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Agroscope Reckenholz-Tänikon Research Station ART

# **ECOFARM: How eco-efficient are Swiss dairy and arable farms?**

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# Outline

- Materials and Methods
- A model to describe eco-efficiency
- Results for arable farms
- Results for dairy farms
- Preliminary conclusions
- Outlook



# Materials and Methods

- Within the framework of the project LCA-FADN (Life Cycle Assessment-Farm Accountancy Data Network) more than 100 Swiss farms of different farm types, production regions and farming systems were assessed for the years 2006-2008.
- The environmental performance is measured using SALCA (Swiss Agricultural Life Cycle Assessment) methodology.
- Preliminary data for the year 2008 of 12 arable and 44 milk producing farms were analysed regarding their eco-efficiency.
  - ➔ E/E = Environmental impact per gross profit



# Project LCA-FADN

## LCA of a farm according to SALCA

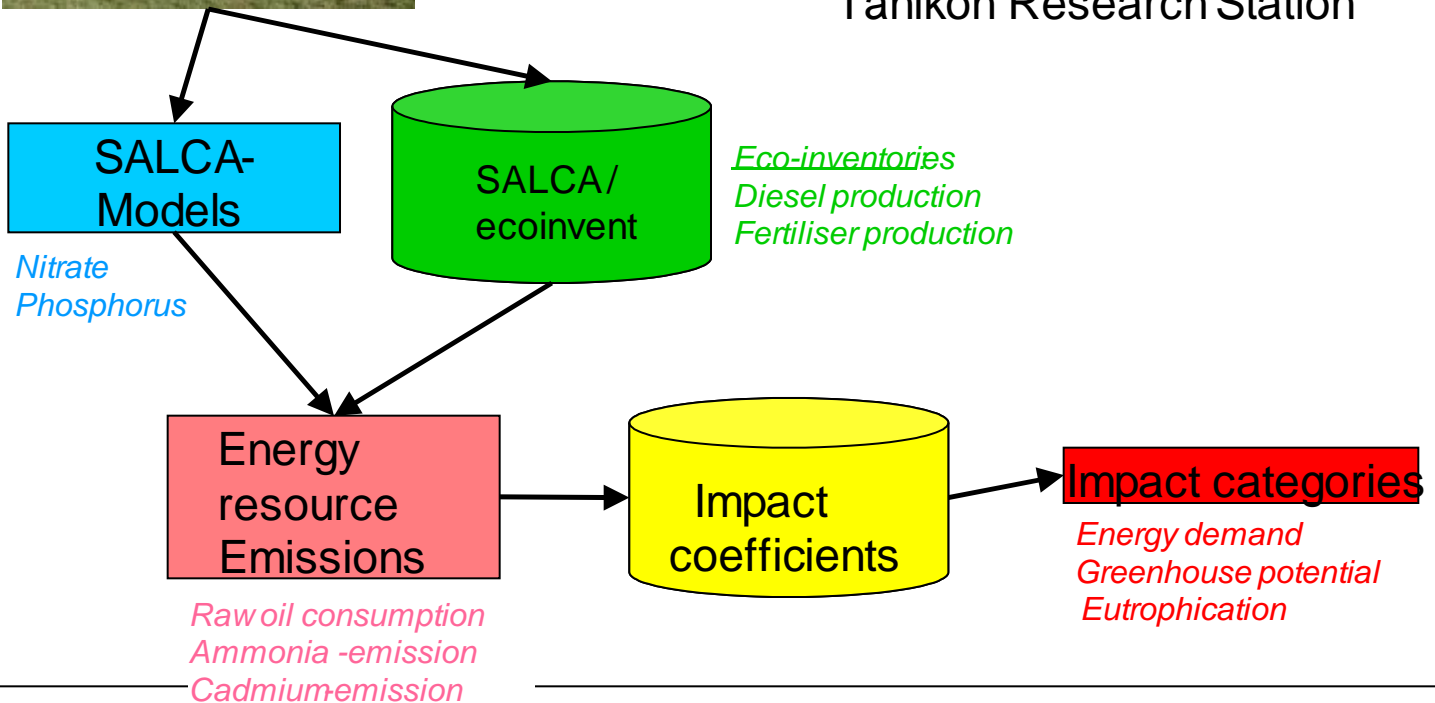


Farm Technical  
Production  
Data  
(AGRO-TECH)

