

# Understanding Agroforestry Management for Sustainable Nut and Fruit Production – a Case Study from Kyrgyzstan

Philip Schierning, Jens Gebauer, Florian Wichern

Rhine-Waal University of Applied Sciences, Faculty of Life Sciences, Kleve, Germany



## 1. Introduction

- **Agroforestry systems** (AFS) have been recognized as a **sustainable solution** to many current challenges, e.g., water scarcity.
- As with any agricultural system, **effective management is crucial** for achieving productive and sustainable outcomes.
- **Kyrgyzstan** has a **wide-range of nut and fruit production** systems, e.g. apricot & walnut, which are **poorly investigated** in their AFS presence and management.

Is there a sustainable field management in AFS for nut and fruit production?

## 2. Objectives

- Map and describe region-specific AFS
- Identify if and which AFS practice bundles are linked to higher productivity
- Quantify productivity and fertilizer-use differences between AFS and monocultures

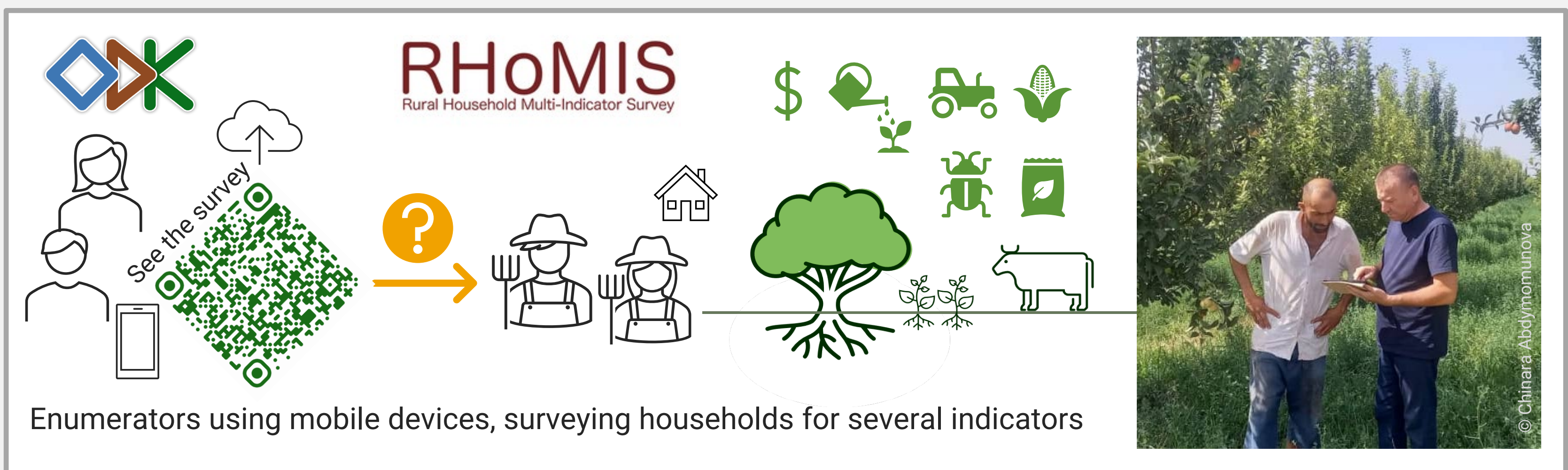


Figures: Apricot + Maize system (left), grazing sheep within Apricot + Alfalfa (centre), farmers harvesting potatoes within young walnut orchard (right).

## 3. Methods

Data collection:

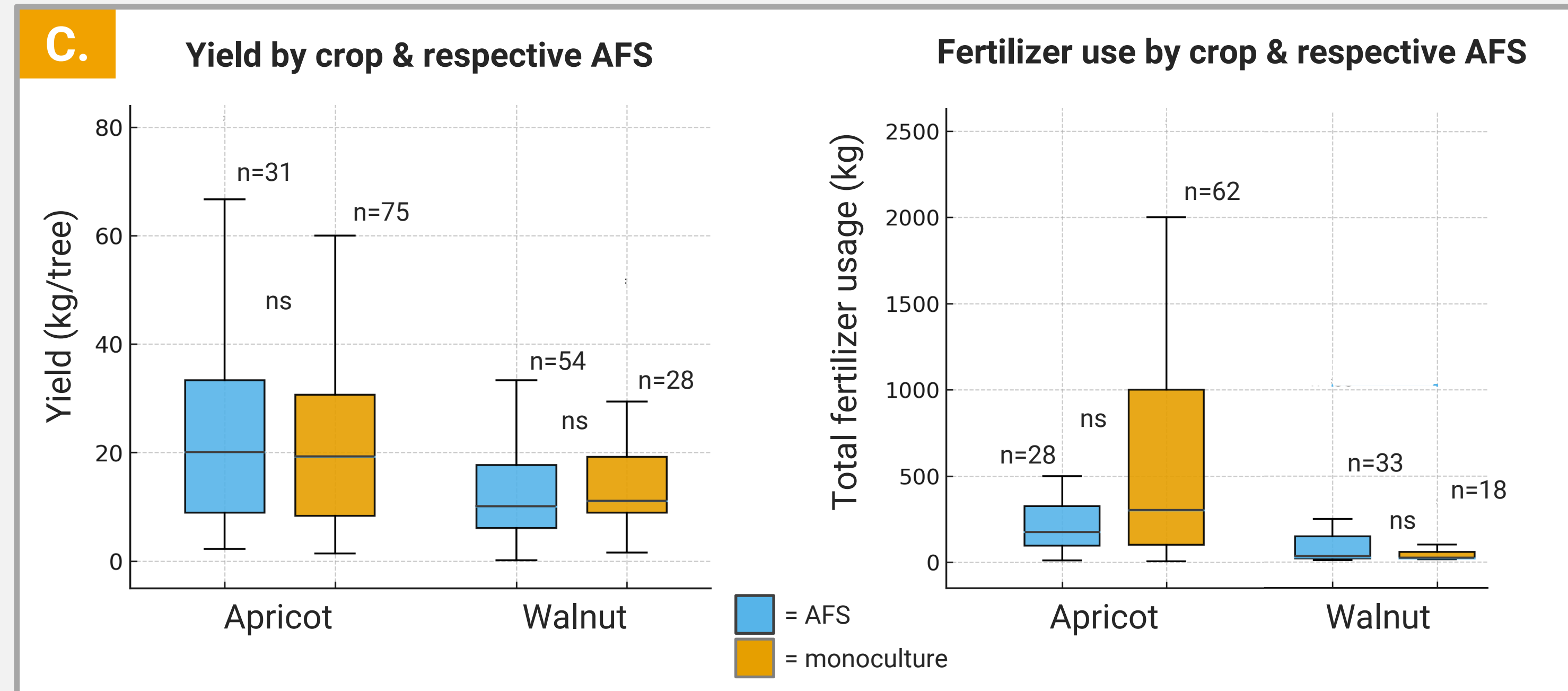
- **Structured household survey** (n= 250), based on RHoMIS
  - Socio-economic farm & household data
  - Farm management incl. e.g., crop, livestock data
  - AFS characteristics e.g., types, practices, motivation
- Technical: self-hosted via **Open Data Kit** (ODK)
- **Period:** June – November 2024
- **Location:** three study sites in Kyrgyzstan (Batken, Jalal-Abad, Arslanbob), 7 villages per site



Data analysis: Descriptive statistics + Nonparametric tests, indicators relevant to crop, tree, livestock & field management.

## 4. Preliminary Results

- AFS is **present across all households**: AFS presence is ~95–99% in Arslanbob, Batken, and Jalal-Abad (monocultural households are a small minority everywhere). (see A.)
- Arslanbob has the **highest share of Tree + Crop + Livestock** interaction, whereas in Batken solely Tree + Crop are equally present.
- **AFS practices mix differs by region** (see B.). Overall, the most mentioned AFS practices per household are **windbreak**, **alley-cropping** and **riparian buffer**.
- TOP-3 **motivations for AFS**: environmental benefits (70%), higher yields (60%), and improve soil fertility (38%)
- TOP-3 **agroforestry crop partnering**
  - Apricot = **Alfalfa**, Clover, Tomato
  - Walnut = **Alfalfa**, Willow, Field grass



