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IMPACT OF DIGITAL AGRO-WEATHER ADVISORIES: EVIDENCE FROM FARMING COMMUNITIES IN KENYA

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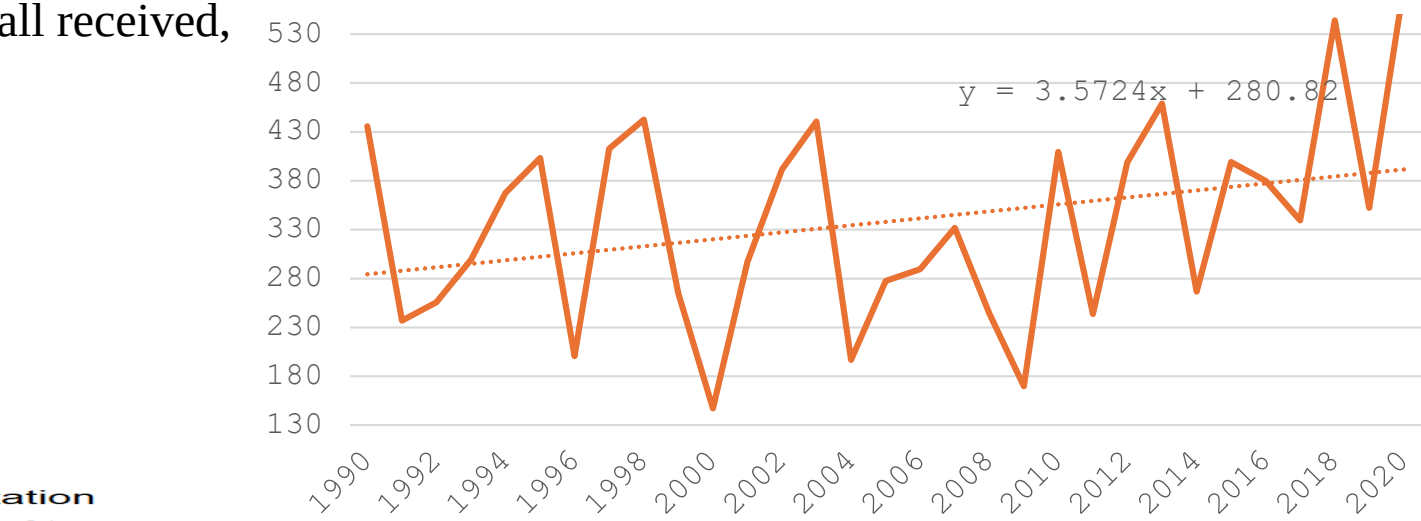
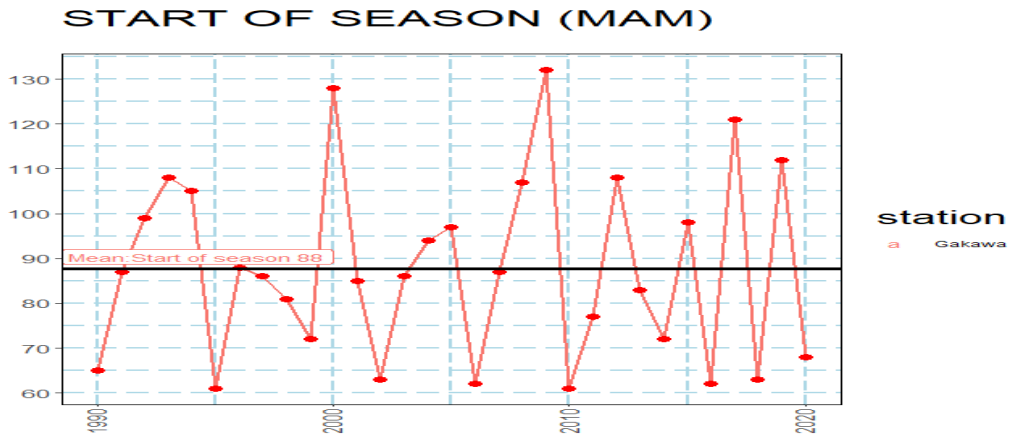
BACKGROUND

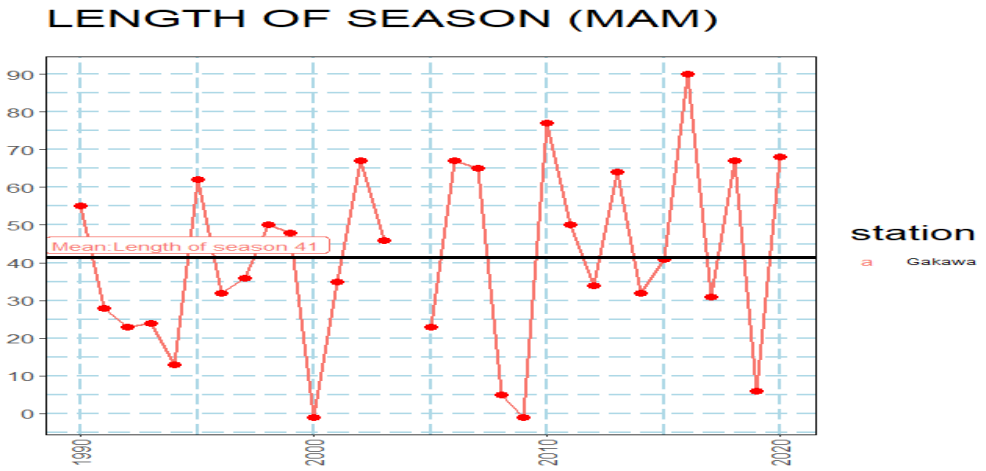
- Increasing variability in the onset of rainfall, changes in length of season, and increase in incidents of extreme temperature events render tried and tested sources of farmers' information on rainfall patterns and cropping calendars less reliable and less useful for decision making (Paparrizos et al, 2021).

1) High **inter annual variability** in the rainfall received, particularly in MAM



2) Variability in Onset and Length of the season





Start of the season (ONSET) is a signal to start planting **Variability** makes planning for sowing and selection of the crop type/variety difficult - results to significantly lower yields

Short rainfall season results to drought or inadequate watering of crops during critical period

Dependable information on the onset dates of the rainy period and length of growing season is critical

- Science-based climate information services (CIS) have potential to empower farmers, including poor farmers, in climate-vulnerable regions of Africa

  - CIS can help mitigate farming risks in farming and enhance farmer/household resilience to climate change (Paparrizos et al, 2021).
    - ✓ Farmers' aid - in making adaptive operational decisions to maximise economic gains from their farming enterprises during a good season, and reduce losses in a bad season

- Though widely accepted as an important tool for mitigating the impacts of climate change and weather variability, little is known about its effect in agricultural value chains

AGRO-WEATHER ADVISORIES

A GOK/World Bank Kenya Climate Smart Agriculture Project (KCSAP)
Intervention

- Deliver situation-specific CIS through localisation: High resolution weather information (Ward level), relevant to specific farm enterprises.
- High frequency, using readily accessible information-sharing tools to increase information timeliness - relevance.

- Messages were transmitted to farmer's phone; in farmer's preferred language and value chain; specific to the stage of growth of the crop or life cycle of livestock.

At the start of the endline survey in Mar-April 2023, KCSAP had transmitted agro-weather advisories for **three cropping seasons**: OND 2021; MAM 2022 and OND 2022

KCSAP PLANNED/EXPECTED OUTCOMES

1. Increase in farmers' access to agro-weather advisories through SMSs

2. Increase in farmers adoption of value chain specific TIMPs
   - Proportion of farmers adopting at lest one TIMP in 'TIMPS category' , by VC
   - Number of TIMPs adopted in each 'TIMPs category' , by VC

3. Increase in productivity
   - Yields (kg/acre)

Research Study Objective

To assess the impact of exposure to action-based agro-weather advisories on farmers adoption of technologies, innovations and management practices, and productivity

- **By comparing outcomes** in households that received SMS with agro-weather advisories (**treatment)** to outcomes in households that did not receive the SMSs with agro-weather advisories (**control**).

EMPIRICAL STRATEGY

The choice of a **treatment effects estimator** is influenced by:
(i) the assignment to program or treatment, and (ii) compliance to treatment:

Fixed Effects Instrumental variable (IV) approach

- Considers the possibility that the individual's decision to participate in the program may not have been random but has an underlying (unobserved) motivation (Suresh Babu, 2017).

- Also suitable for estimating effects of programs where there is partial compliance.
  - Not everyone will follow the assignment to treatment rules.
    - In the KCSAP, farmers in the treatment group may receive the agro-weather advisories but simply ignore it, delete the message from their phones, or message could be crowded out by spam messages.

