Can Agroforestry Sustain Farm Profitability Under Climate Shocks in Uzbekistan?

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Outline

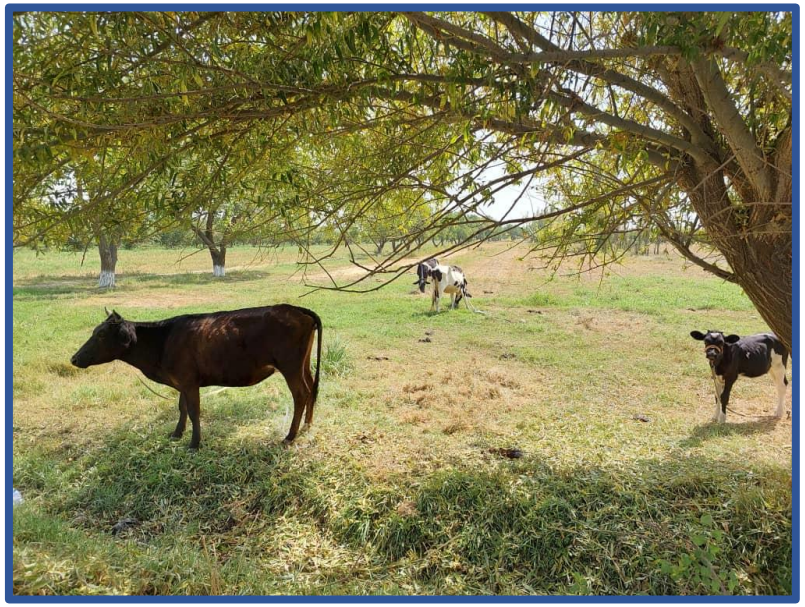
- Field study overview
- Research gap
- Methodology
- Framework: Profitability analysis
- Preliminary findings

Field study overview

- **Study locations**: Altyaryk, Rishton, Fergana district (Fergana Valley region, Uzbekistan)
- **Study time period**: June 2025 – September 2025
- **260 smallholder farming household surveys** conducted via enumeration team
  - Open Data Kit (ODK) Collect Survey application, Snowball sampling method)
- **Focus Group discussion (FGD)** (2 for each region)
- **Expert Interview (EI)** (2 for each region)
- Agroforestry vs. Non-agroforestry
- **SUFACHAIN Project: Promoting sustainable land management through product, process and SME development in NTFP and agroforestry value chains in Central Asia**

Source: Asia - Detailed | MapChart

Field study overview (contd.)



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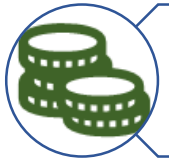
Research gap

- Uzbekistan's agricultural production systems:
  - Economic volatility
  - Heightened vulnerability to climate shocks
  - Climate-driven resource constraints
  - Increasing water resource constraints
  - Irrigation challenges
  - Transboundary conflicts
  - Posing significant risks on agricultural sustainability and rural livelihoods
- **Agroforestry systems (AFS) remain understudied in the region**

Net benefits of Agroforestry systems (AFS)

Maximum production of ecosystem services (primary output, soil, water, air, carbon, etc.)