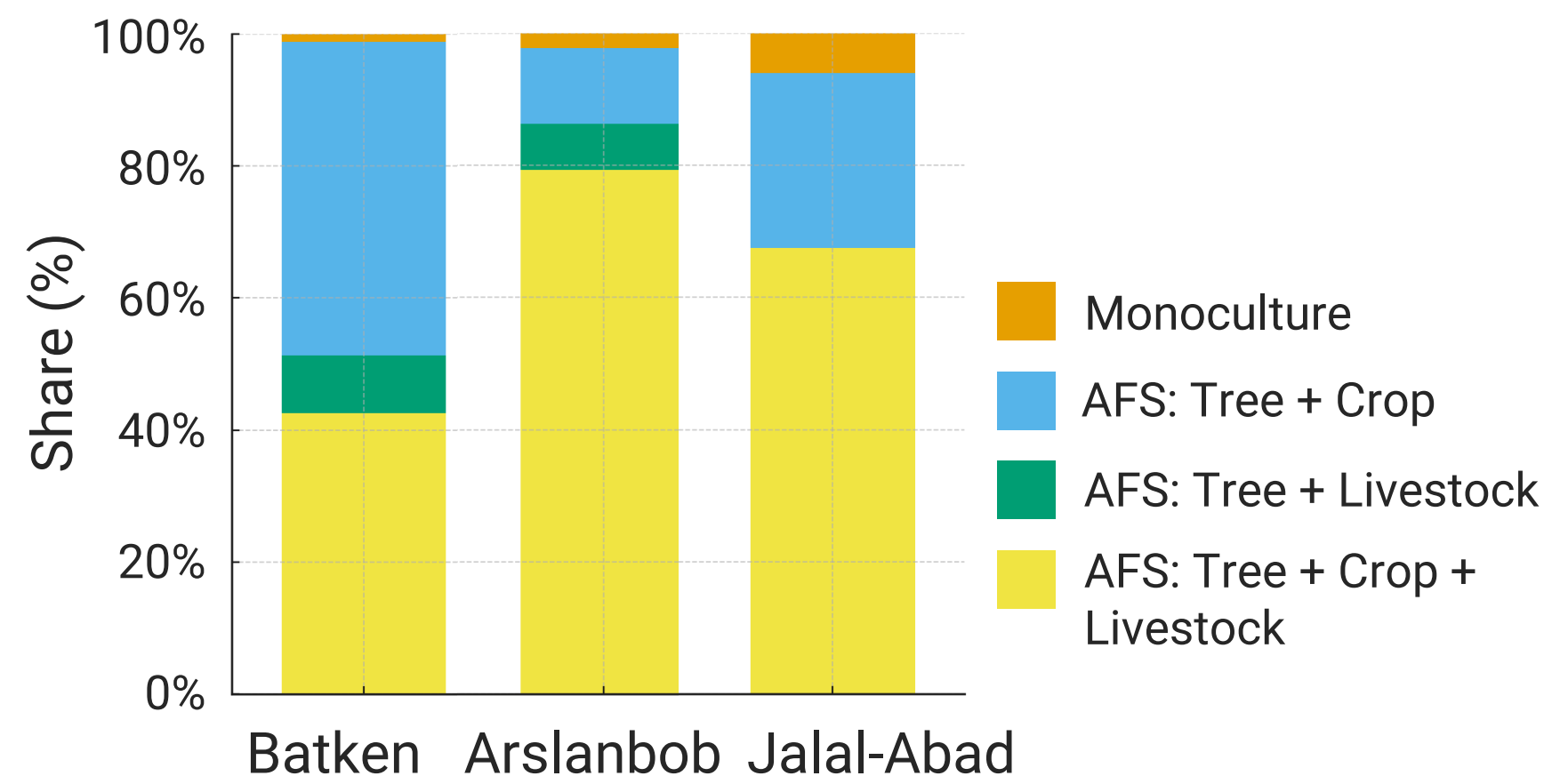
- There is **no significant differences** in **yield** (kg/tree) or **fertilizer used** (total kg) between **monoculture vs. AFS** (see C.).