    - On the other hand, farmers who receive the agro-weather advisories and heed the advice provided, might have been placed in the control group.

- Controls for effects of non-observables

FINDINGS

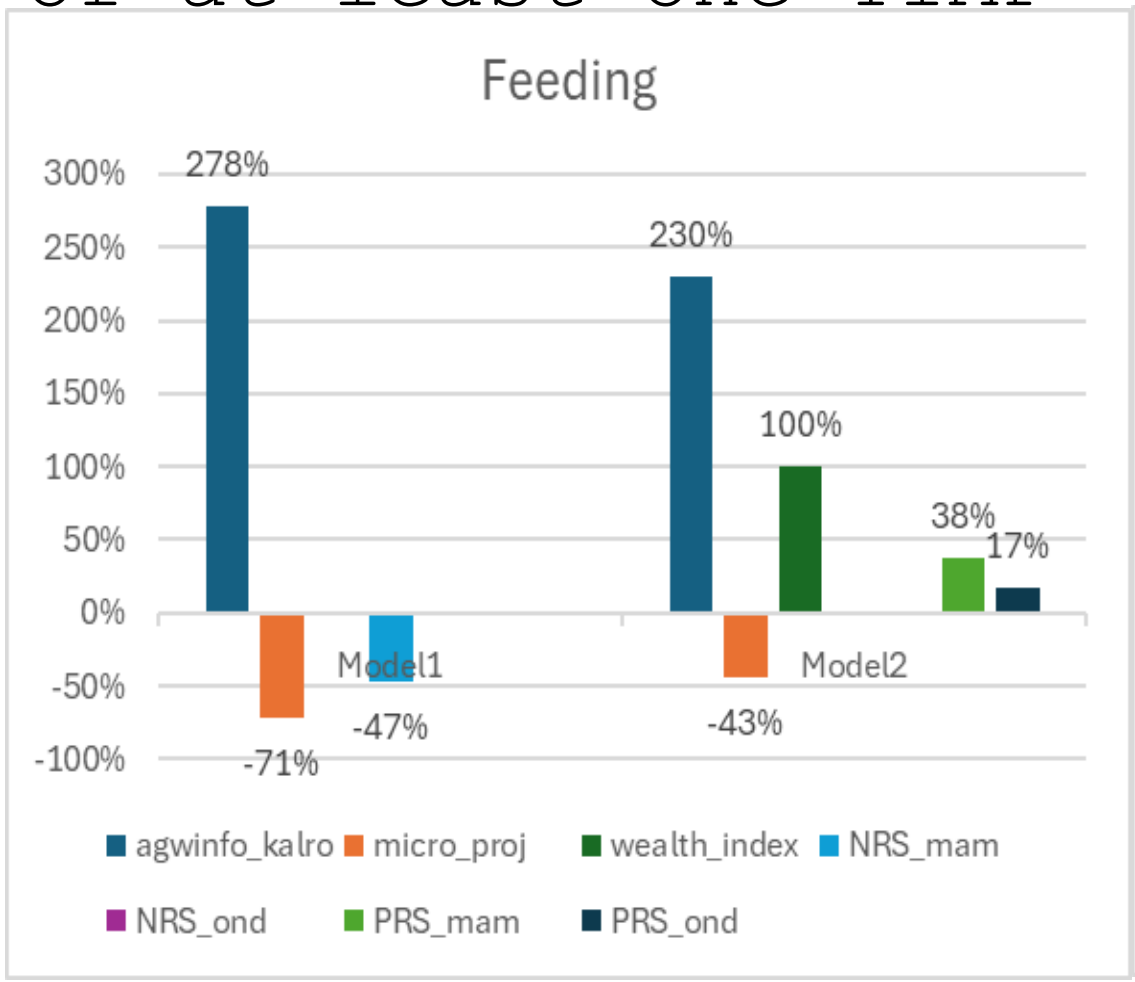
Farmers' access to agro-weather information increased

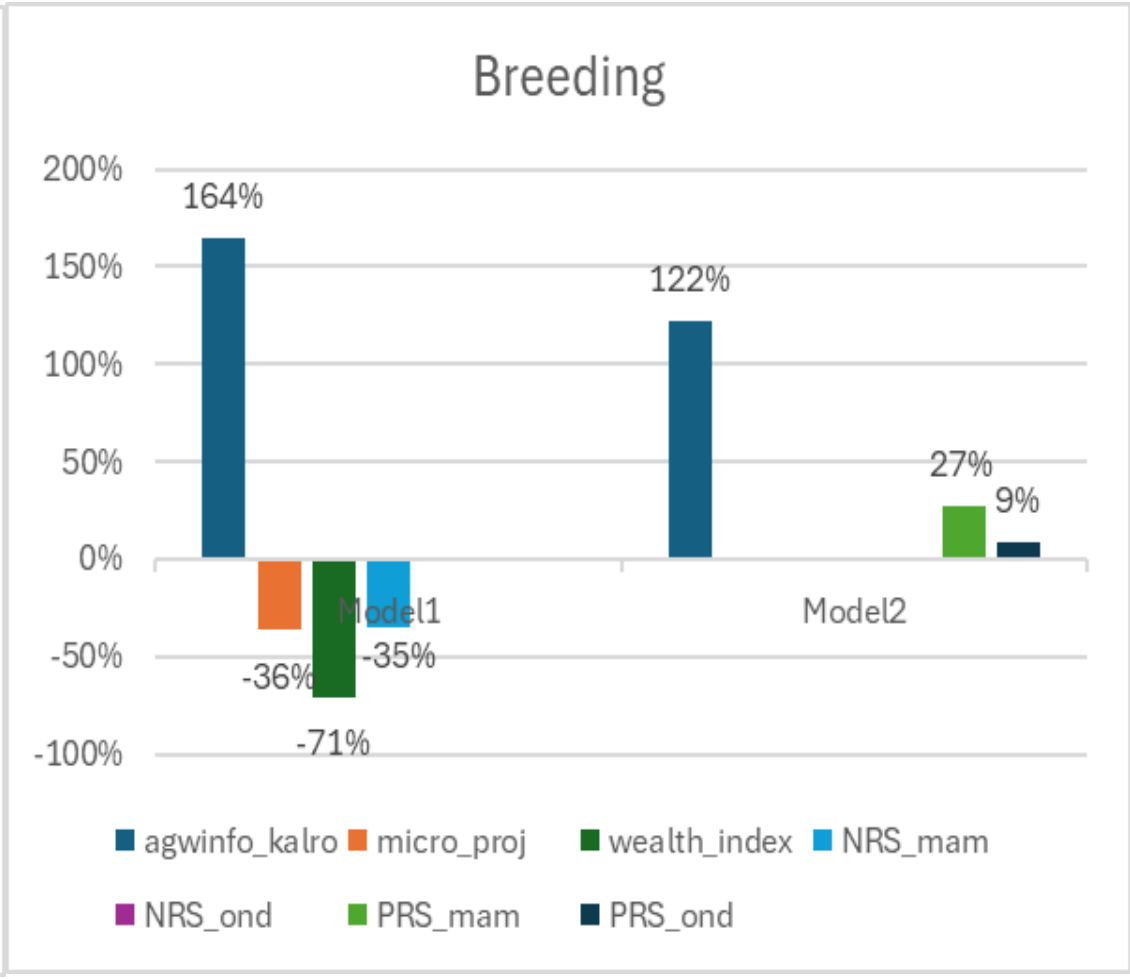
	Percent
Received agro-weather information services	.293***
	(.023)
Received agro-weather information from KALRO	.313***
	(.015)
Observations	6,034