*Examples*  
Energy carriers  
Machines  
Feedstuffs

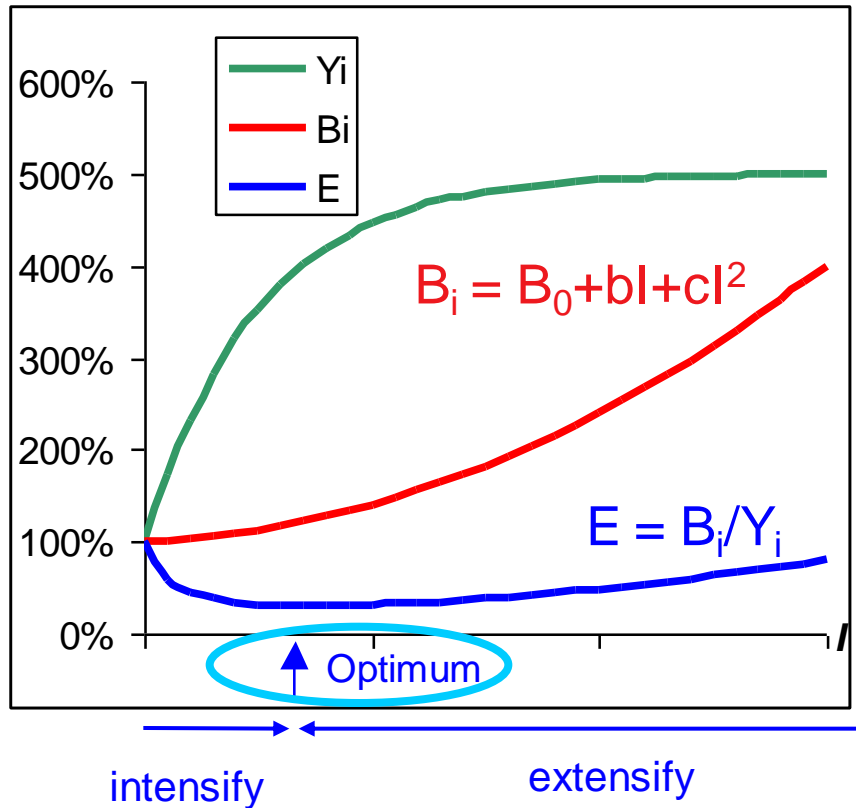
SALCA =  
Swiss Agricultural  
Life Cycle Assessment

