

Phenotype-Genotype Linkage through Modern Data Logging: Developing a Protocol Application for Animal Research

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animal breeding



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Structure

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Introduction

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Background

- Shift in animal breeding goals
 - Focus was on maximizing absolute performance traits (Sambraus 2010)
 - This has unintended negative consequences for biodiversity (Teletchea 2019)
 - Breeding for high performance correlates negatively with health traits (Martens et al. 2022, Bauer et al. 2021, Köck et al. 2017)
- Shift towards lifetime performance and encouragement of animal health (BRS 2024)

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Background

- Increase in importance of locally well-adapted breeds
 - These populations have characteristics that contribute to sustainability and resilience (Sambraus 2010)
 - Increase in interest in sustainable agriculture
 - Interest in preserving biodiversity
- Locally well-adapted populations could be important here!



Background

- Benefits of those populations must be scientifically proven
 - Digital tools for data recording are not available
 - Or embedded in herd management systems
- No application available in the required form of data recording

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Material & Methods

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Material & Methods

- Virtual Server provided by the University of Kassel
 - Linux as the operating system for the application database
- Development of the application with *Android Studio* (Google 2024a)
- Testing of application on the smartphone and in the Firebase test lab environment (Google 2024b)
- Data set linking on the server with algorithm
- Calculations on the server with *PLINK* (Purcell 2010)

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Results

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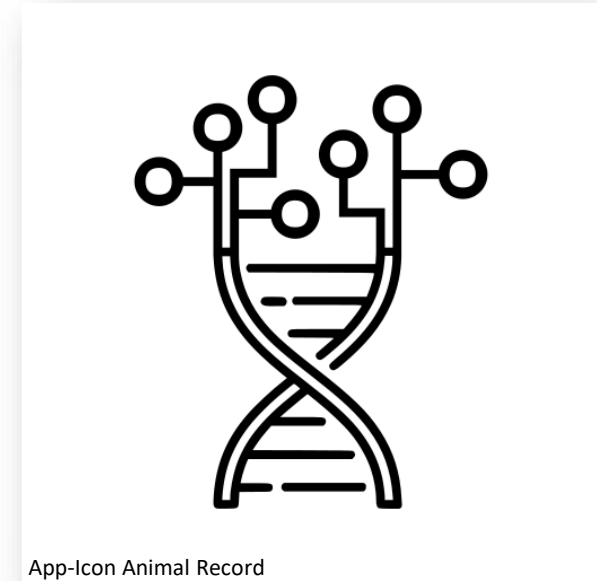
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The App: „Animal-Record“

- Free digital tool for recording animal data
- Broad compatibility with a wide range of devices
- Functions:
 - Create account and farm
 - Add animal species, breeds and animals
 - Record animal-specific data
 - Free selection and arrangement of options for diseases, treatments, animal assessments
 - Identification of animals with QR- or Barcodes and NFC-Code or ID
 - Offline mode for use in rural areas



Server

- Secure infrastructure for sensitive data
 - Personal data
 - Animal data
- Linking phenotypic and genotypic data
- Calculation of animal breeding figures from SNP information
 - Display these in the application

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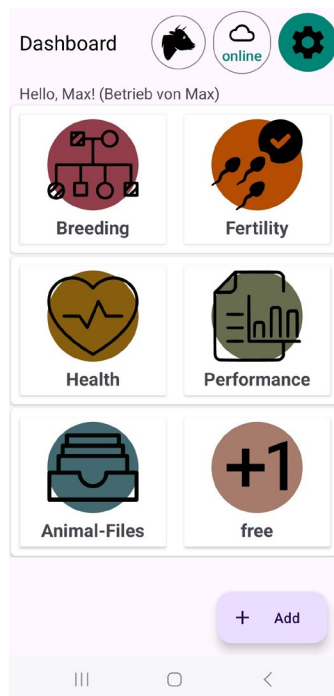
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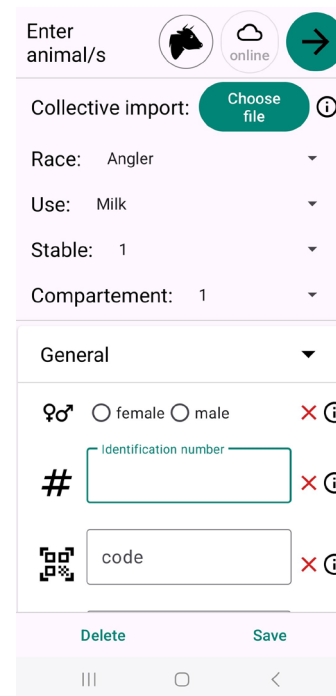
Application - Screenshots