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

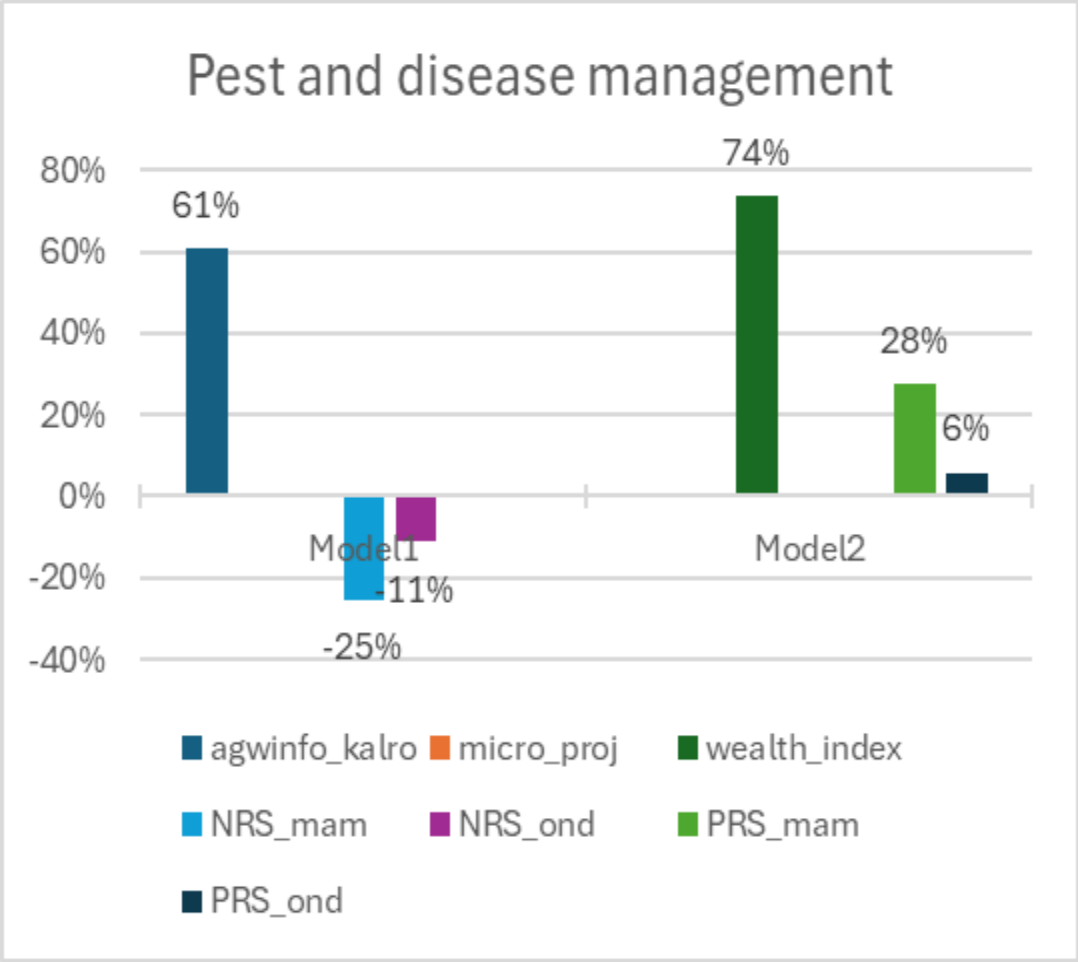
- **29.3%** more farmers (in KSCAP areas) received SMS with agro-weather advisories from KALRO
- Other sources of agro-weather advisories:
  The main ones - Kenya Meteorological Department (28%) & Radio (29%)
- Significantly fewer farmers received from other CIS providers

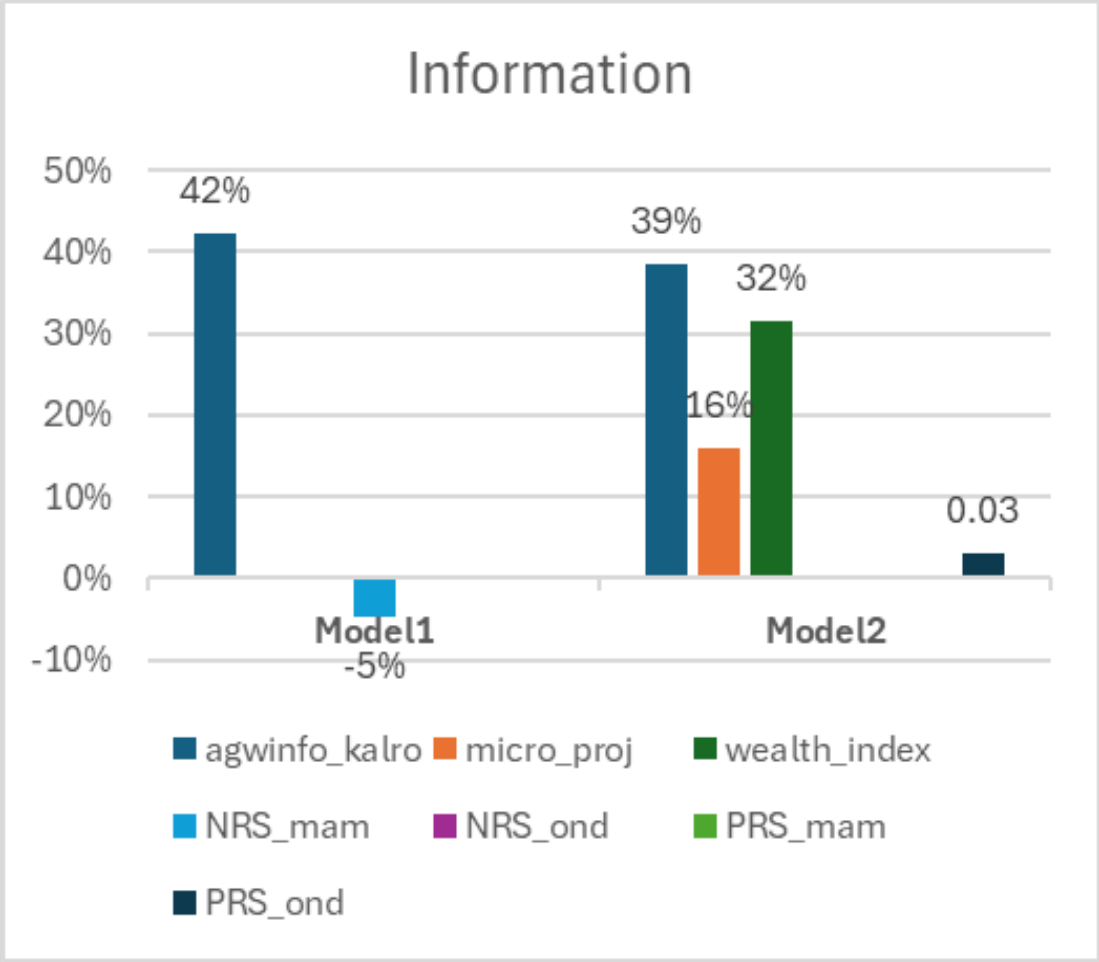
Indigenous chicken VC – Effect on adoption of at least one TIMP