Developed at ART Reckenholz-  
Tänikon Research Station





# A model to describe eco-efficiency



$$Y_i = Y_0 + (1 - e^{-aI})(Y_{\max} - Y_0)$$

- $Y_i$  Yield
- $B_i$  Environmental impact
- $I$  Input
- $E$  Eco-efficiency

Source: Nemecek et al. 2005



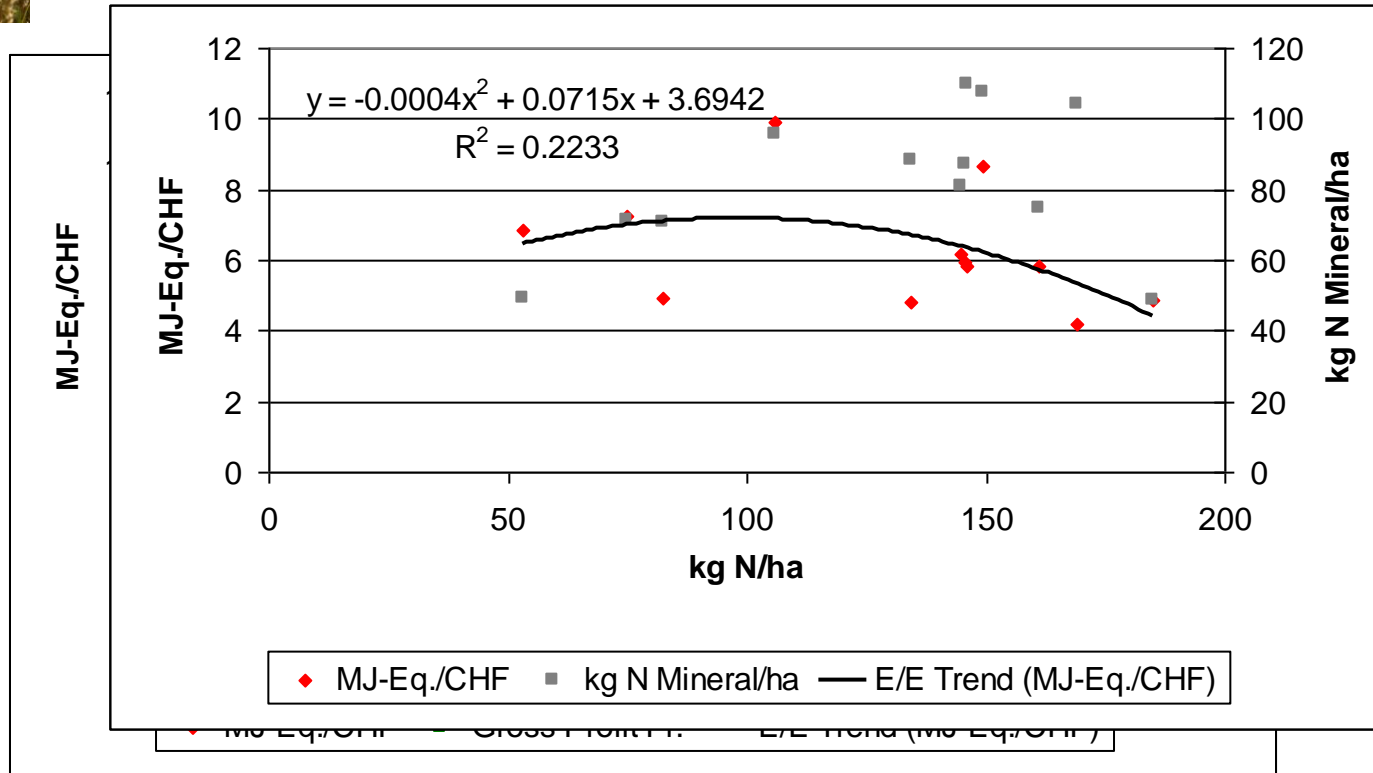
# Results for arable farming N-fertilising intensity – Energy use



Farm type: arable farms (n=12)

Production branch: cereals

Input: N-Fertilising intensity (whole farm)





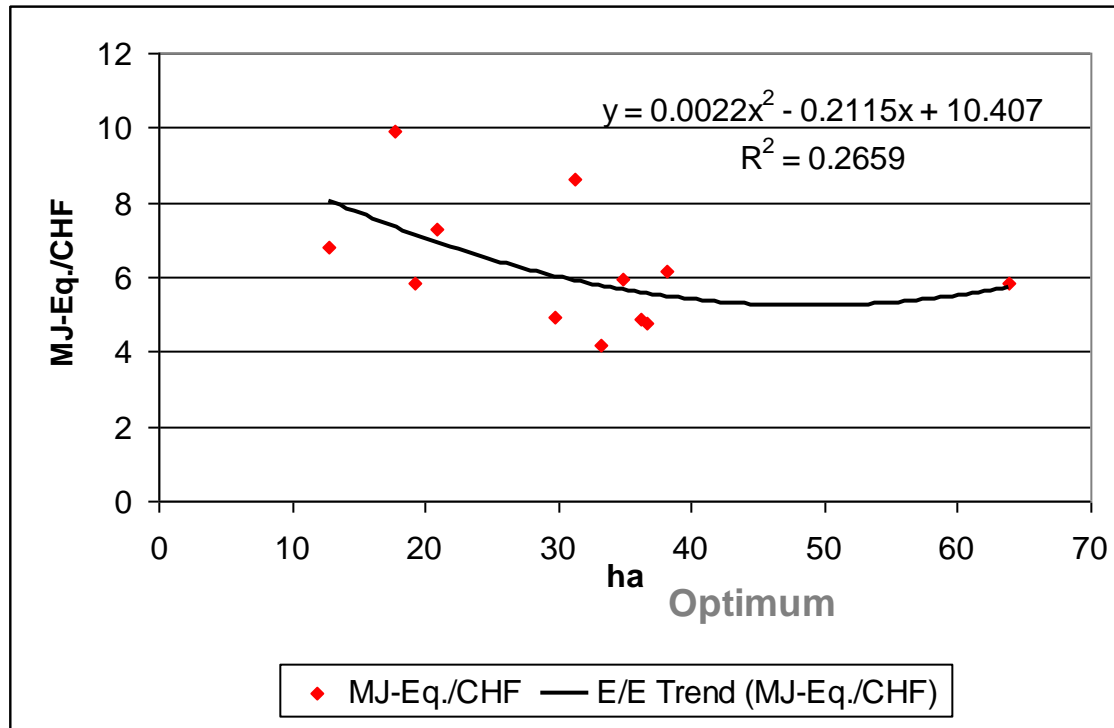
# Results for arable farming Land use – Energy use