Strengthens rural economies, smallholder enterprise development

Expands employment opportunities, food security

Promotes environmental sustainability

Problem: Lower productivity & profitability vs. high-input agriculture

Methodology

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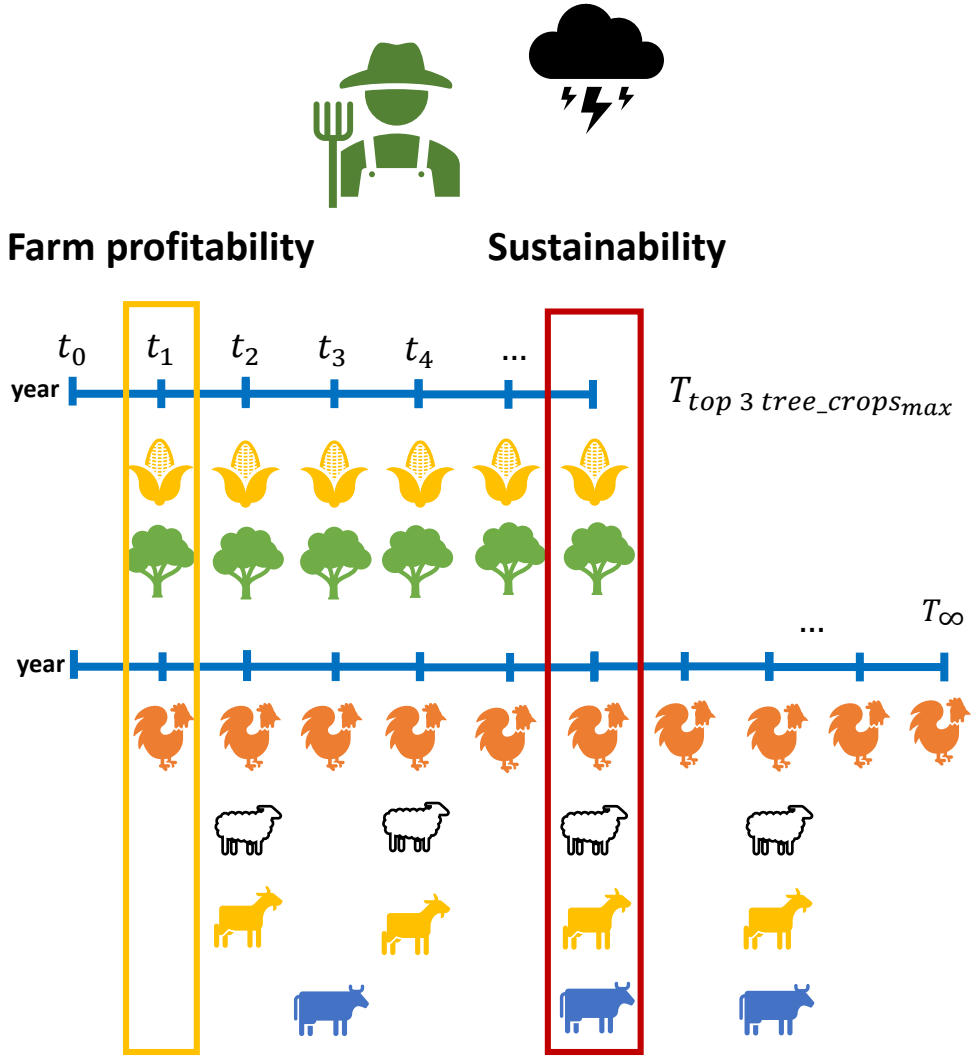
Short-term

Static analysis

Capital budgeting techniques

Net present value (NPV)