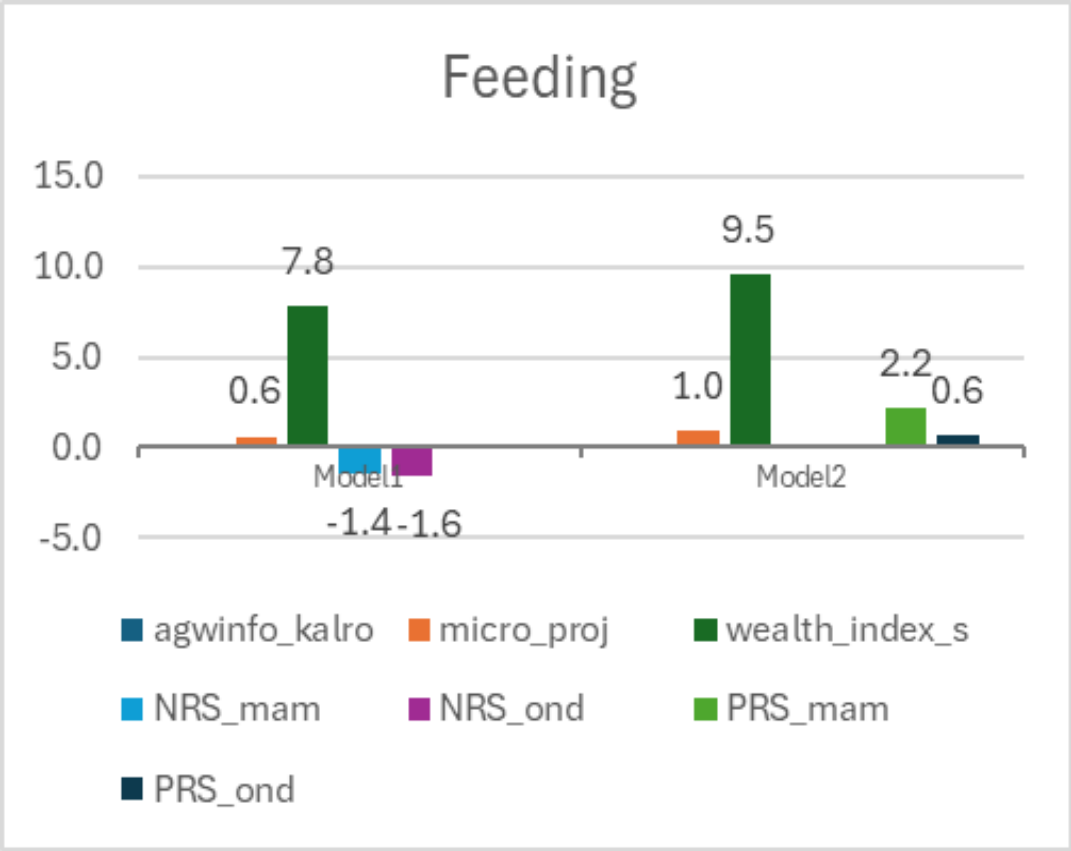


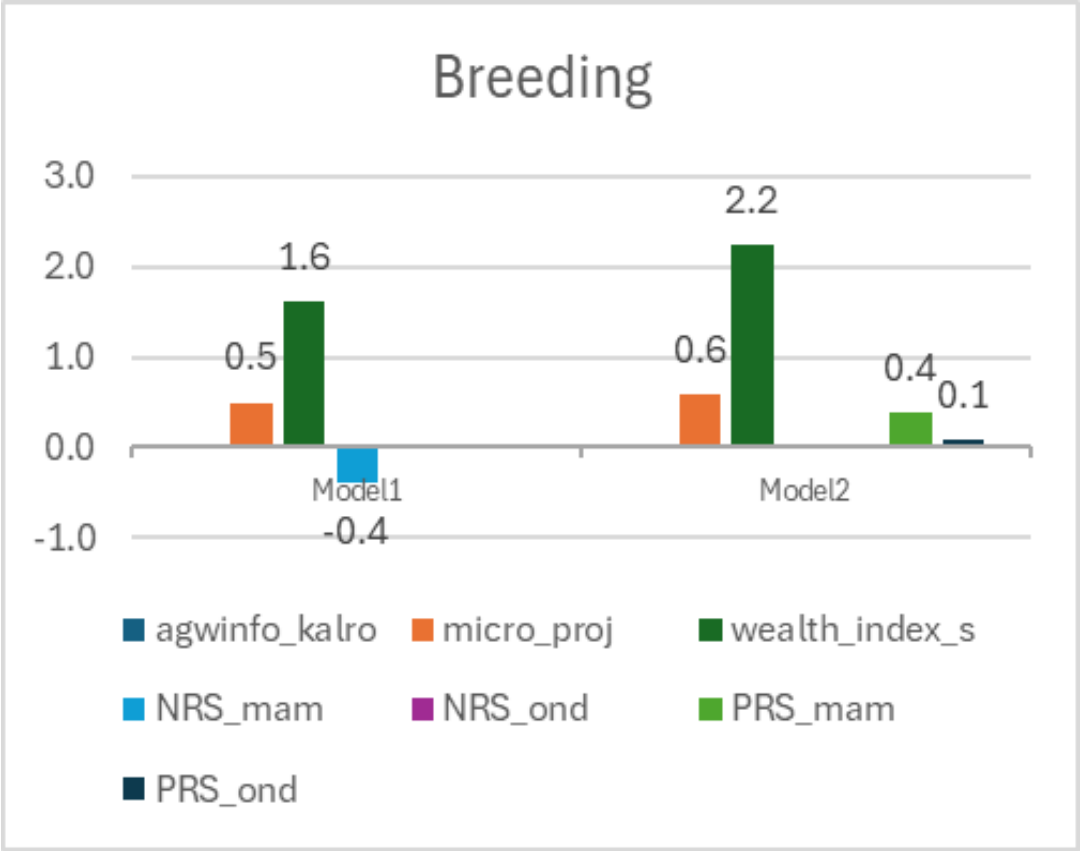
Indigenous chicken VC - Effect on adoption of at least one TIMP





