12th ANAPRI STAKEHOLDERS CONFERENCE

The Effectiveness of Alternative Agrifood system Investments for Jobs and Inclusive Transformation in Ethiopia

Emerta Aragie, James Thurlow, **Alemayehu Seyoum Taffesse**, Karl Pauw, and Eleanor Jones

IFPRI

Acknowledgments

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Objective

Assess the impact of investments in the **agrifood system** on **jobs and inclusive transformation**

Must compare **cost-effectiveness** of different interventions

(i.e., returns per dollar spent)

Must assess **trade-offs** across a set of outcomes

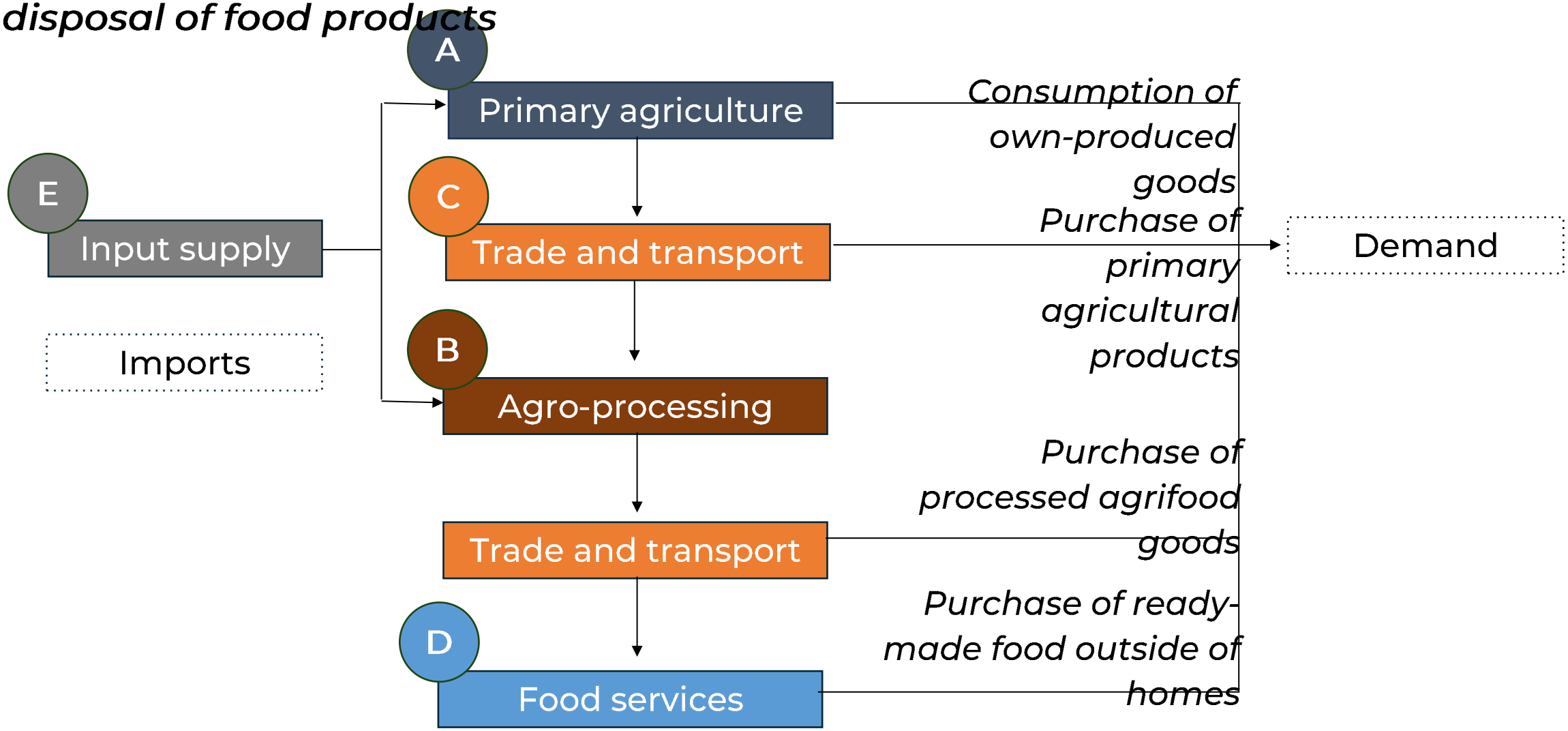
(i.e., growth, employment, poverty, food security, environment, etc.)

Must measure impacts across the **agrifood system** and population

(i.e., beyond the farm and rural populations)

The AFS – A simple Conceptual Framework

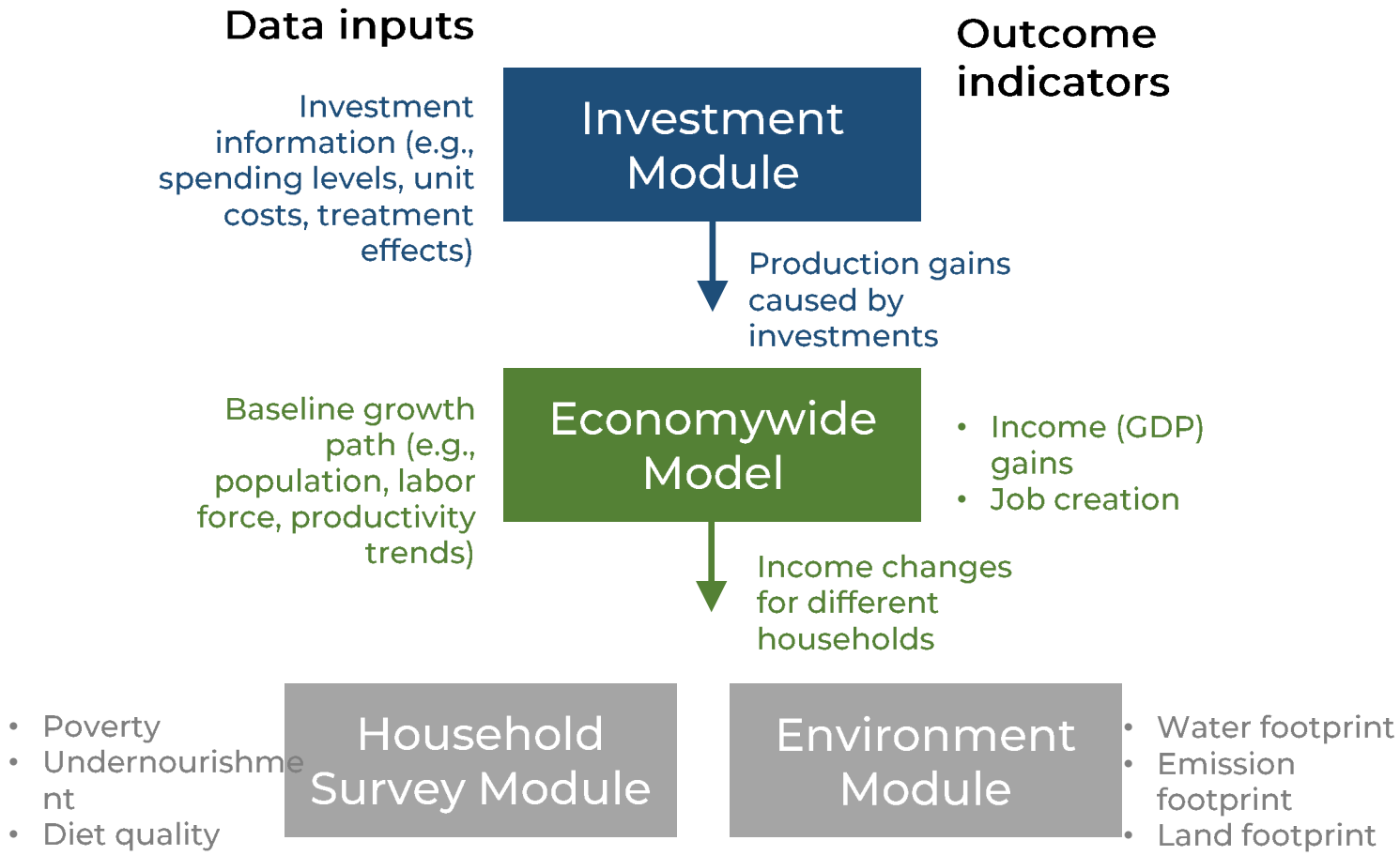
- The AFS is a complex network of *actors* and *their interlinked value-adding activities* involved in the *production, aggregation, processing, distribution, consumption and disposal of food products*