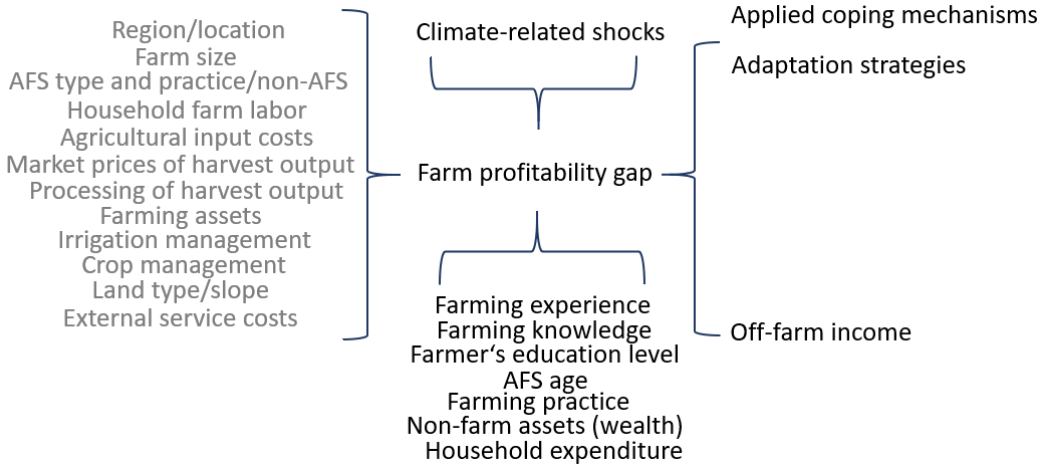
Long-term

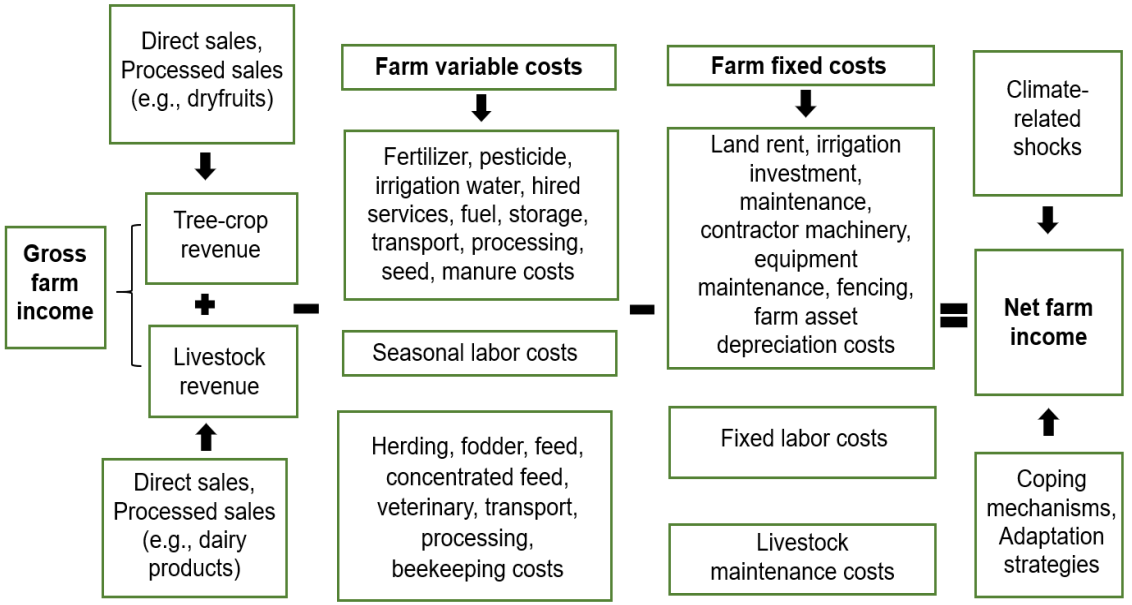
Dynamic analysis

Monte-Carlo simulation

Probability distribution

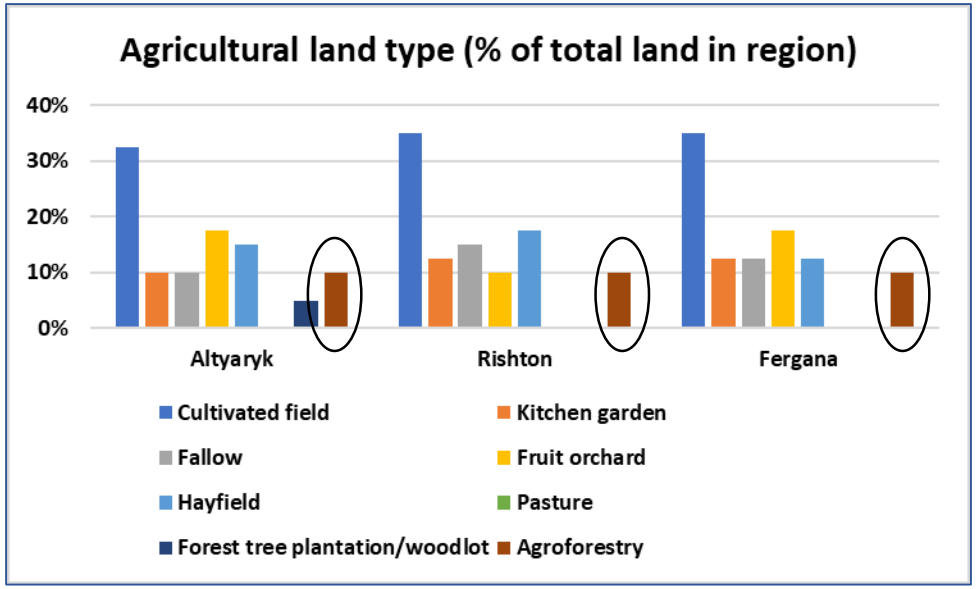
Framework: Profitability analysis

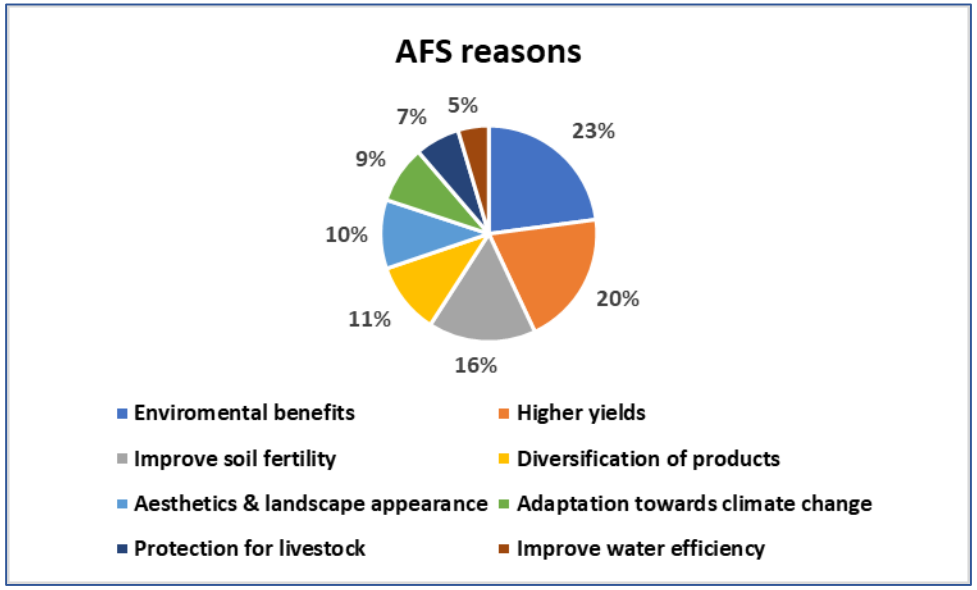




- Socio-economic farm and household data
- Farmers' production and sales decision-making (heterogeneity)
  - Farm production
  - Household consumption
  - Direct sales
  - Processed sales
  - Price selection based on sales location
  - Crop and water management, practices
- Biophysical data (trees-crops)
- Opportunity costs of land and family labor contribution, household expenditure distribution
- Preliminary findings – subject to change!