## 5. Discussion

- Constructed validity: What counts as AFS/ intercropped? Definition?
- Representativeness & response quality: Enumerator/ translation drift
- Field ≠ Household: Difficulties to address field management
- Underestimation of livestock as element of AFS

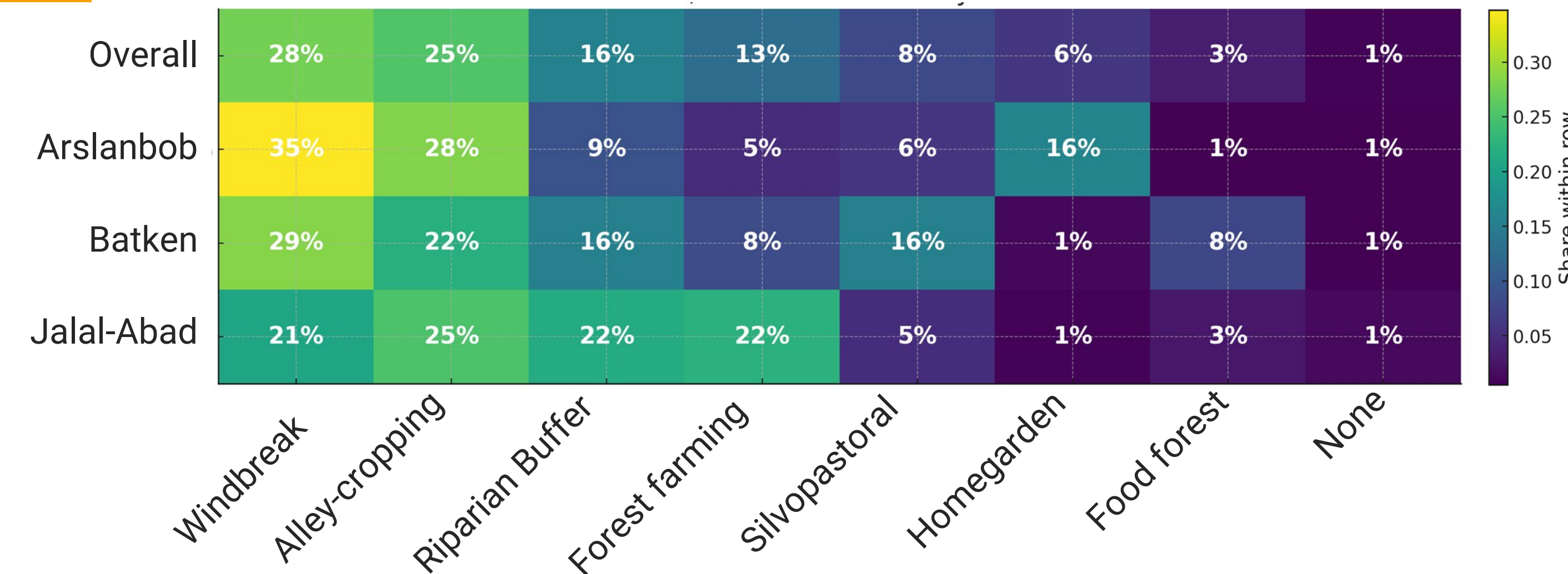
### A.

#### AFS type present at household level



### B.

#### Region x AFS practices (share of mentions)



## 5. Conclusions & Outlook

- **AFS is near-universal (~95–99%) spread across regions**, composition varies by site.
- **Practice bundles differ** windbreaks, alley-cropping, riparian buffers dominate. Alfalfa is the most chosen partner.
- Apricot pairs most with alfalfa; Walnut with alfalfa/willow/field grass.
- **No significant mean differences in yield** (kg/tree) or **fertilizer** (kg total) between monoculture vs. AFS

**Future Research** (ongoing)

- Compare more HH survey indicators and compare to specific field sites with detailed farmer interviews and soil & biomass samples.
- Evaluate the socio-economic data, incl. financial and economic viability



**Contact**  
Philip Schierning  
PhD candidate  
philip.schierning@hsrw.eu

**Rhine-Waal University of Applied Sciences**  
Marie-Curie-Strasse 1  
47533 Kleve, Germany

Project's website

