Newly proposed selection strategies for feed efficiency

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Feed-a-Gene

Adapting the feed, the animal and the feeding techniques to improve the efficiency and sustainability of monogastric livestock production systems

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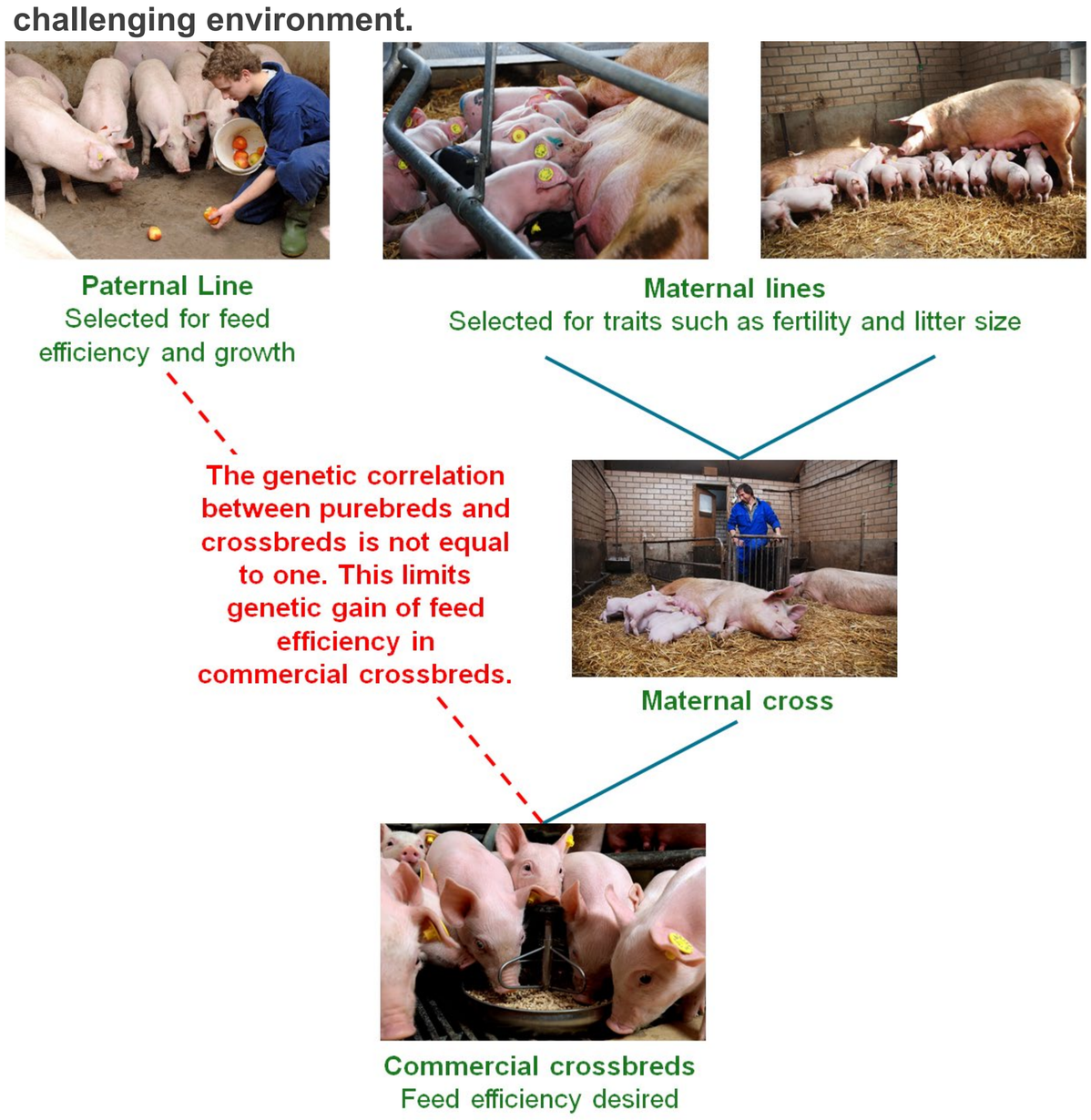
RECOMMENDATIONS

- Economic weights should be for the trait of the crossbreds rather than purebreds.
- Adding information recorded on crossbreds is more beneficial if not already recorded on the selection candidates.
- New selection indices should consider adding the new traits described by other Feed-a-Gene tasks.
- Which traits to add are dependent on the cost of recording and ability to record phenotypes.
- Genomic prediction should be included, but requires investment to maintain a reference population in a commercial environment.

INTRODUCTION

- Data collection and genetic selection is normally made on purelines.
- The breeding objective is for commercial crossbreds.
- Accounting for differences between purebreds and crossbreds in breeding programs could improve the response to selection for feed efficiency.
- Adding new traits from Feed-a-gene could also improve the response to selection.

Figure 1: Genetic gain of crossbred pig feed efficiency has been lower than predicted, due to purebred animals having a less challenging environment.