Indigenous chicken VC - Effect on number of TIMPs adopted





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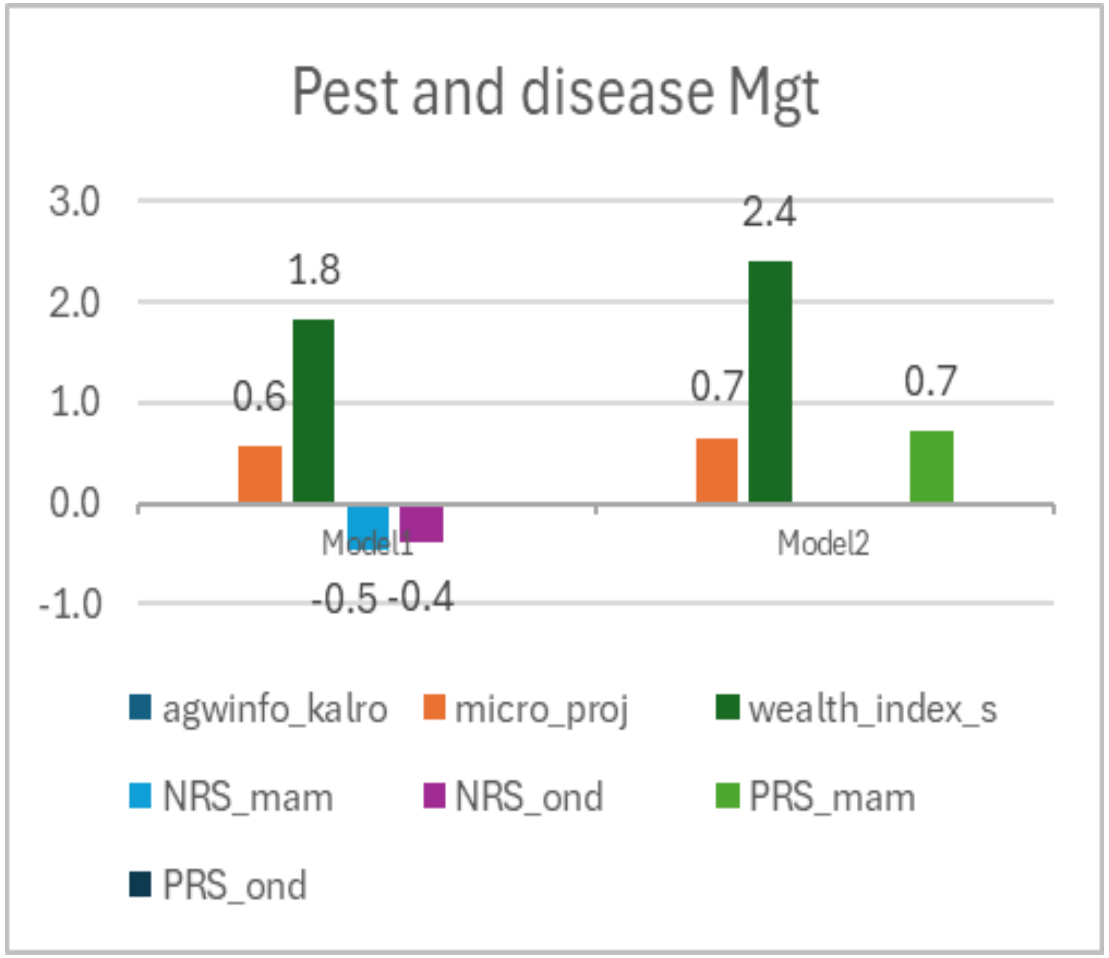
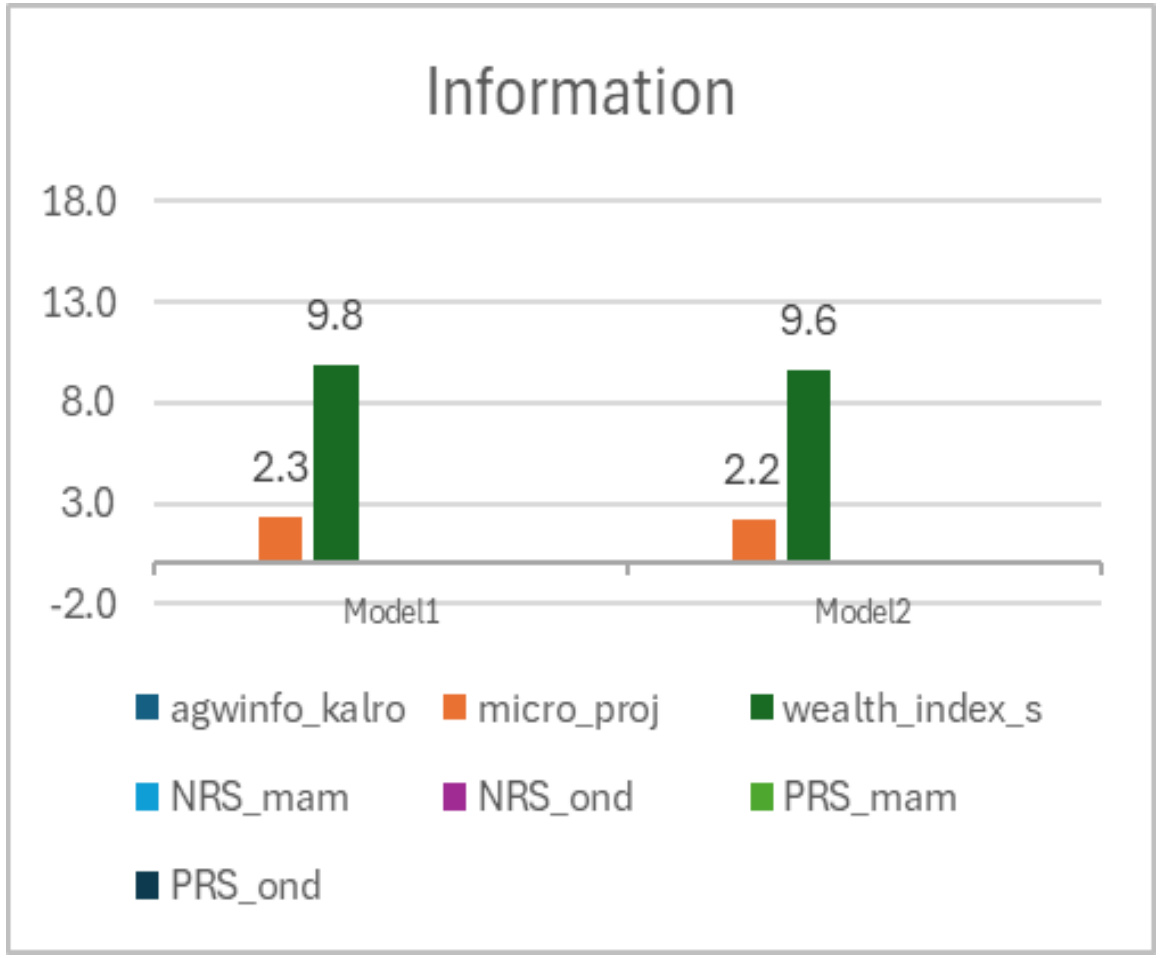
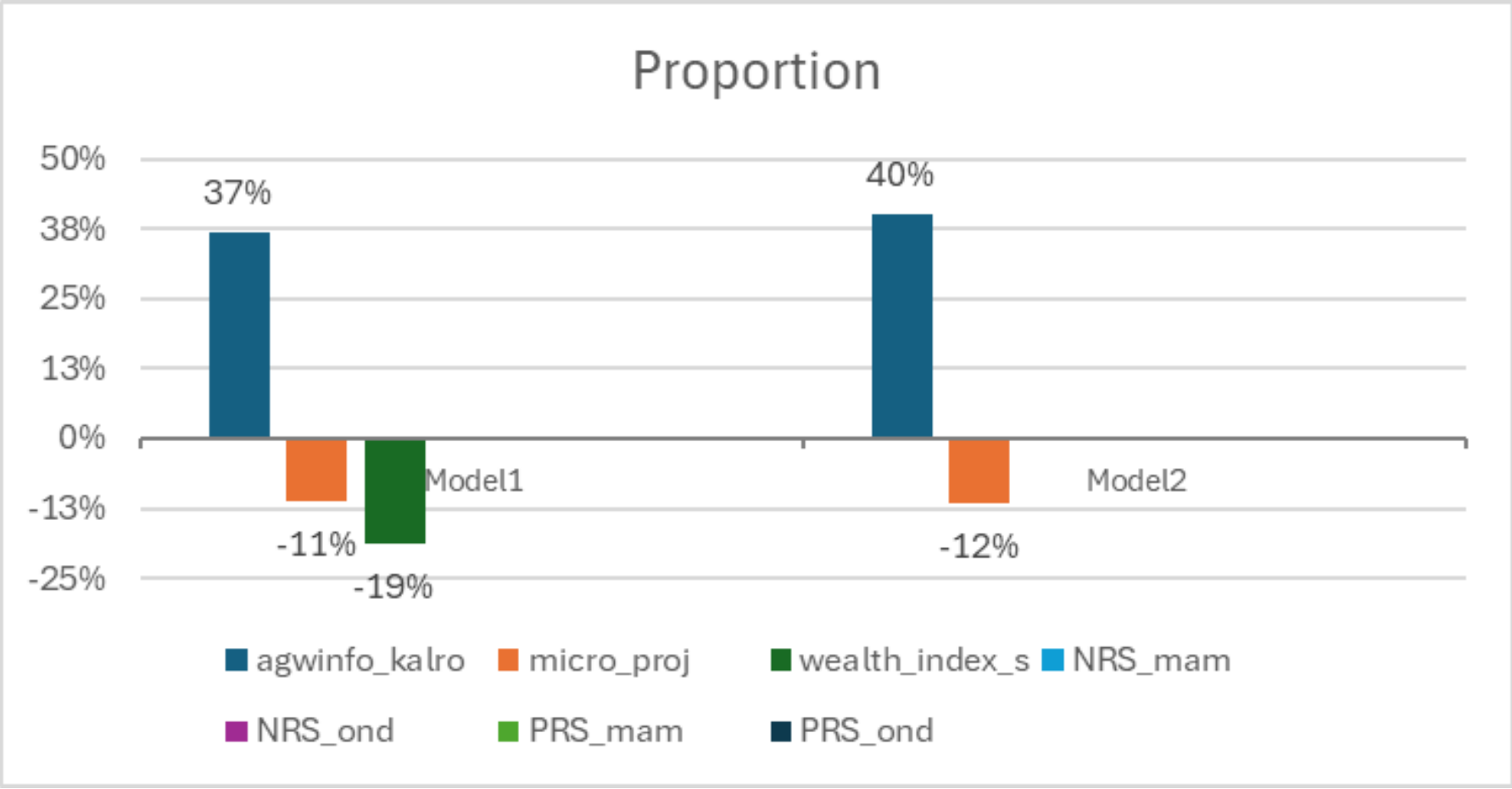
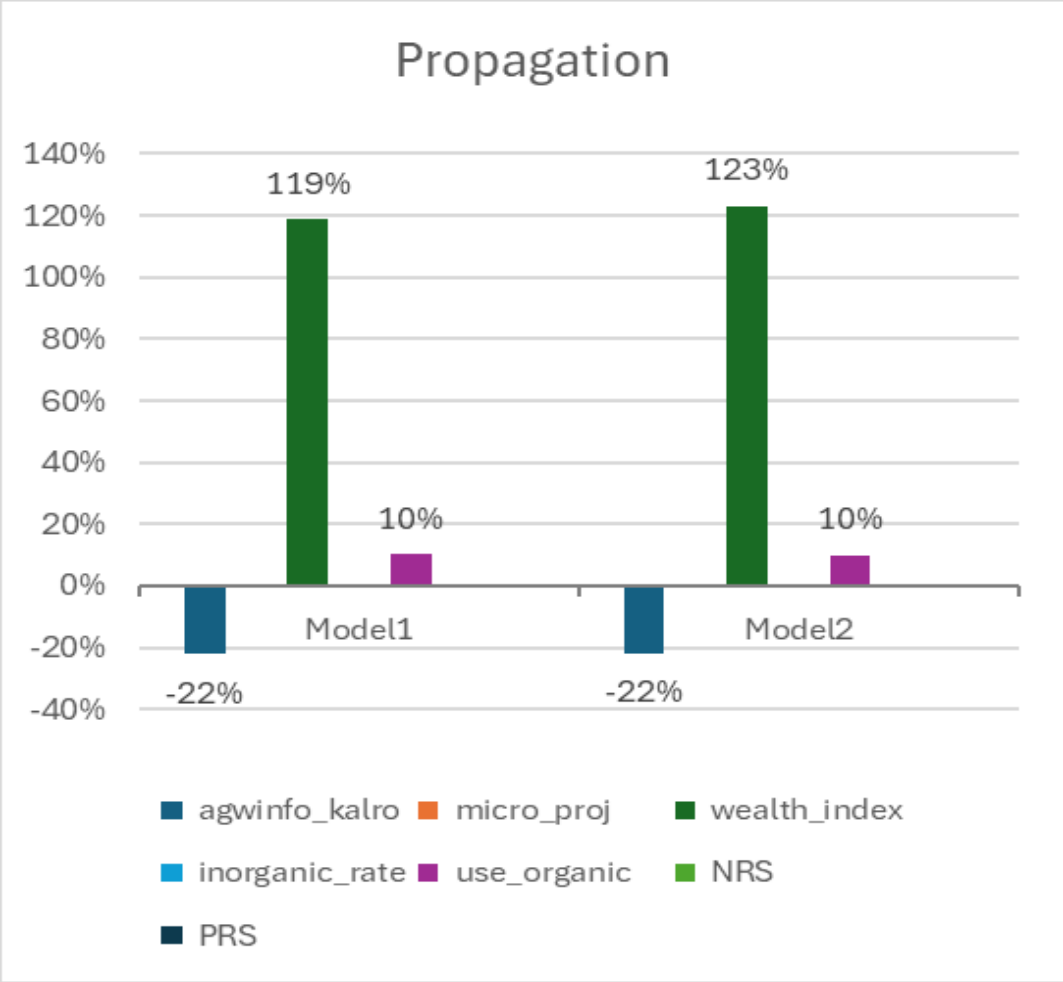