Dashboard



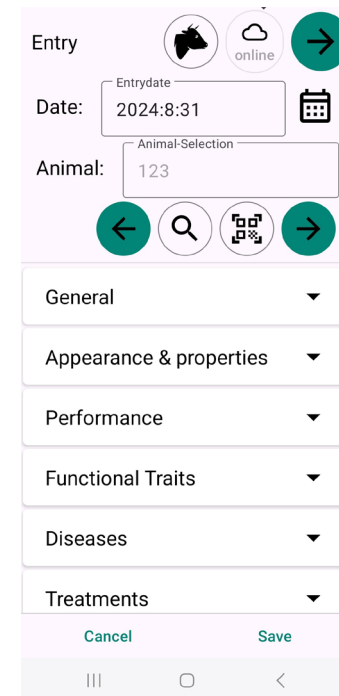
Source: Screenshot

New Animal



Source: Screenshot

Data entry



Source: Screenshot

animal breeding



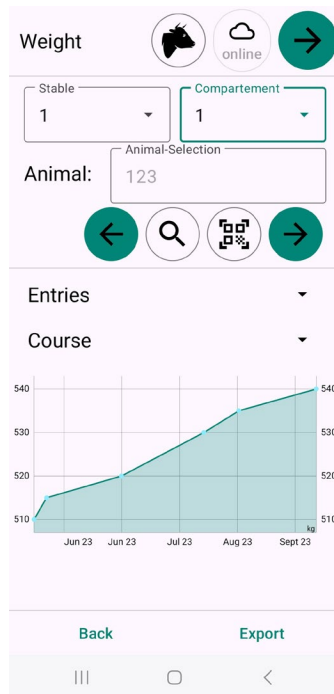
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Application - Screenshots

Weight Course



Source: Screenshot

Genotype

Genotype

Stable: 1, Compartment: 1

Animal: 123

Inbreeding coefficient: 13.78%

Back, Export

Source: Screenshot

Assessment

Assessment

Stable: 1, Compartment: 1

Current Animal: 123

Horn-related skin damage - general

≤ 3, 4, ≥ 5

Back, Continue

Source: Screenshot

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Discussion

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Discussion

- Important: Security of data on the server
 - Data of animals and users
- Collected data is a valuable basis for any research
 - phenotypical data (performance, diseases, treatments)
 - genotypic data (inbreeding, relationships)
- Breeding decisions can be made based on the calculated animal breeding figures
- Application the base for research to develop sustainable and scientifically sound breeding practices for the future



Outlook

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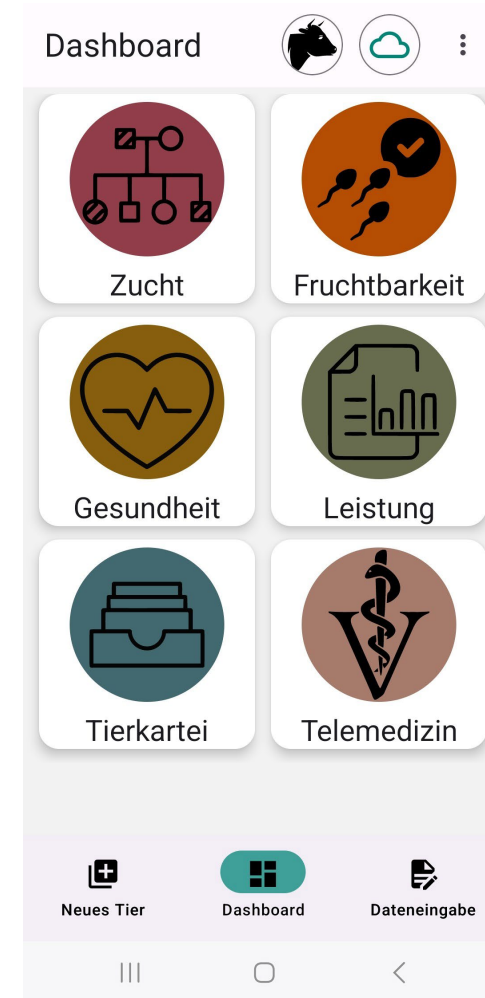
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Outlook

- Continuation of the project
- Application
 - Support for iOS and other operating systems
- Server
 - Further options for using *PLINK*



Source: Screenshot



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Thank you kindly for your time

Link to the Play-Store:



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