Modeling System

Impacts of investments are estimated using IFPRI's RIAPA modeling system…

- ❑ *Investment module* estimates the impacts of investments on *sector-level growth*
- ❑ *Economywide model* estimates impact of sectoral growth on *household incomes*
- ❑ *Household survey module* tracks changes in *individual-level welfare*
- ❑ *Environment module*



Economywide Model

Economy divided into 88 sectors

- 30 agriculture and 17 agro-processing
- Tracks supply chains
- Links producers to consumers
- Based on national accounts data

Population divided into 15 groups

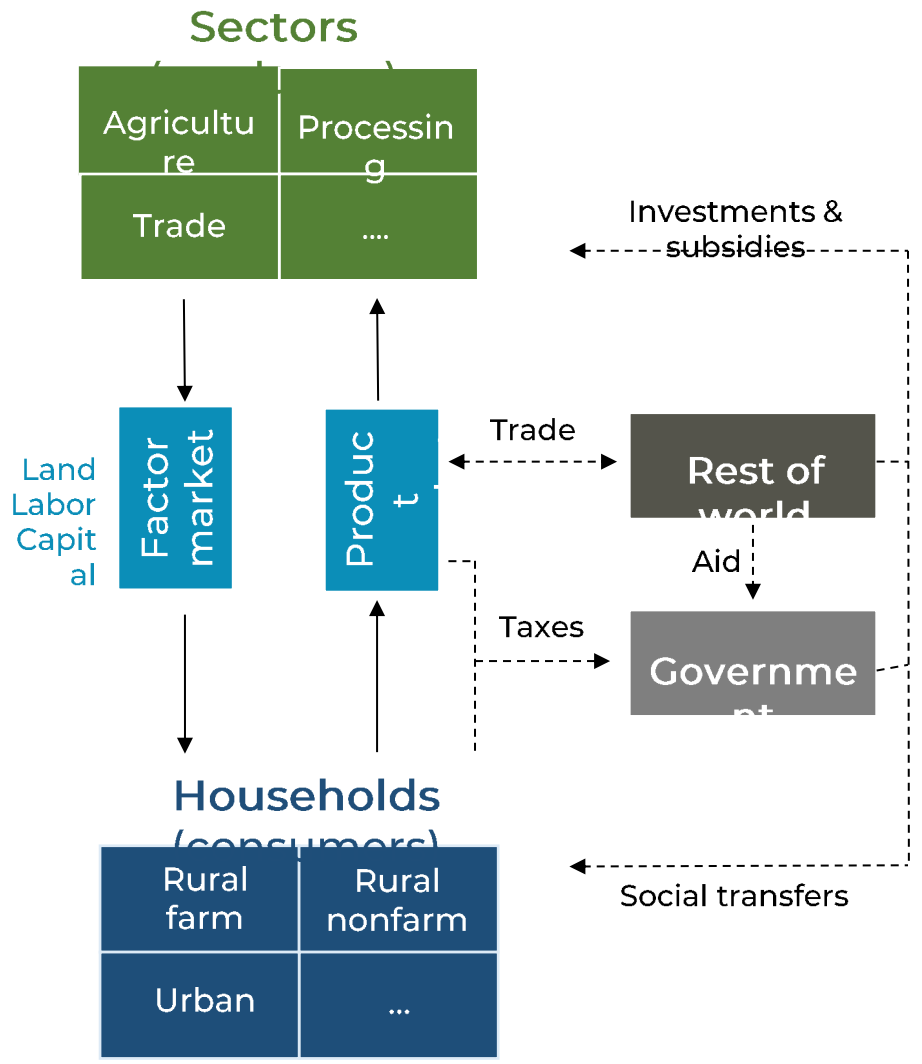
- Rural farm, rural nonfarm, and urban
- Per capita expenditure quintiles
- Tracks income and expenditure patterns
- Based on national household survey

Detailed factor markets

- Labor separated into education groups
- Crop land and livestock herds
- Nonagricultural capital