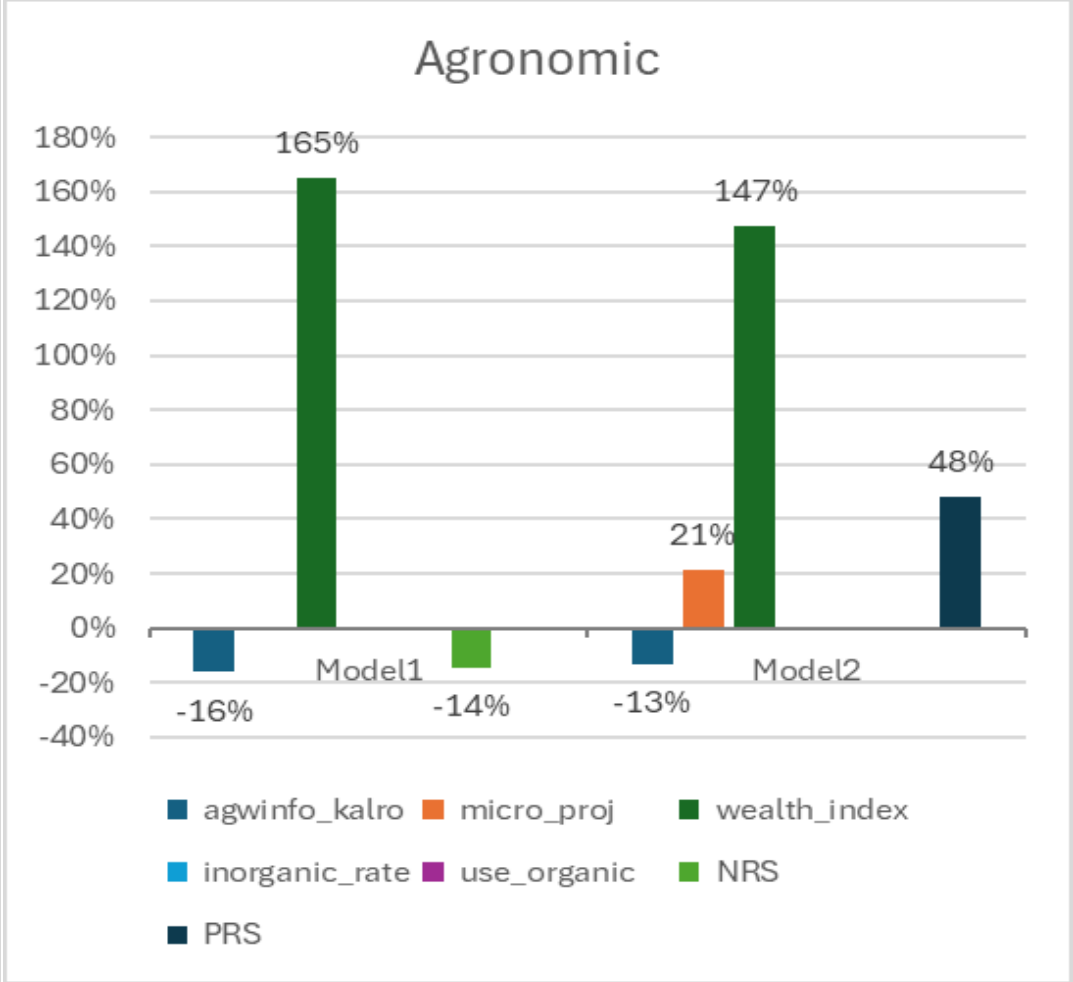


Dairy VC – Effect on proportion of milk sold



Irish potato VC – Effect on adoption of at least one TIMP





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