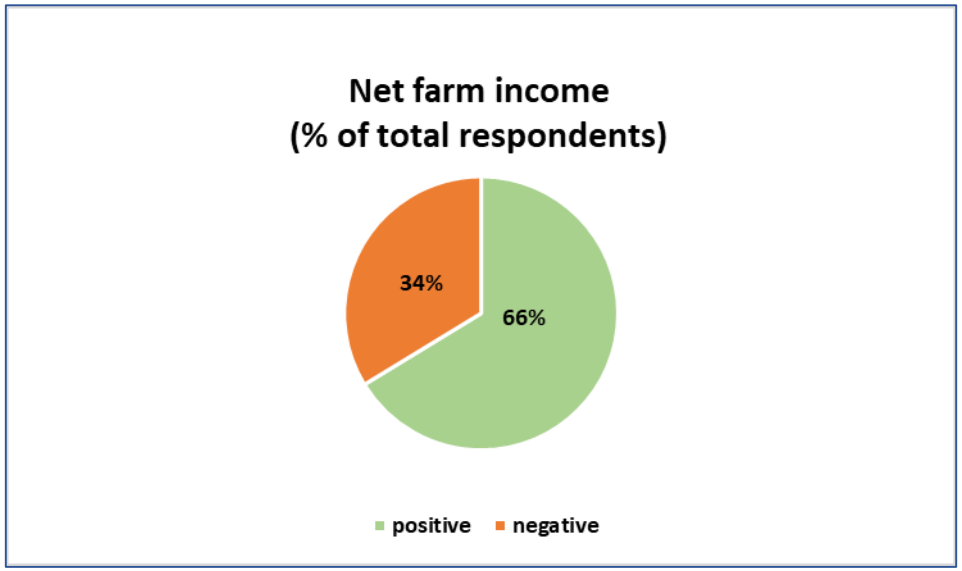
Preliminary findings

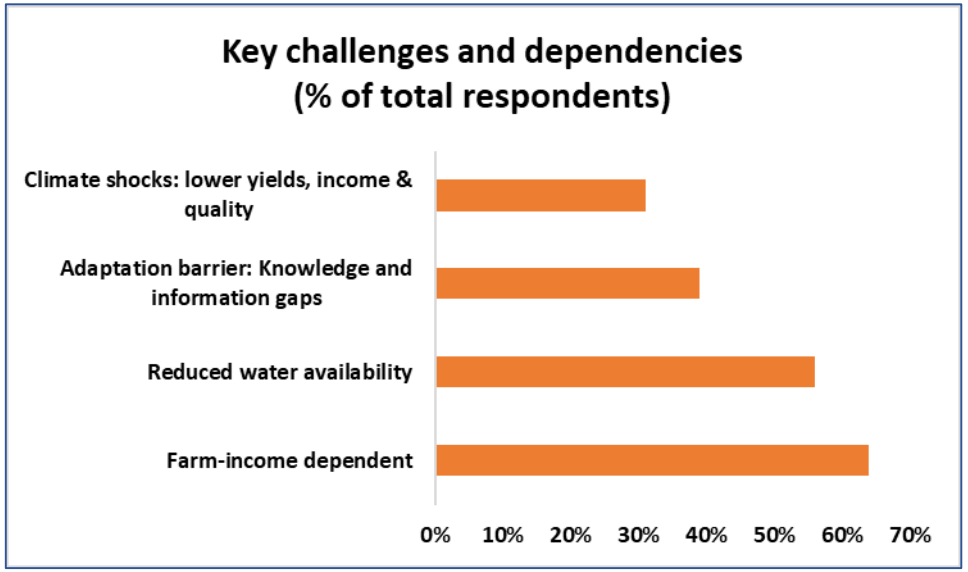




- Sample: 65% agrisilvopastoral systems, 28% agrisilvicultural systems
- Non-parametric tests:
  - Kruskal-Wallis test
  - Wilcoxon Signed-Rank Test
  - Mann-Whitney U test
  - Group-wise descriptive statistics
- **Respondent:** Household head (**93%** of respondents)
- **HH head gender:** Male (**85%** of respondents)
- **Education:** Secondary-level (**69%** of respondents)
- **Farm income dependent:** Most from farm (**64%**)
- **Family contribution in farming activities:** Yes (**80%** of respondents)
- **Farm experience:** 3 – 50 years (mean: 20 years)
- **Cultivated land (mean):** 0.26 hectares
- **Land tenure:** Own land (**79%** of respondents)
- **Off-farm income:** Yes (**64%** of respondents)
- **AFS practices:** Homegardens and Alleycropping **(60%** of respondents)