Government

Rest of the World



Investment Module

Downstream production

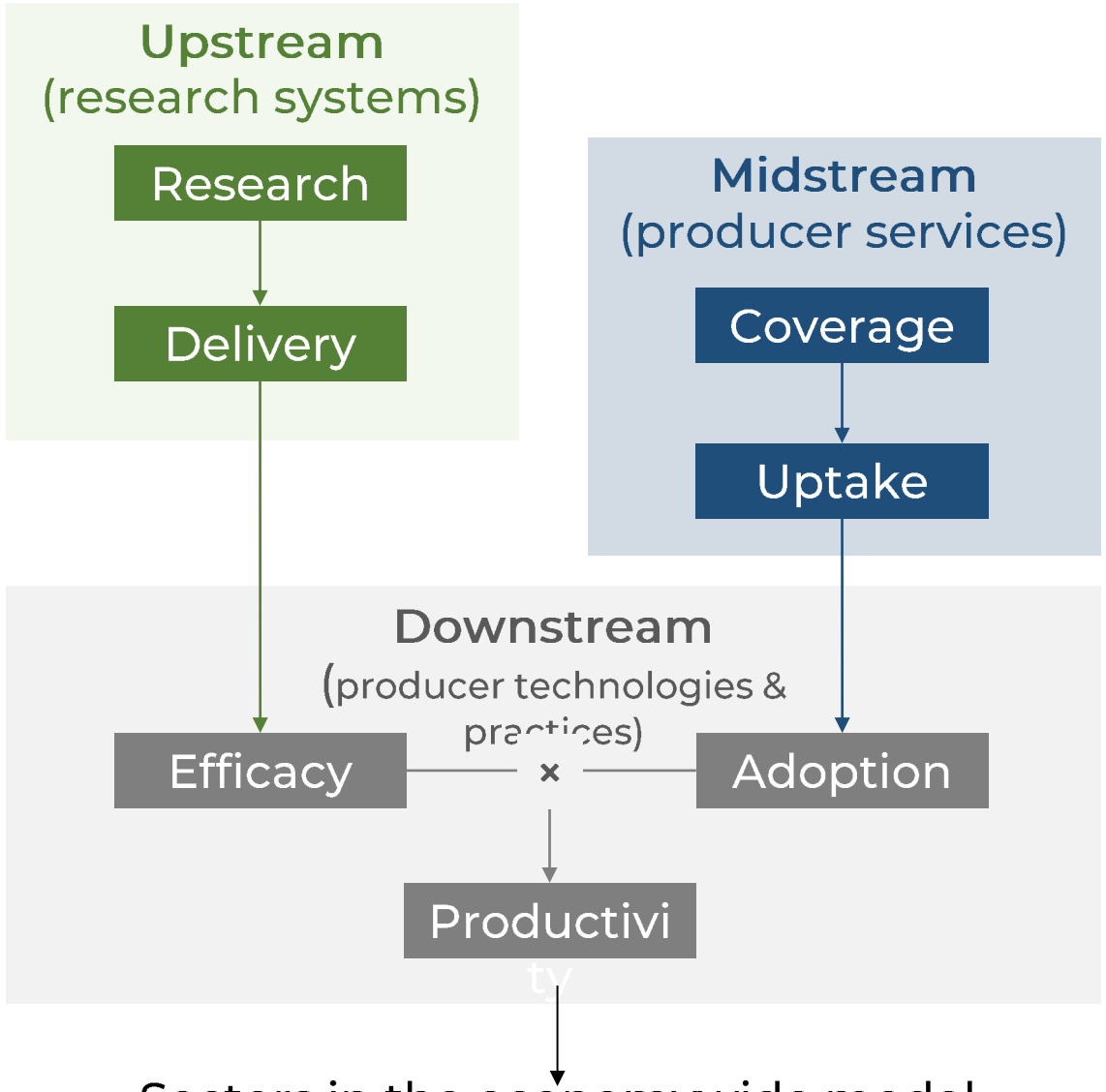
Sector productivity is driven by the efficacy of technologies and producers' decisions to adopt

Midstream services

Adoption decisions are influenced by the coverage of services (e.g., extension) and assets (e.g., irrigation) and producers' willingness to take up new practices

Upstream systems

Efficacy of technologies is improved through research (e.g., new seed varieties) and better delivery systems (e.g., seed multipliers)



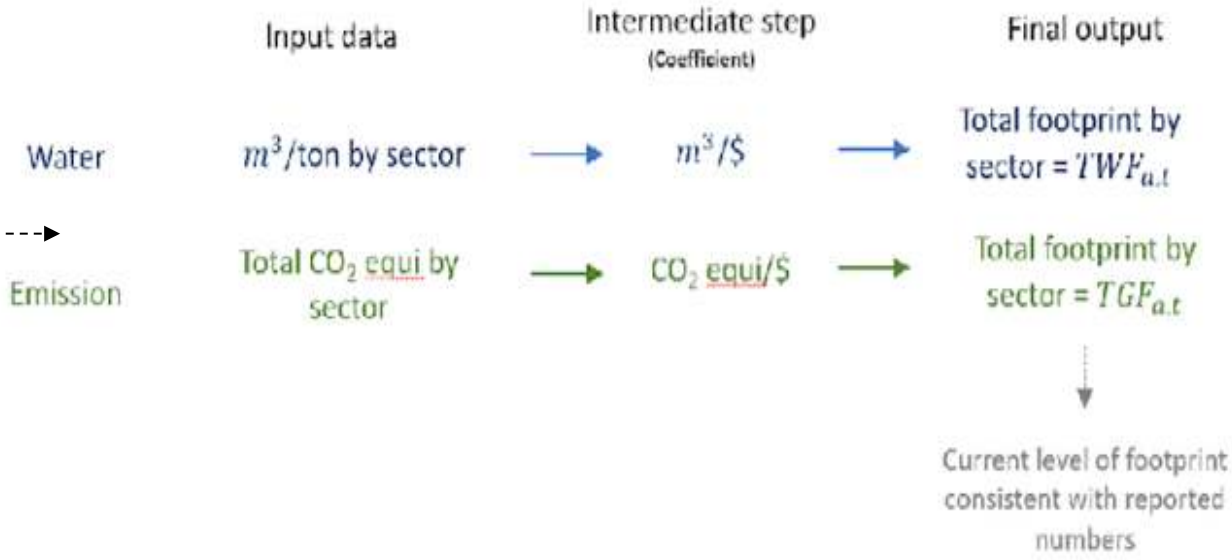
Household Survey and Environment Modules

Household Survey Module

- Run household survey-based microsimulation modules linking CGE model outputs (prices, income) to surveyed households
- Measure changes in:
  - Poverty (rate and headcount)
  - Prevalence of undernourishment
  - Diet deprivation

Environment Module

- Compiles data coming from several sources (FAO, Water Footprint Network, etc.) (see IFPRI's Ghana Agrifood Diagnostics for details)
- Generates coeffects on water, emission and land footprint per $
- Baseline level water, emission, and land



Scenarios and Outcomes

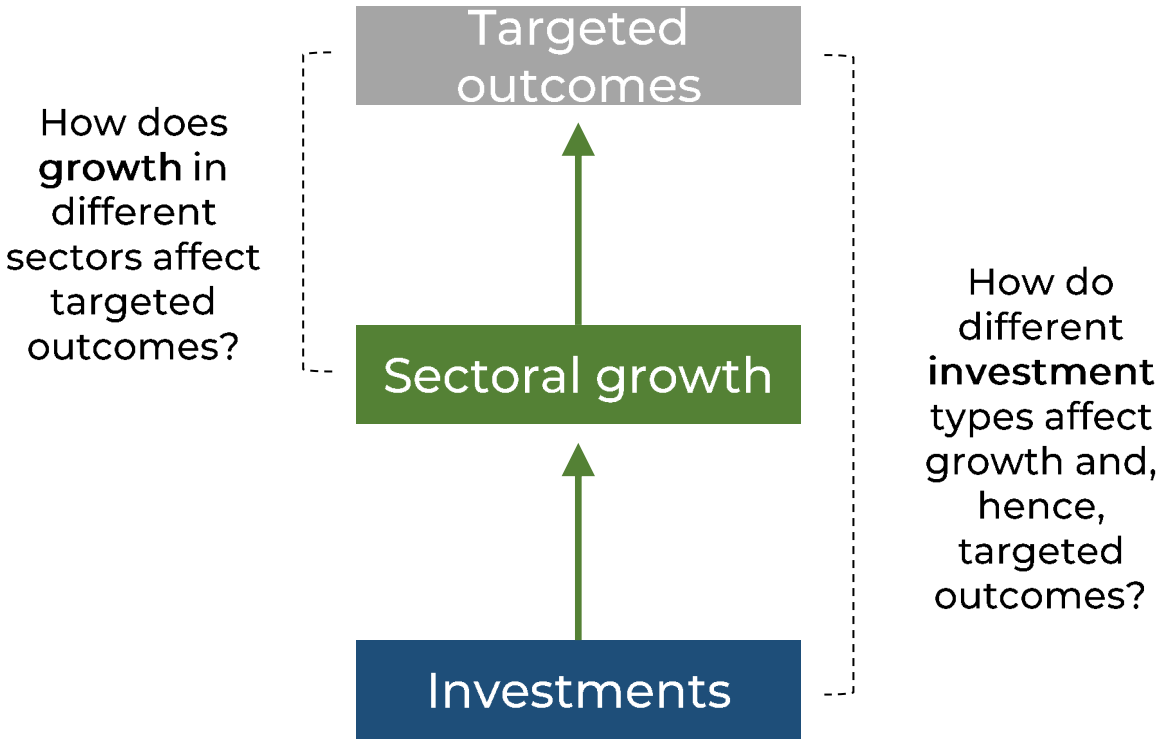
Main scenarios considered:

Investment scenarios link spending to outcomes

Targeted outcomes:

- ❑ Economic outcomes
  - Agrifood system GDP (i.e., all incomes, incl. informal sector)
  - Job creation (i.e., all jobs, incl. informal sector)
- ❑ Social outcomes
  - Poverty headcount rate ($2.15-a-day poverty line)
  - Undernourishment headcount rate (FAO's daily calorie threshold)
  - Diet quality (EAT-Lancet's healthy diet)
- ❑ Environmental outcomes
  - Water footprint (total m3 of water)
  - Emission footprint (GHG in CO2

Growth vs. Investment Scenarios



Investment Scenarios

Question:

- What is the impact of spending an equal amount of $25 million per year (2025-30), directed at different investment areas, on a targeted set of outcomes by 2045?

Scenarios:

- 18 areas spanning the agrifood system (R&D, farm services, markets, etc.)
- Some investments are cross-cutting, other target sectors (as per growth scenarios)
- Spending starts in 2025 for 5 years (model runs to 2045)

Additional considerations:

- ★Some scenarios are targeted at specific crop groups (i.e., cereals, roots, pulses/oilseeds, horticulture, other crops)
- Stress-test investments under severe drought conditions (i.e., 1-in-25-year extreme historical weather event)

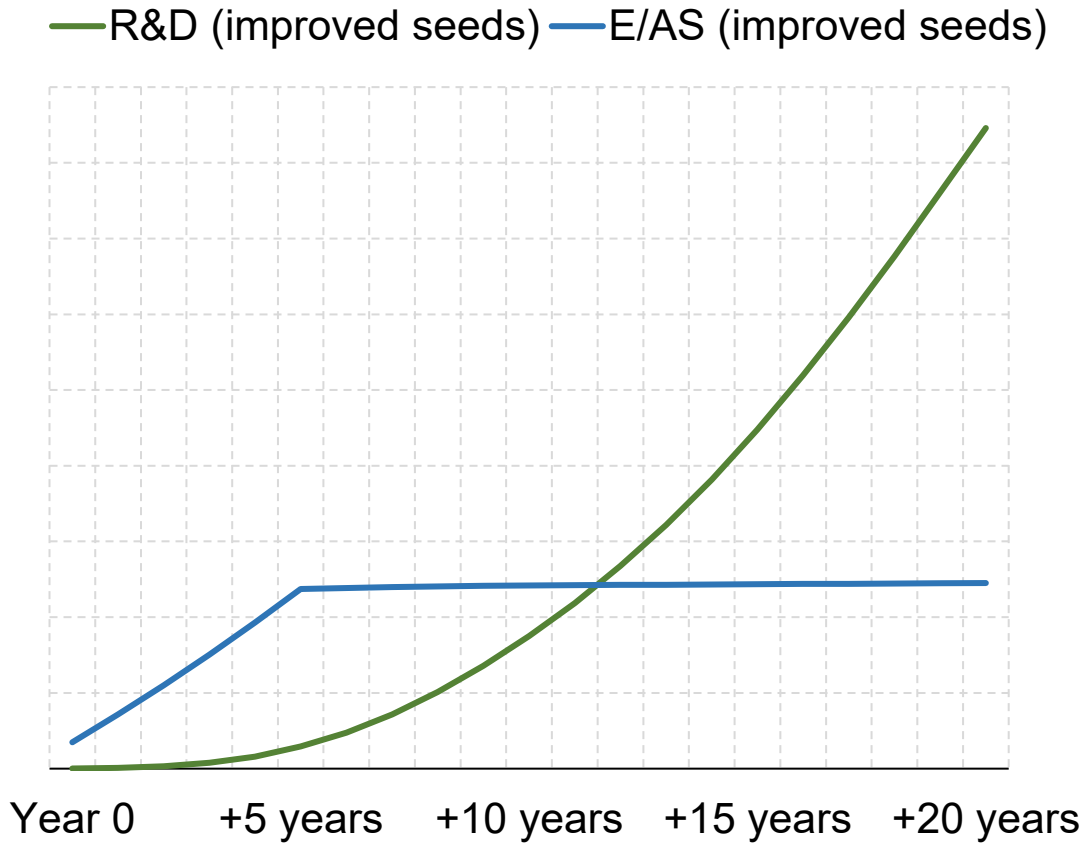
R&D	1	R&D (improved seeds)
	2	R&D (agronomic practices)
	★3	R&D (animal breeds)
	★4	R&D (animal husbandry)
Extension / advisory services	★5	E/AS (improved seeds)
	★6	E/AS (agronomic practices)
	★7	E/AS (livestock)
	8	E/AS (climate information)
	9	E/AS (climate smart agriculture)
Markets and food systems	★10	Seed systems (agro-dealers)
	11	SME processors (finance + training)
	12	SME traders (finance + training)
	★13	Food loss (post-harvest storage)
	14	Credit access (financial inclusion)
Risk reduction and resilience	15	Seasonal forecast (early warning)
	★16	Productive safety nets

Investment Data

The investment module requires a range of data inputs for each of the 18 investment areas

- ❑ Production/profitability impact (from impact evaluations, crop and livestock models, etc.)
- ❑ Technology adoption/service coverage rates (from household surveys)
- ❑ Investment unit costs (from government accounts, impact evaluations, literature)
- ❑ Investment lags (i.e., time to first impact, impact duration, etc.)