Farm type: arable farms (n=12)

Production branch: cereals

Production factor: utilised agricultural area (ha UAA)





# Results for arable farming

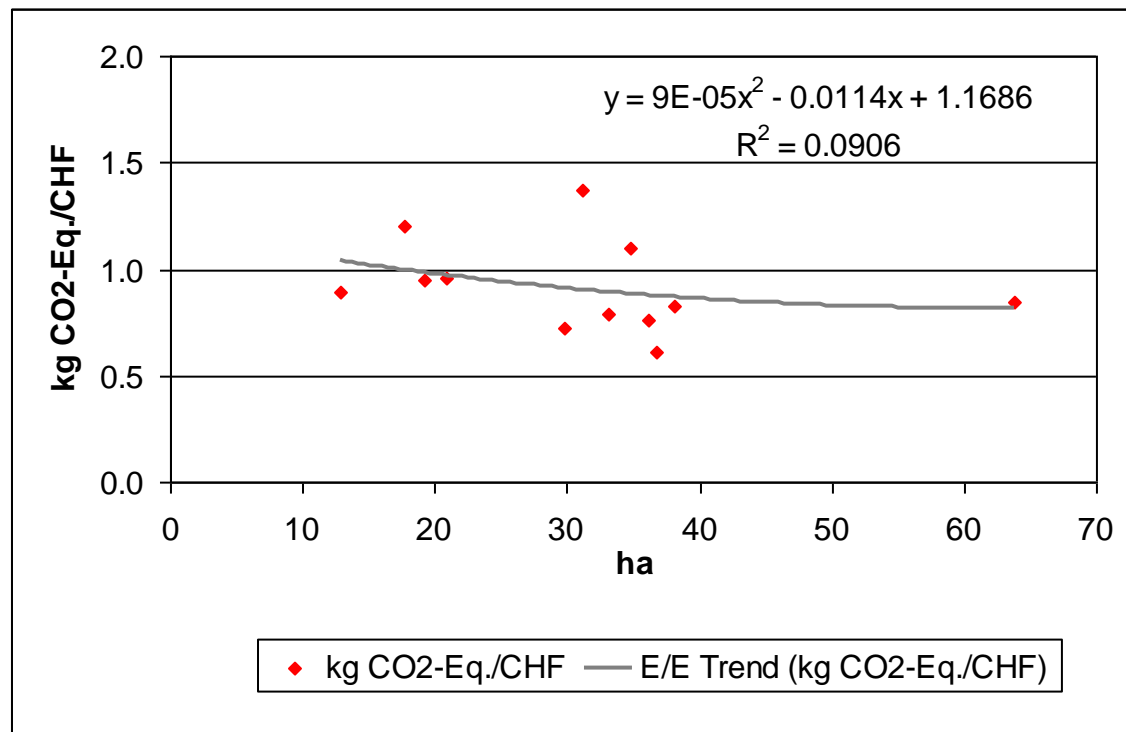
## Land use – Global warming potential



Farm type: arable farms (n=12)

Production branch: cereals

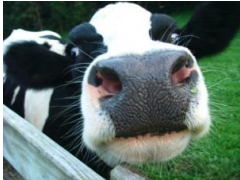
Production factor: utilised agricultural area (ha UAA)