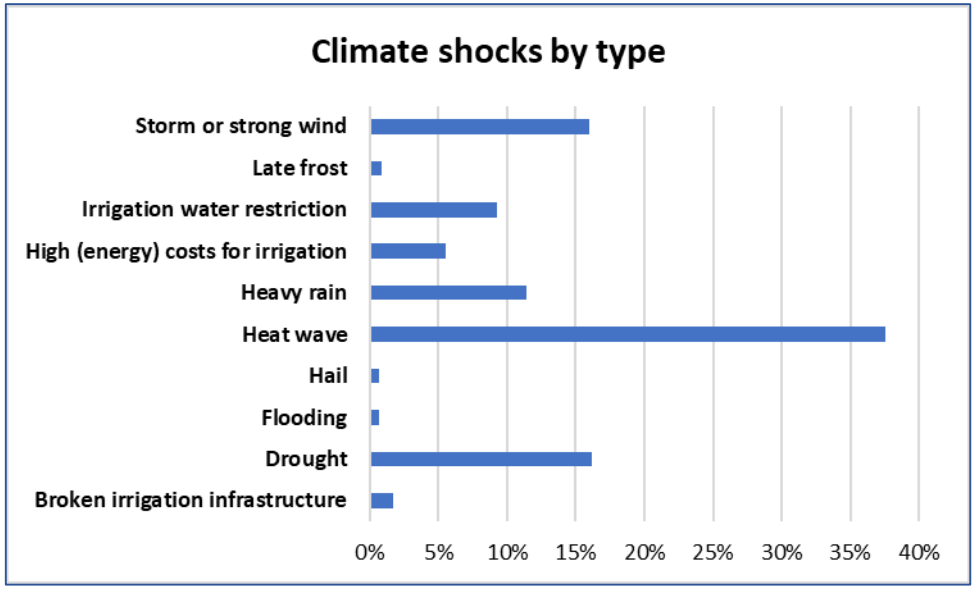
Farm profitability

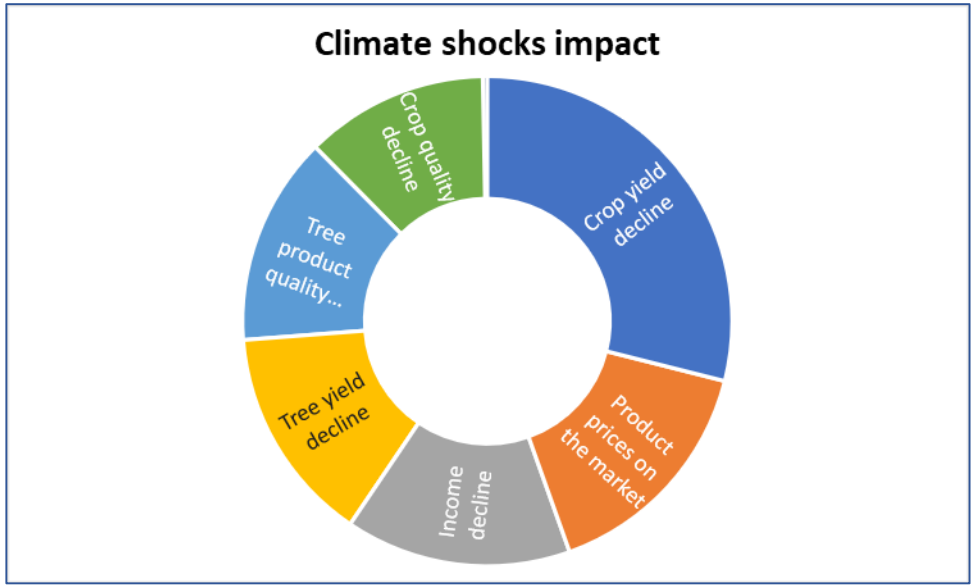


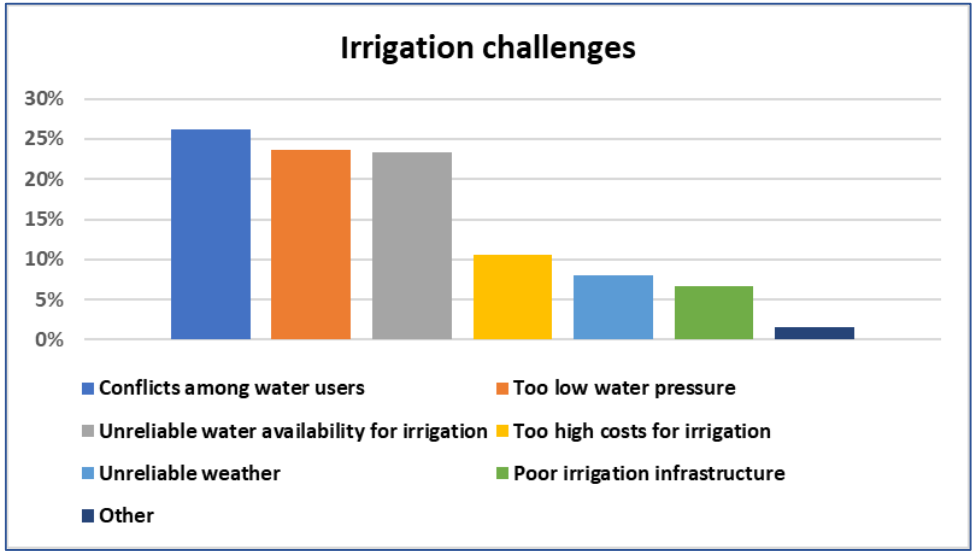


- **Positive net farm income: 66%** of respondents
- **Top income-generating crops and livestock:**
  - Grapes, apricots, tomatoes, potatoes, peaches, and apples
  - Poultry, sheep, and cattle
- **AFS age:** 2 – 40 years (mean: 11 years)
- **Agrisilvopastoral systems**, higher net farm income compared to agrisilvicultural systems
- **Land tenure** linked to farm profitability
- More **years of farm experience** associated with higher net farm income
- **Intercropping**, pruning households have higher net farm income than non-intercropping households