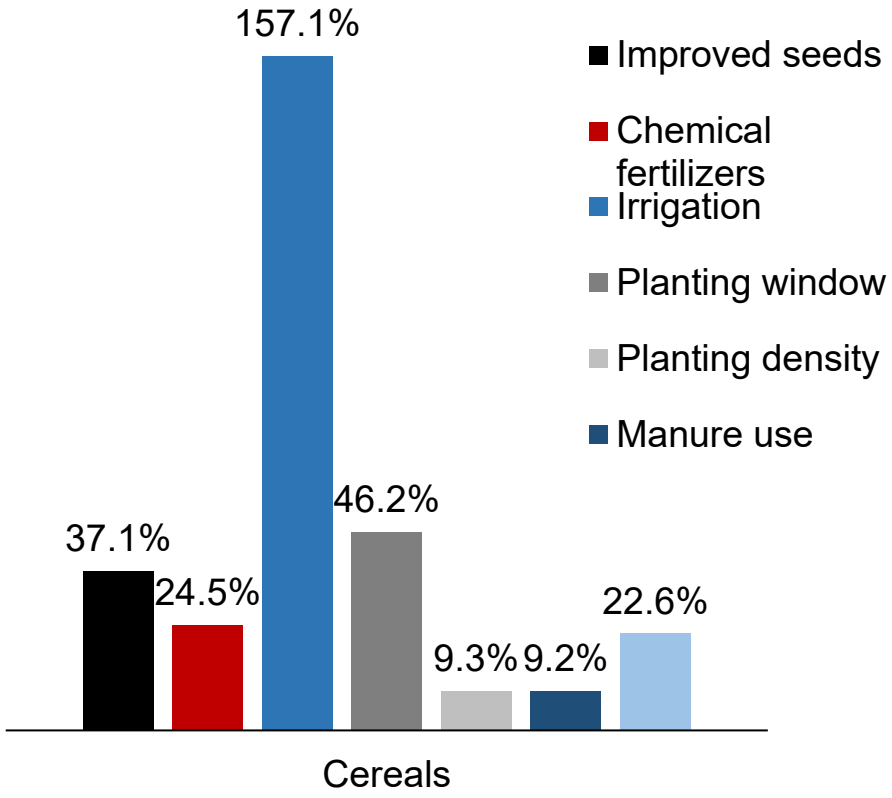
Cumulative GDP impacts over time from investing in R&D vs. extension services



Example Data | Practice Efficacy and Adoption Rates

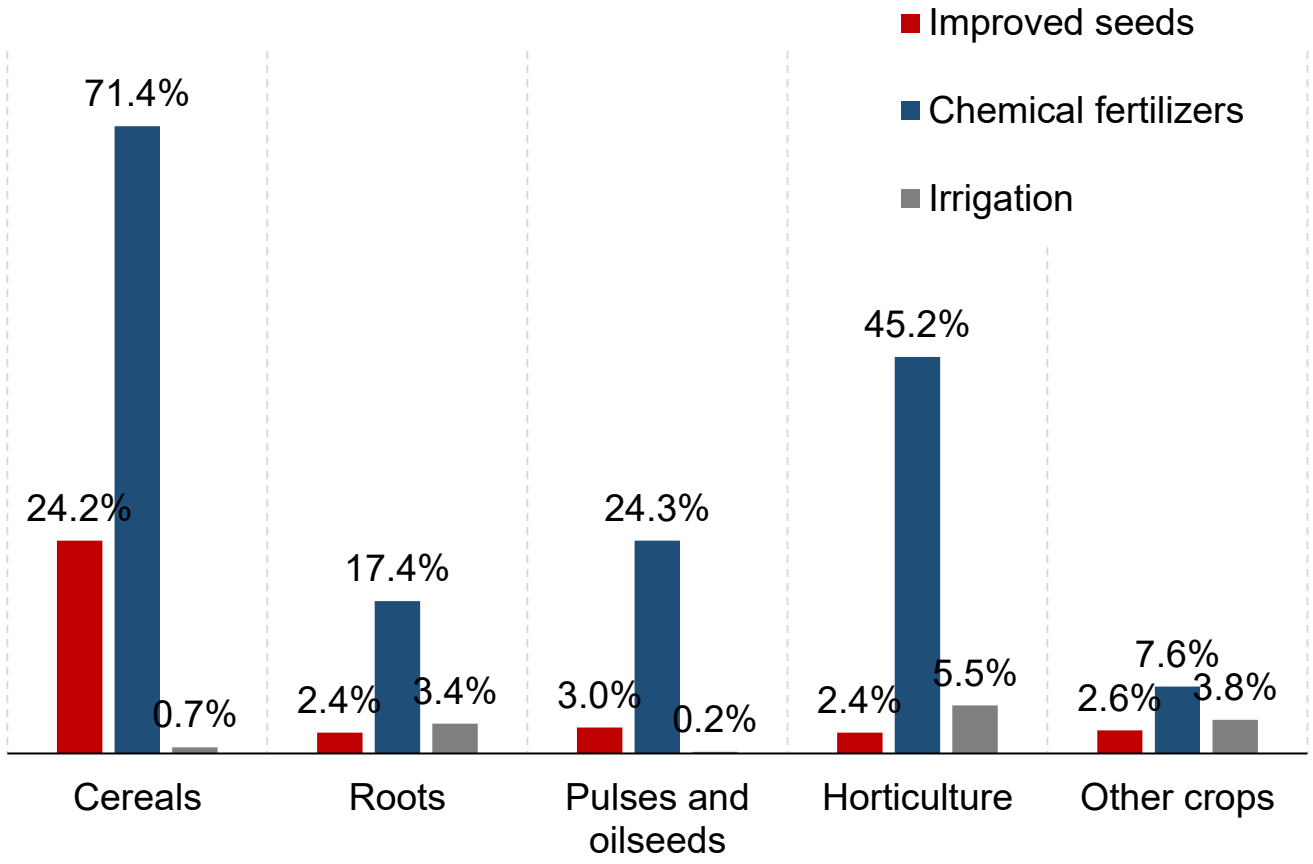
IFPRI's **crop models** are used to estimate yield gains from adopting different farm practices

Cereals yield gains in Ethiopia (%)



Agricultural Sample Survey (ASS) 2021-22 provides adoption and coverage rates for practices/technologies

Share of total crop land under each practice (%)



Example Data | Investment Profiles

Extension / Advisory Services (improved seeds)

- **Unit cost** = $55 per hectare ($20 per farmer)

  Source: Government spending divided by number of farmers receiving extension visits

- **Coverage rate** = 48.6% of crop land

  Source: ASS 2021-22

- **Uptake likelihood** = 45.9%

  Source: Derived from ASS 2021-22

- **Assumed duration** = 1 year, impacts end after spending year

R&D (improved seeds)

- Base R&D knowledge stock = $297 mil. (cereals)

  Source: ASTI data for each crop and livestock group

- **Unit cost** = $1 per $1 of knowledge stock (by implication)

