **ECM yield** due to reduction of concentrates differed between systems (583 to 1,725 kg)
- ◆ **Adapted** breeds **mostly** had **higher milk solid** content, which (partially) compensated for lower milk quantity
- ◆ **No general trend** could be observed across systems and breeds concerning **body weight**, **BCS** and their **changes**: Breed-specific response patterns to specific feeding system
- ◆ Inconsistent **advantages** for **adapted breeds** in **fertility** and certain **health** traits address key success factors for OLIS



Conclusions (2)

- ◆ Blood & milk **biomarkers** point at certain **differences** in breed **response** at the metabolic level
- ◆ **Few interactions** between breed and feeding system
 - ✧ Feeding system similarly challenging (AUT)
 - ✧ Similar response of different breeds, i.e. breeds similarly suited
 - ✧ Limitations of the current study, i.e. relatively low number of animals
- ◆ **Breeding** should address the **specific** production **environment**, considering **traits** most relevant to OLIS





Thank you