Climate Shocks

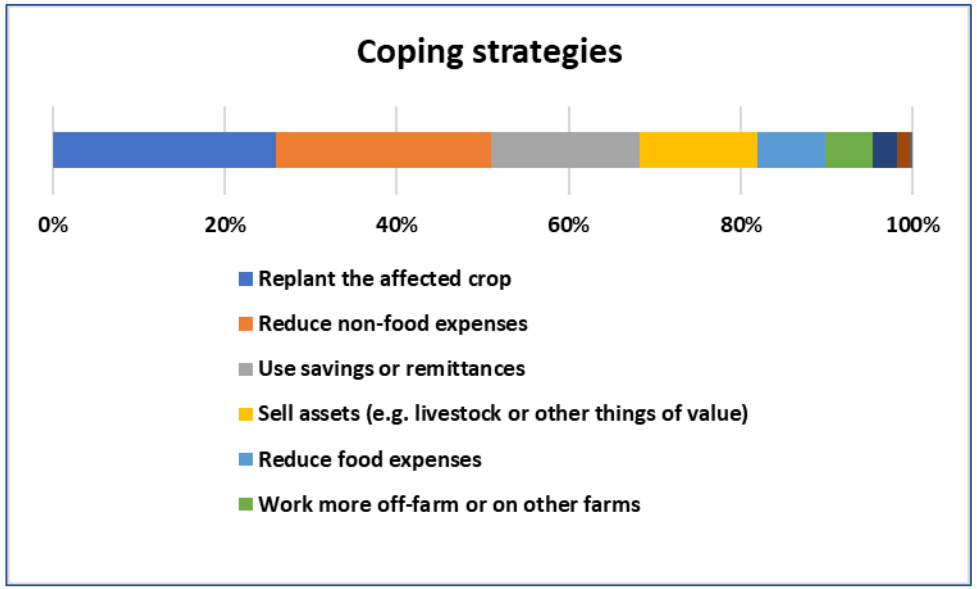


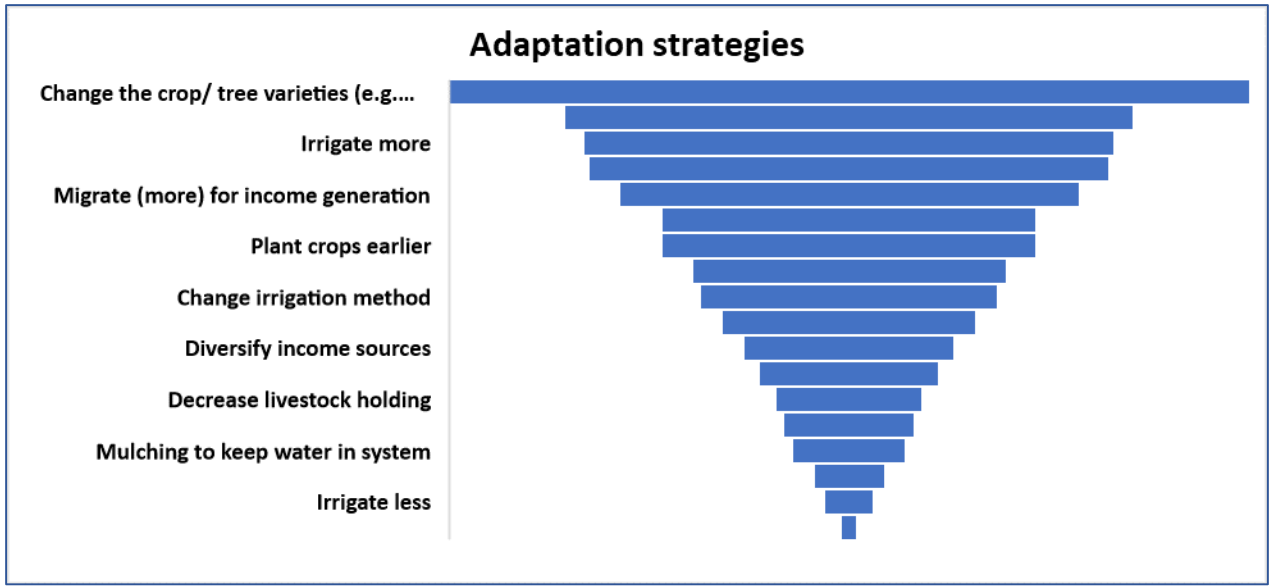


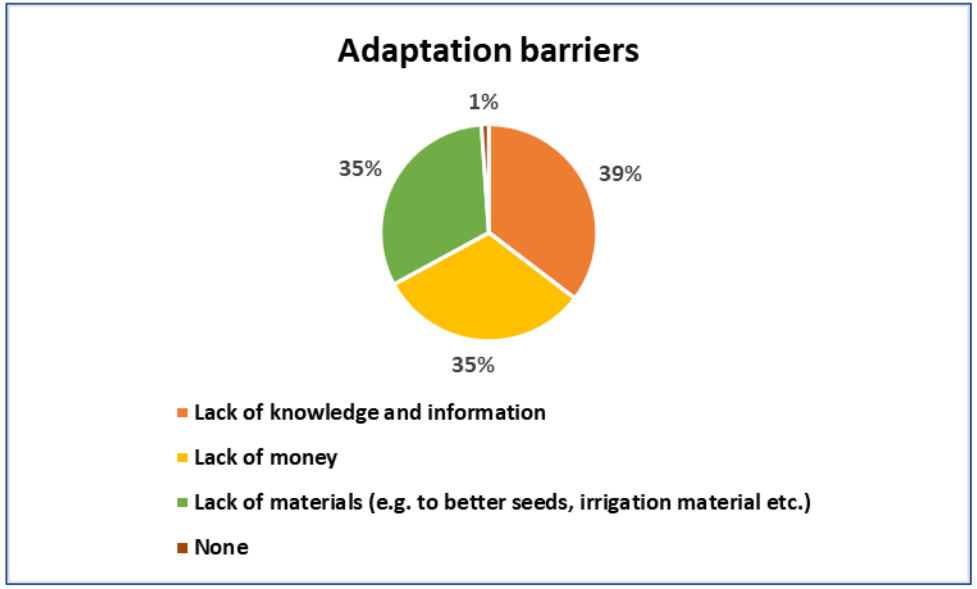


- **Most commonly reported climate shocks:** heatwave, storms/winds, drought
- **Irrigate: 99%** of respondents
- **Irrigation challenges:** Low water pressure, unreliable water irrigation water availability, conflicts among water users (**increased water stress**)
- **Significant negative impact of more frequent climate shocks on farm income (yields, prices, quality)**
- **Water availability future expectations:** less water (**56%** of respondents)

Coping and adaptation strategies







- **Coping strategies:** dominated by replanting, cutting expenses (food reduction, migration to off-farm work)
- More severe **shocks leads lower net farm income, more coping strategies**
- **Adaptation strategies:** efforts focus on crop changes, water management
- **Adaptation is limited mainly by knowledge, money, and access**

Outlook

- Agroforestry improves productivity and resilience, but adoption is limited by irrigation constraints, climate-related shocks, and knowledge gaps.
  - Diversifies income sources
  - Reduces losses from climate shocks
  - Supporting household food security
- Further research to evaluate profitability and the impact of climate shocks:
  - Household labor contribution, opportunity cost of land, household consumption patterns
  - Biophysical traits of tree–crop species
  - Cost and price dynamics in profitability assessment
  - Identifying effective management practices, agroforestry arrangements that drive higher profitability and resilience
- AFS adoption requires targeted support; institutional, technical, economical support;
- Research: proper documentation and farmer mobilization

Thank you! ☺

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