- **Annual rate of genetic gain** = 1%

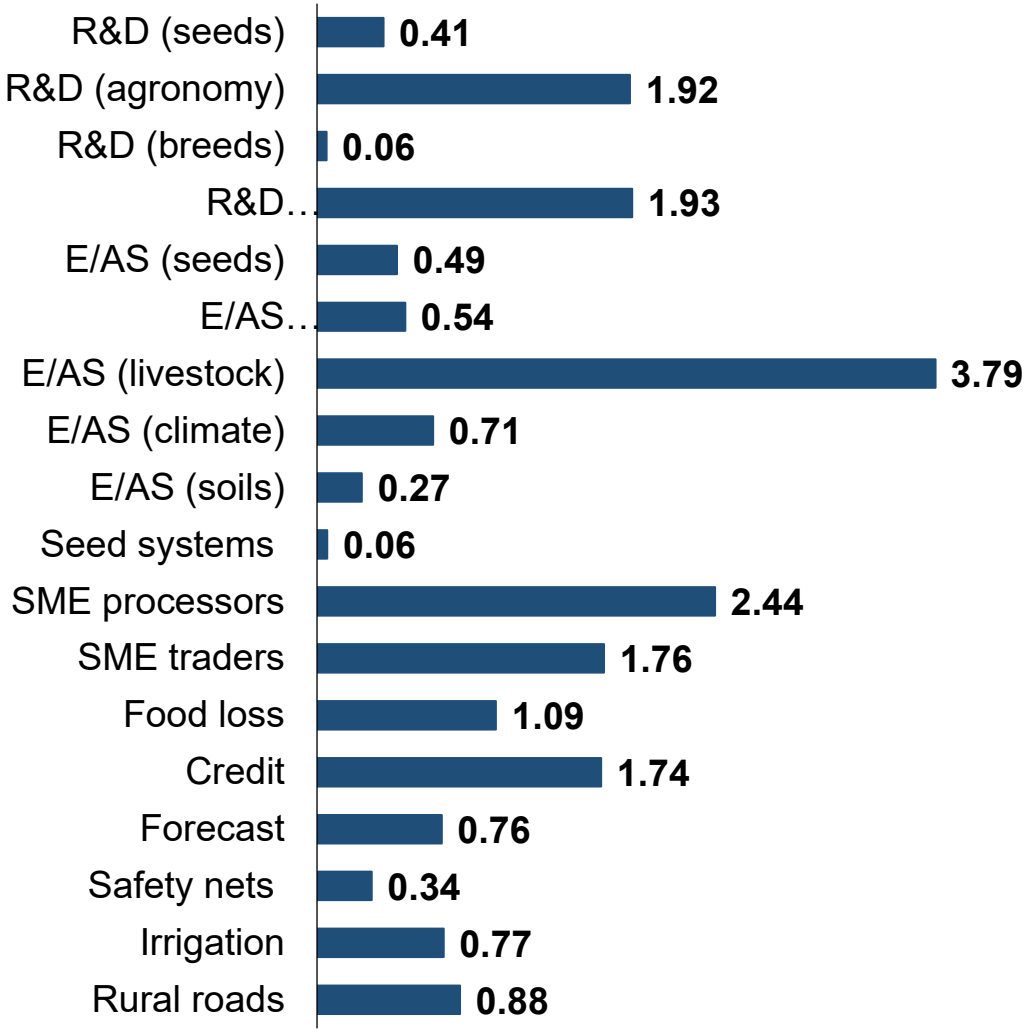
  Source: BMGF Crop R&D portfolio assumptions

- **Assumed duration** = 30 years, 4 years until full impact, declining after 16 years.

Results | Economic Outcome Indicators (4% discount rate, 2025-2045)

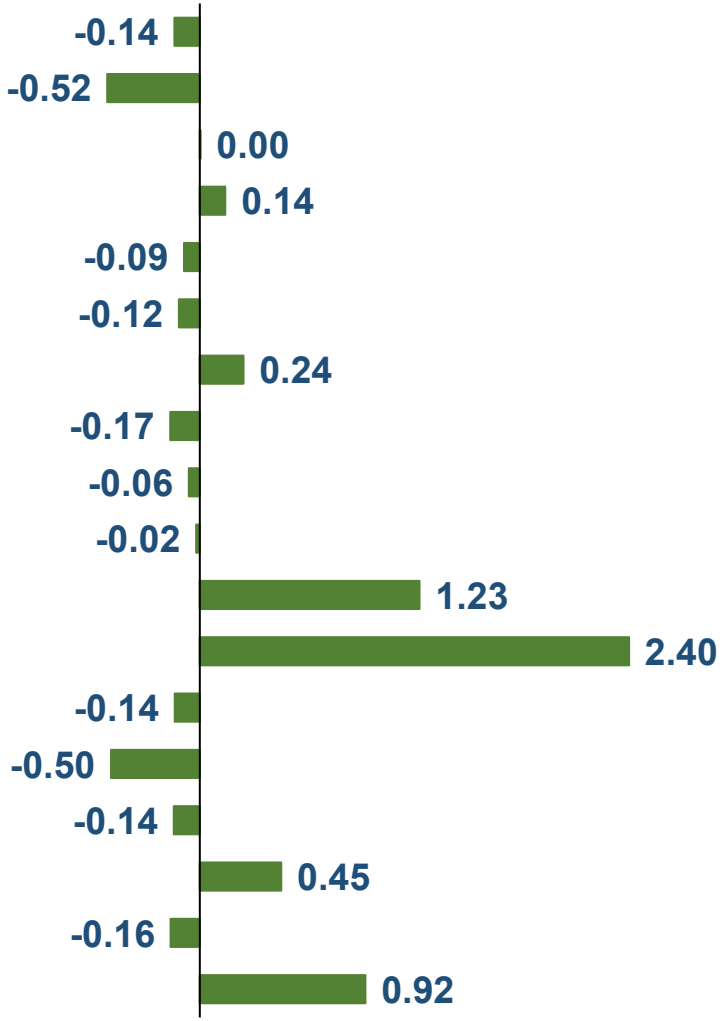
Agrifood GDP

($ change in total GDP per $ of investment spending)



Jobs

(change in number of jobs created per $1000 of investment spending)



Top three for agrifood GDP:

- E/AS (livestock)
- SME processors
- R&D (husbandry)