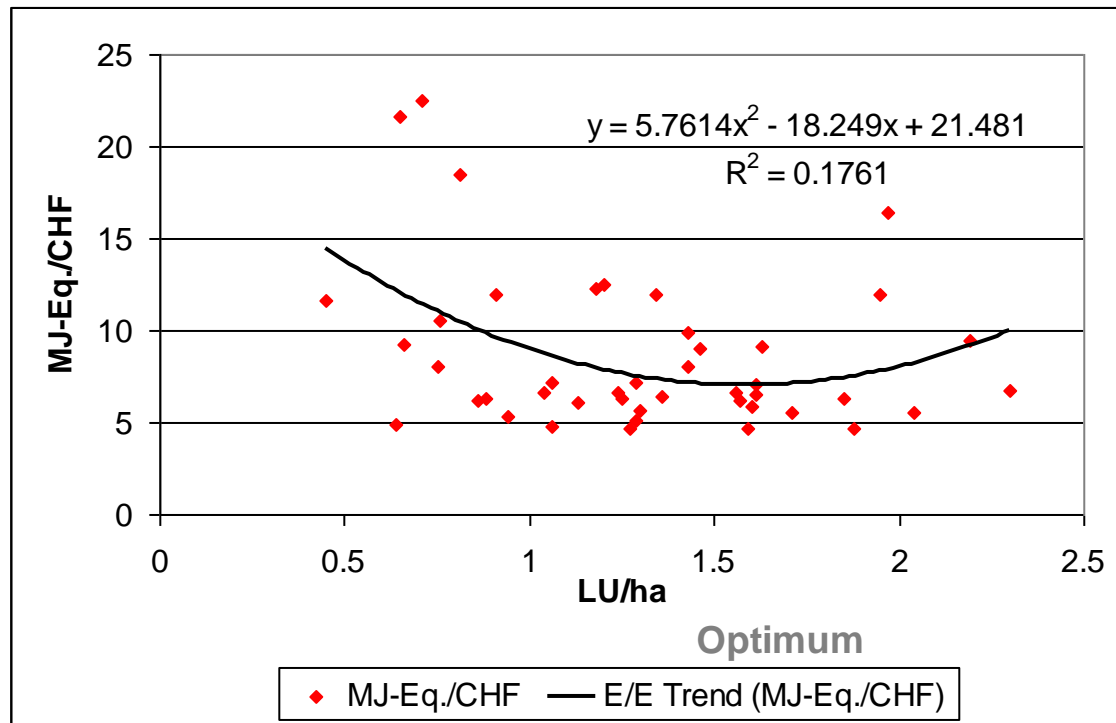


# Results for Dairy Farming

## Stocking density – Energy use



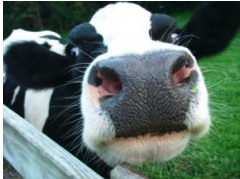
Farm types: Dairy farms (n=32) and combined arable/dairy farms (n=12)  
Production branch: milk  
Input: Livestock unit (LU) per ha



