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## Introduction

Dairy cattle differ in production, fertility, health, and other important traits in the different environments at both the phenotypic and genetic level. Fertility of Nordic dairy cattle breeds (Holstein, Red, Jersey) is a complex trait and the heritability estimates of this trait is low and ranging from 0.02- 0.04. Furthermore, the expression of the trait is very sensitive to environmental factors and it may be affected by the interaction between genotype and environment (GxE).

## Objective

The objective of the present study is to develop a method to detect the environmental sensitivity of fertility related traits as the GxE effect in Denmark and Sweden.

## Data Structure

### Production Records

Production records (milk yield, fat and protein) from commercial dairy herds in Denmark containing 17205 cows starting from January 2009 till June 2012.

### Fertility Records

#### Traditional

16631 cows born from 1995-2011 and starting from January 2010 till June 2012. These records were used to obtain three traditional fertility traits.

Number of inseminations till conception (NINS)

Interval from calving to first insemination (ICF)

Interval from first to last insemination (IFL)

#### Automated

Data from activity monitoring devices for 17562 cows. Records will be used to obtain three activity traits.

Days to first high activity

Strength of oestrous

Duration of oestrous

### Pedigree file

Pedigree file for 63 813 animals born from 1966 to 2011.

## Methods to detect GXE

The type of the environmental descriptor determines the method to be used to detect the GxE interaction.

### Descriptors

#### Discrete

Geographic region, production level, feeding intensity

Multi-trait approach which estimates the genetic correlations between the same traits in different environments.

#### Continuous

Herd size, average herd milk yield and climatic factors (THI, Chill factor, day length).

Reaction norm approach, which describes the performance of the genotype as a function of the environmental gradients.

## Preliminary Results

1.94

• NINS

0.03

76.43 d

• ICF

0.02

28.78 d

• IFL

0.03



The model and data used provides heritability estimates that agree with the previous estimates for the fertility traits in the Danish dairy cattle.

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