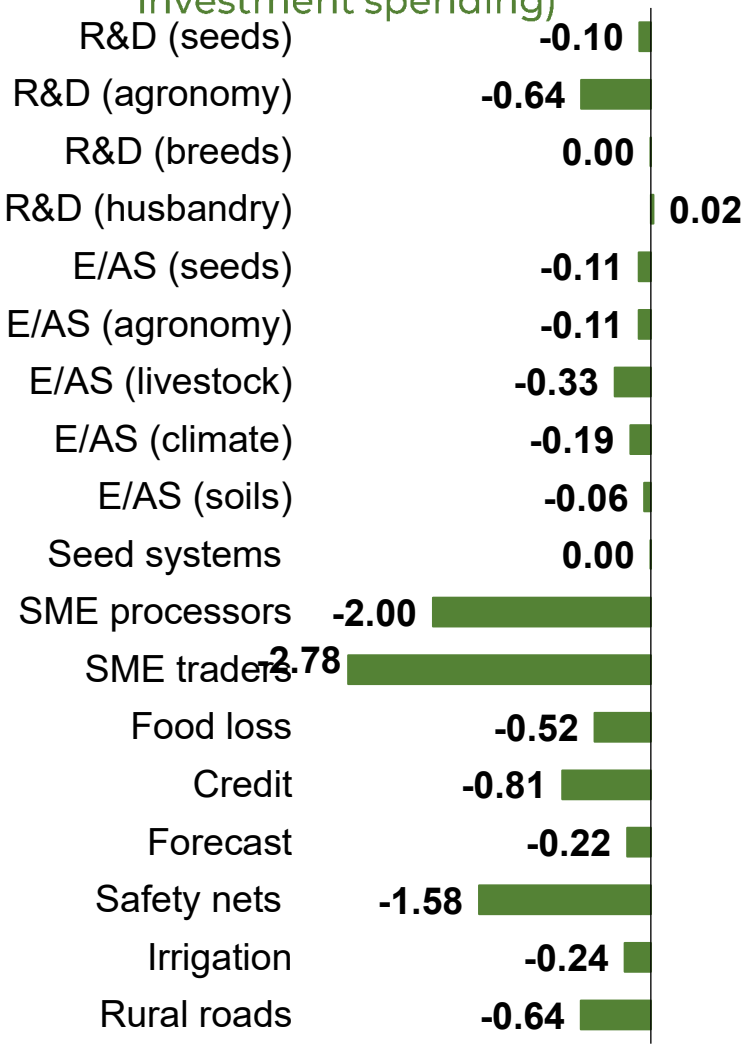
Top three for agrifood jobs:

- SME traders
- SME processors
- Rural roads

Results | Social Outcome Indicators (4% discount rate, 2025-2045)

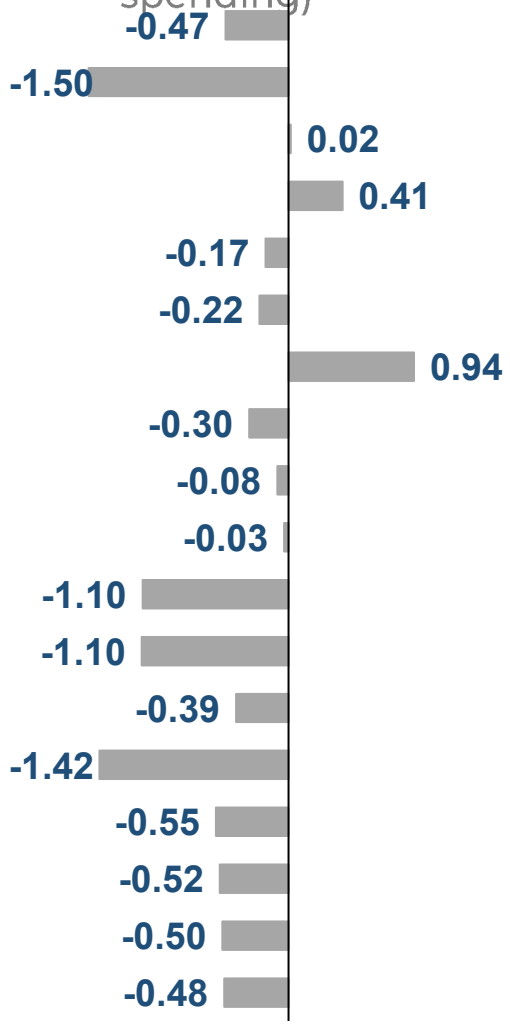
Poverty

(change in number of poor people per $1000 of investment spending)



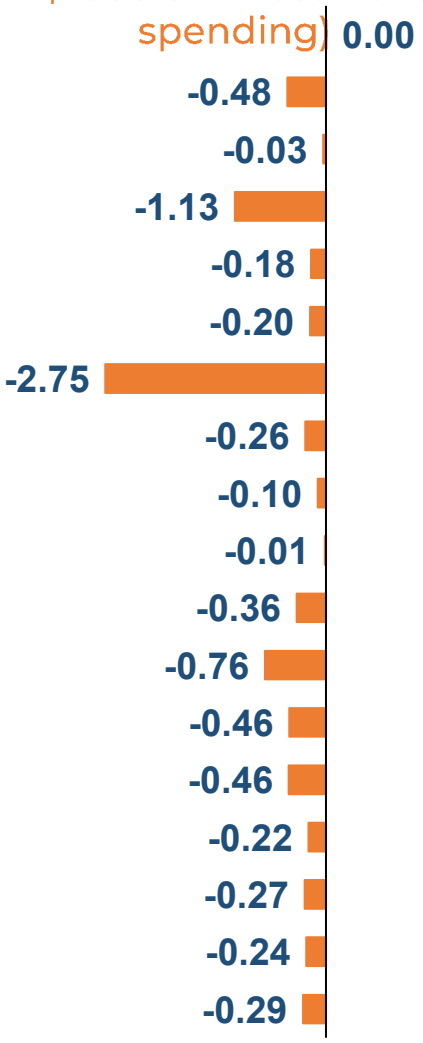
Undernourishment

(change in number of undernourished people per $1000 of investment spending)



Diet Quality

(change in consumption gap to a healthy diet per $1000 of investment spending)



Top three for poverty:

- SME traders
- SME processors
- Safety nets

Top three for undernourishment:

- R&D (agronomy)
- Farmers credit
- SME processors/ traders

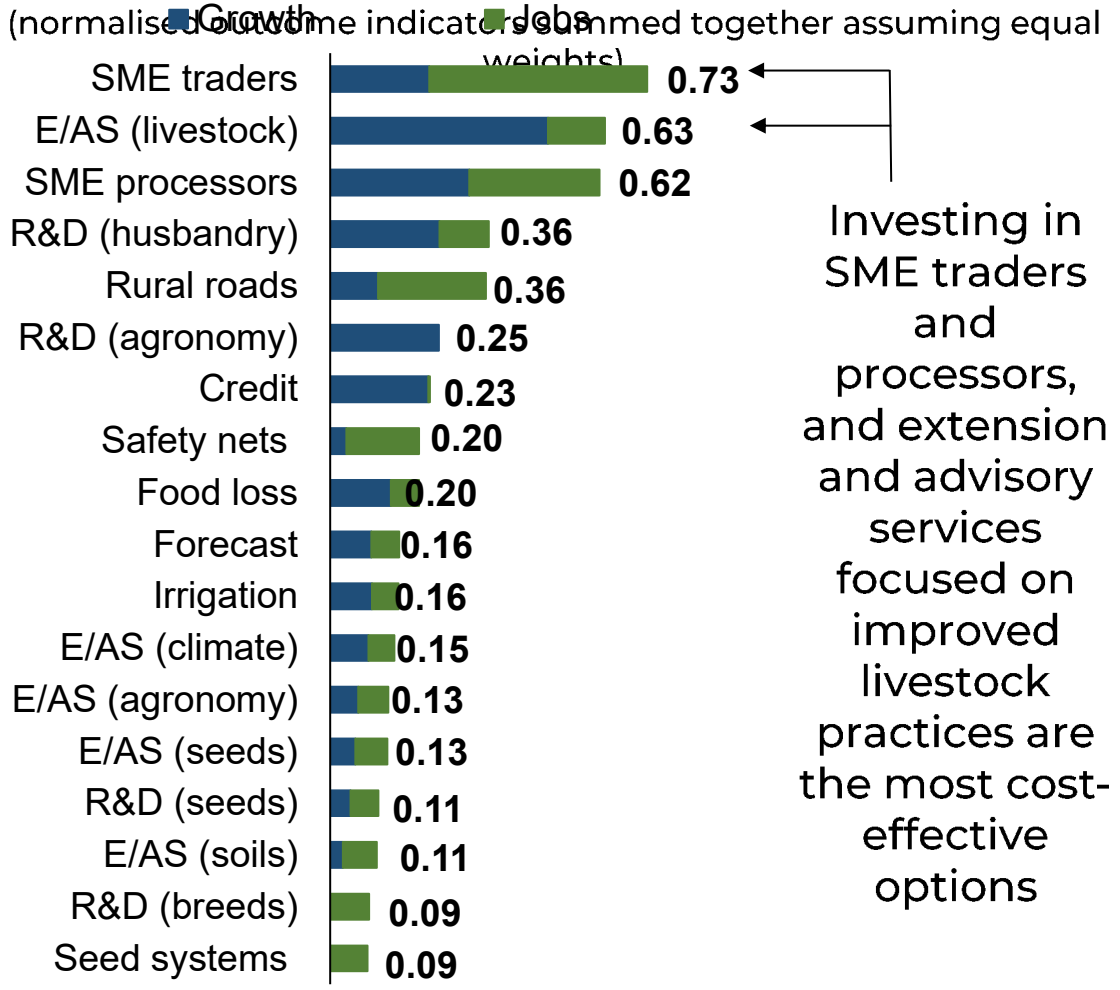
Top three for diet quality:

- E/AS (livestock)
- R&D (husbandry)
- SME traders

Results | Composite Score – Economic Outcomes (4% discount rate, 2025-2045)

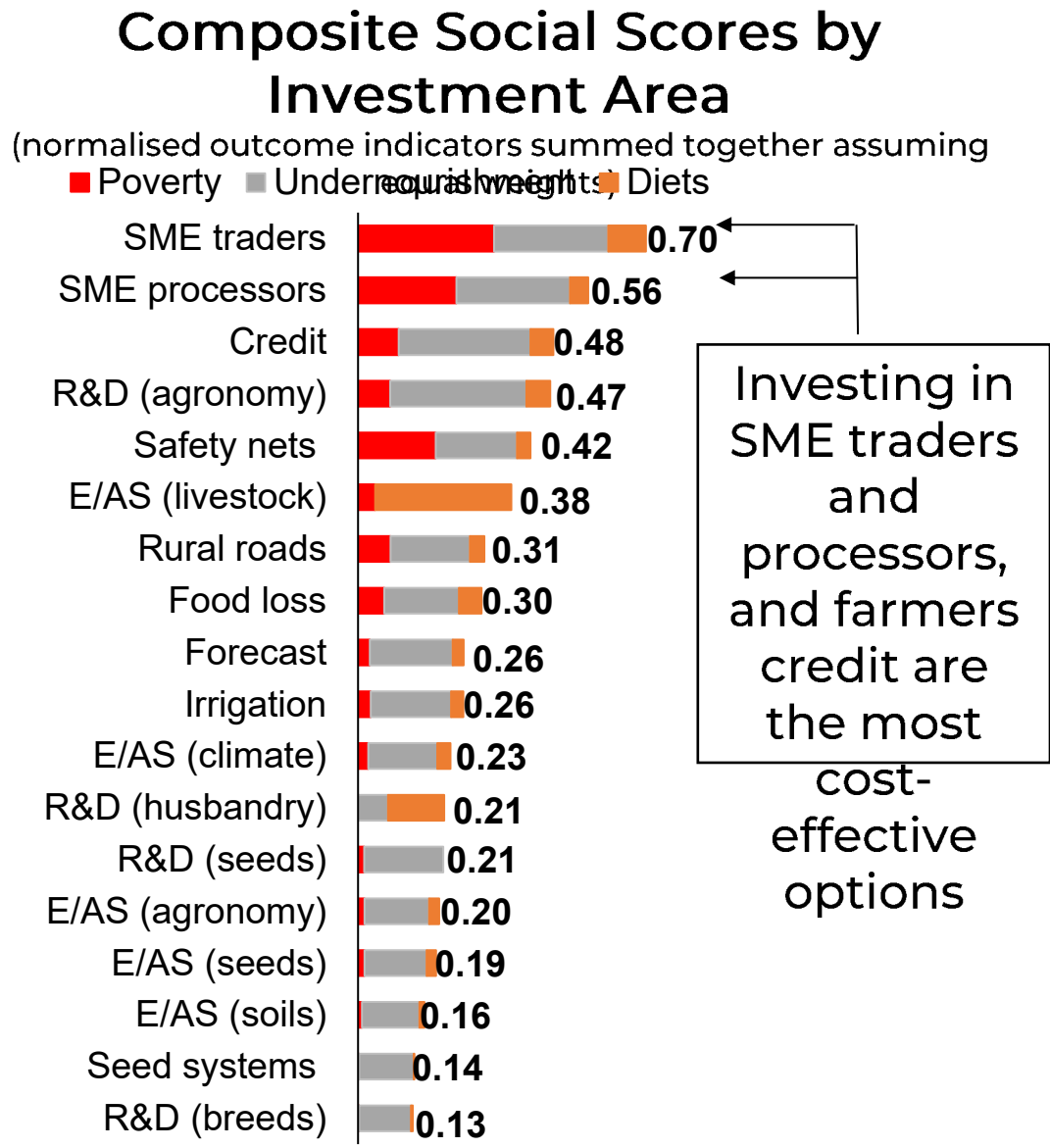
- Indicators are **normalized,** and a composite score is calculated assuming equal weights for indicators
- **Key findings**
  - Investing in **SME traders and processors** is the most cost-effective option for job creation
  - **Extension and advisory services,** focused on livestock, are the most cost-effective investments (livestock is particularly good at both accelerating growth)
  - Providing **credit** and **reducing post-harvest food losses** are cost-effective market/system interventions with a particularly stronger effect on growth

Composite Economic Scores by Investment Area



Results | Composite Score – Social Outcomes (4% discount rate, 2025-2045)

- Indicators are **normalized** and a composite score is calculated assuming equal weights for indicators
- **Key findings**
  - Investing in **SME traders** and **processors** is the most cost-effective option for expanding agrifood systems and reducing national poverty and undernourishment
  - Providing **credit** and **safety nets** are cost-effective market/system interventions with particularly stronger effect on undernourishment
  - **Extension and advisory services** focused on livestock and climate are the most cost-effective investments (livestock is particularly good at improving diets)
  - **R&D investments** in **agronomy** rank the most effective in impacting social



Thank You