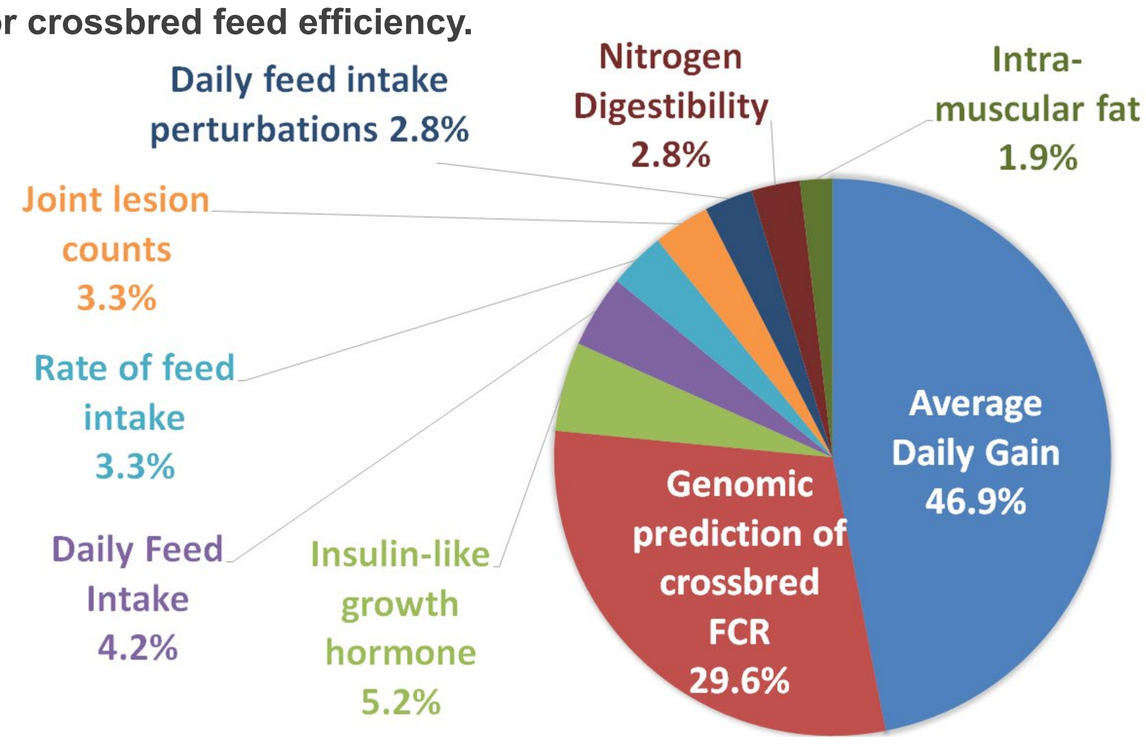
OBJECTIVE

Create a new selection index for feed efficiency of crossbred pigs that includes:

- Digestibility,
- Feeding behavior,
- Welfare indicators,
- Indirect genetic effects,
- Biomarkers,
- Group records,
- Perturbations,
- Meat quality, and
- Genomic prediction.

RESULTS & DISCUSSION

Figure 2: Contribution each traits makes to a new selection index for crossbred feed efficiency.



- Placing an economic value on purebred traits is not appropriate if the breeding objective is for crossbred feed efficiency.
- Information from the new traits in Feed-a-Gene improves both the accuracy of the index (allowing for faster rates of gain), and the economic value of the index.
- Traits from the categories digestibility, feeding behavior, and biomarkers are likely to have the largest response in feed efficiency.
- Adding genomic prediction has the largest improvement to the accuracy of the index and response to crossbred Feed Conversion Ratio (FCR).
- Adding all possible traits from all categories makes the selection index too complex.

Table 1: Expected changes to feed efficiency traits with new traits and genomic prediction added to a crossbred selection index.

Change in response for	Old selection index with FCR and ADG economic values for		New selection index	
	Purebreds	Crossbreds	Without genomic prediction	With genomic prediction
Index parameters				
Accuracy of the index	0.566	0.260	0.408	0.420
Economic value per sow joined	3.07	1.33	€2.03	€2.04
Crossbred traits				
FCR of Crossbreds (2.59 kg/kg)	-0.028	-0.035	-0.030	-0.032
ADG of Crossbreds (882 g/day)	13.44	12.48	25.67	25.10
DFI of Crossbreds (2339 g/day)	-13.28	-21.00	31.45	37.99
Purebred traits				
FCR of Purebreds (1.99 kg/kg)	-0.031	-0.039	-0.026	-0.032
ADG of Purebreds (1061 g/day)	42.53	38.23	28.03	18.08
DFI of Purebreds (2175 g/day)	9.79	-21.00	-27.85	-1.45

CONTACT DETAILS

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Feed-a-Gene

Feed-a-Gene is a European H2020 project involving 23 partners which aims to adapt feeds, animals and feeding techniques to improve the efficiency and sustainability of pig, poultry and rabbit production systems. It is coordinated by INRAE (France), started in March 2015 and will last 5 years. The project aims to reduce the environmental impact of monogastric livestock production by improving and diversifying animal diets and feed technologies and by integrating new selection criteria for these animals. The Feed-a-gene project further aims to develop new management systems for precision feeding and precision farming and to evaluate the overall sustainability of the different management solutions proposed in the project.

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