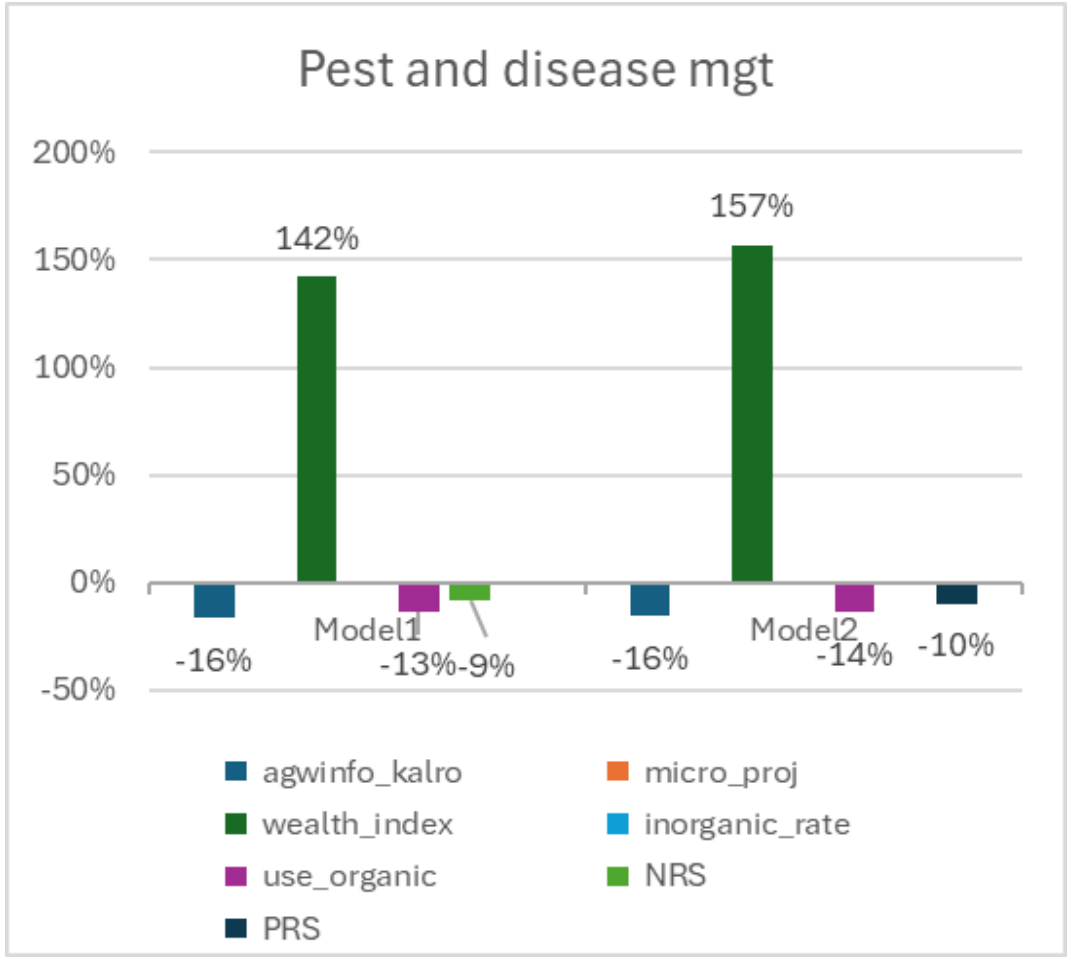
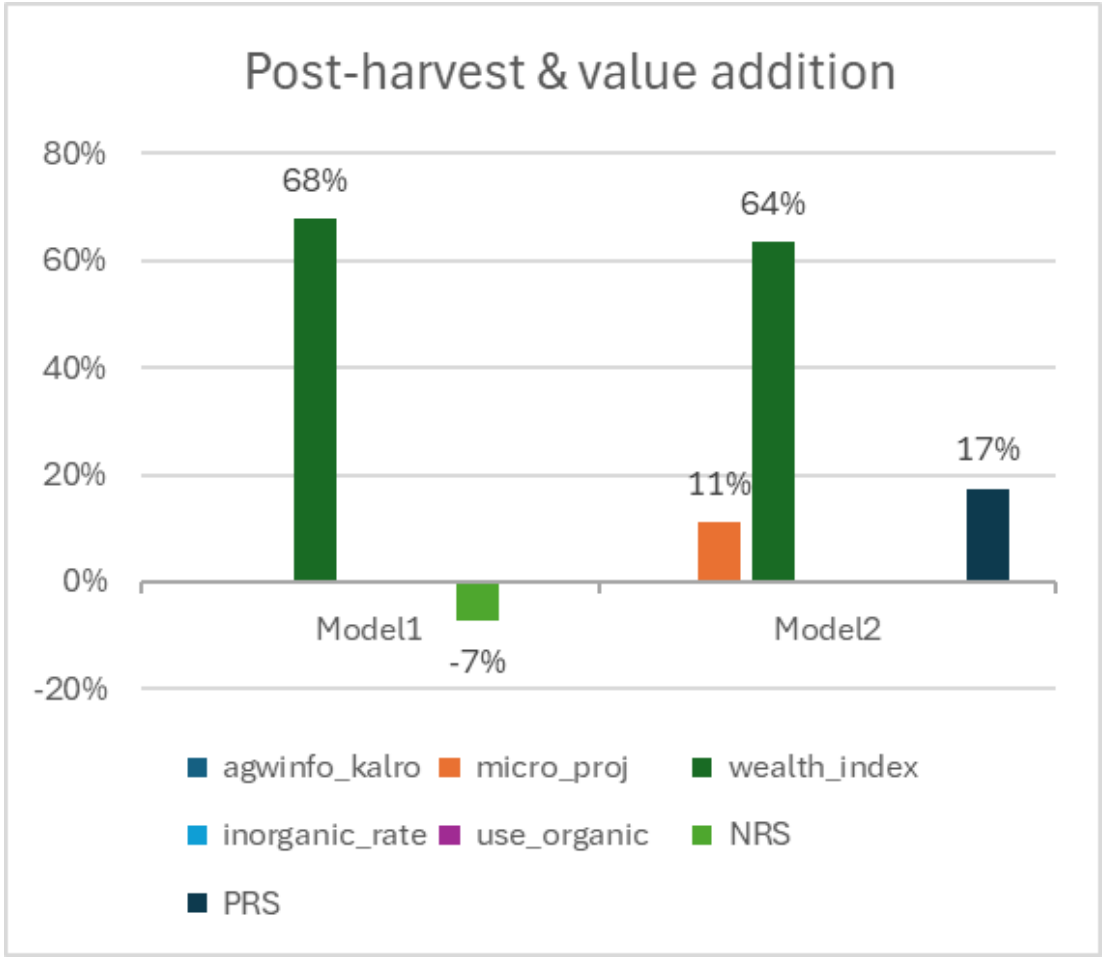
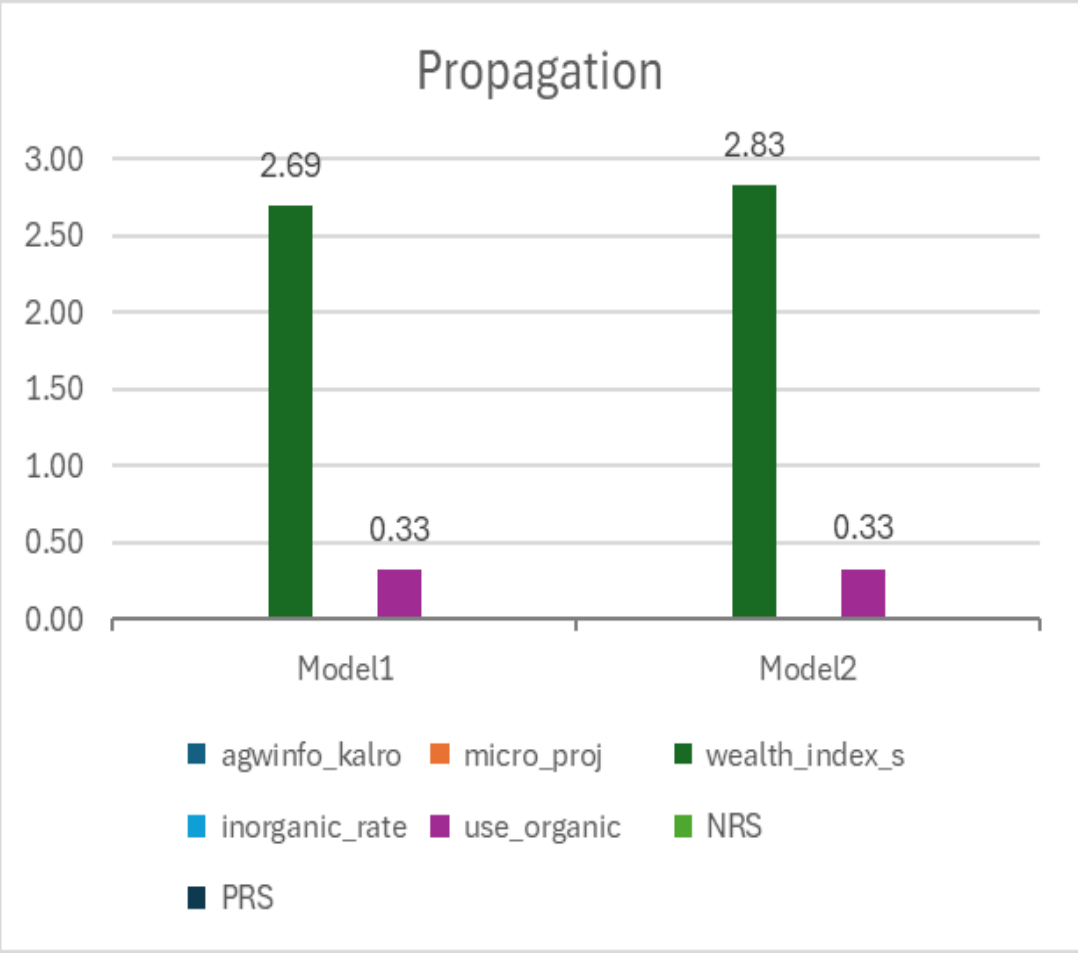
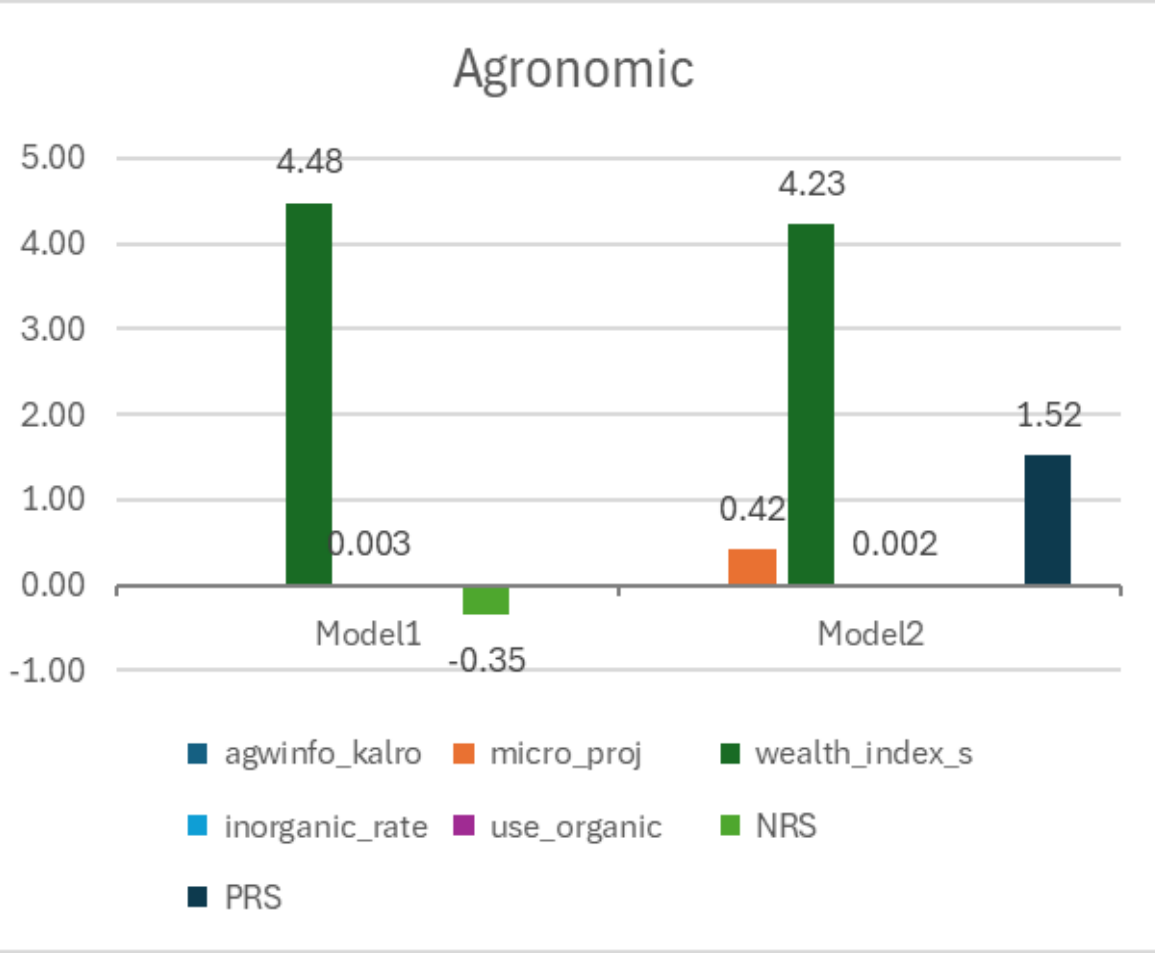