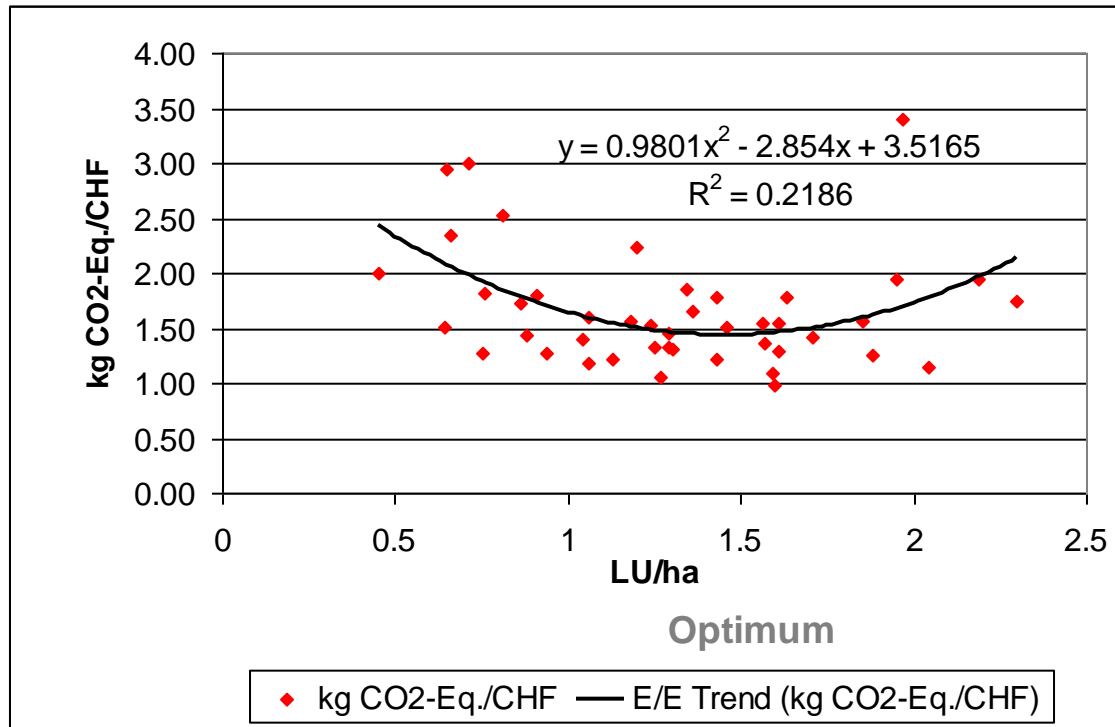


# Results for Dairy Farming

## Stocking density – Global warming potential



Farm types: Dairy farms (n=32) and combined arable/dairy farms (n=12)  
Production branch: milk  
Input: Livestock unit (LU) per ha





# Results for Dairy Farming

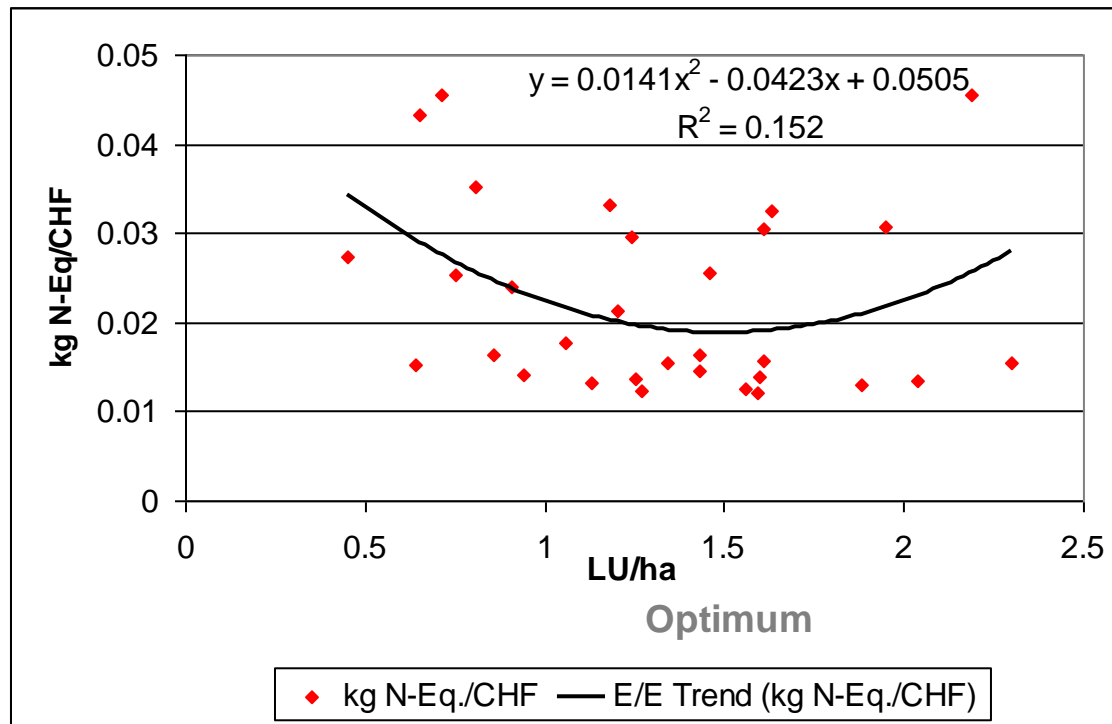
## Stocking density - Eutrophication



Farm type: Dairy farms only (n=32)

Production branch: milk

Input: Livestock unit (LU) per ha





# Preliminary conclusions

The hypothesis can't be sustained:

- Eco-efficiency of a farm is **not dominated by a single input**. The farm management and other factors interfere.
- Single intensity measures are not sufficient to explain the performance of a farm.
- Swiss farms are small production units with very diverse structures. It is therefore complex to derive general functions for eco-efficiency based on their data.
- The **variability** between the different farms suggests that there must be **important optimisation measures**.





# Outlook

- We will update and deepen these analyses with an improved data set.
- A multivariate analysis shall give us a better understanding of the important factors.
- The optimisation options have to be defined in order to give advise to politicians, extension services and farmers
- The unique data set can be used for further research projects.



# Thank you!



**ART – Research for  
Agriculture and Nature**

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