Irish potato VC - Effect on number of TIMPs adopted





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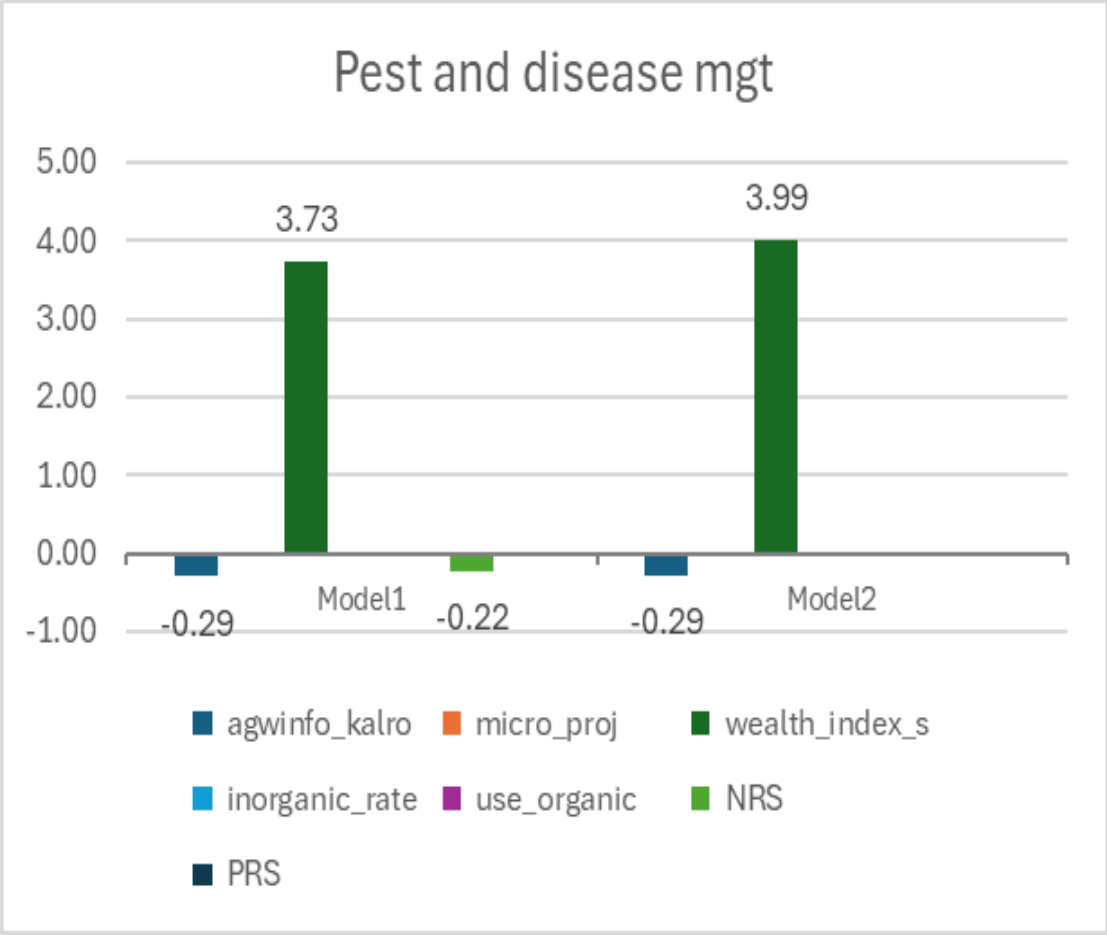
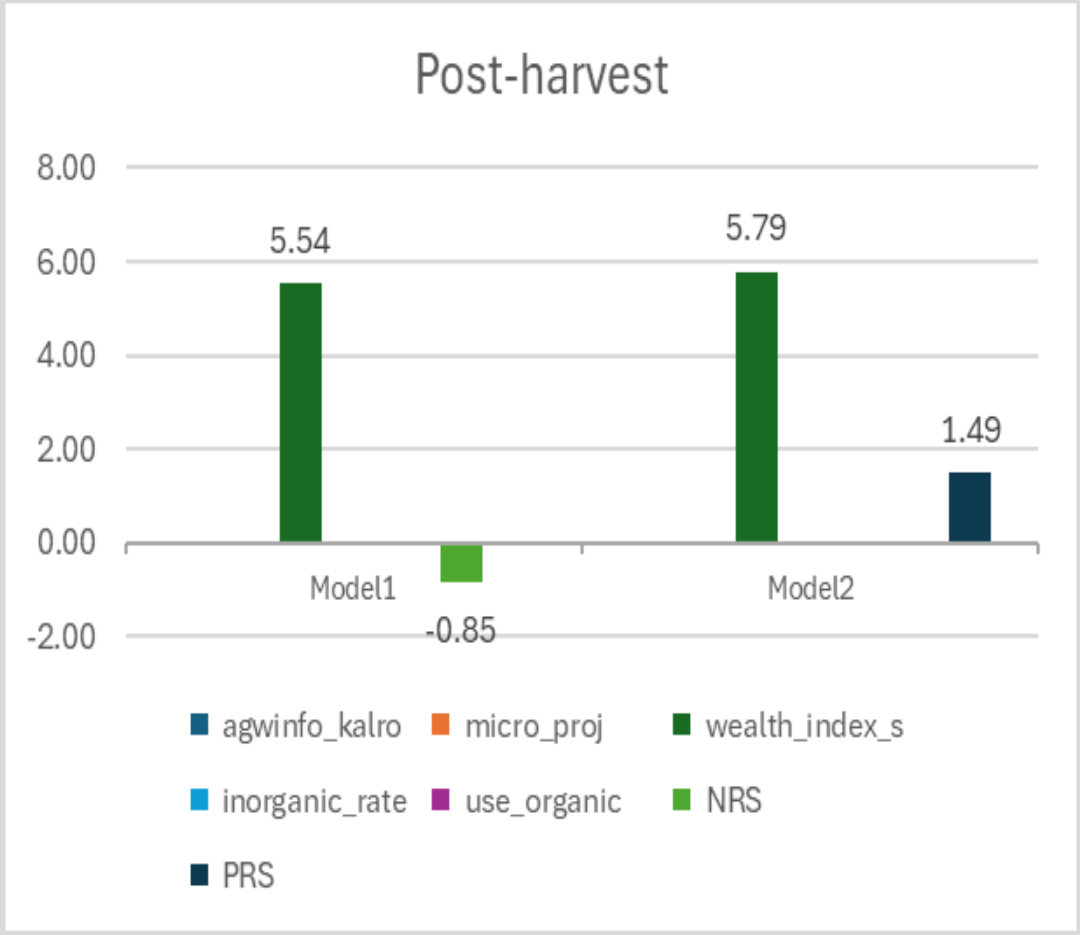
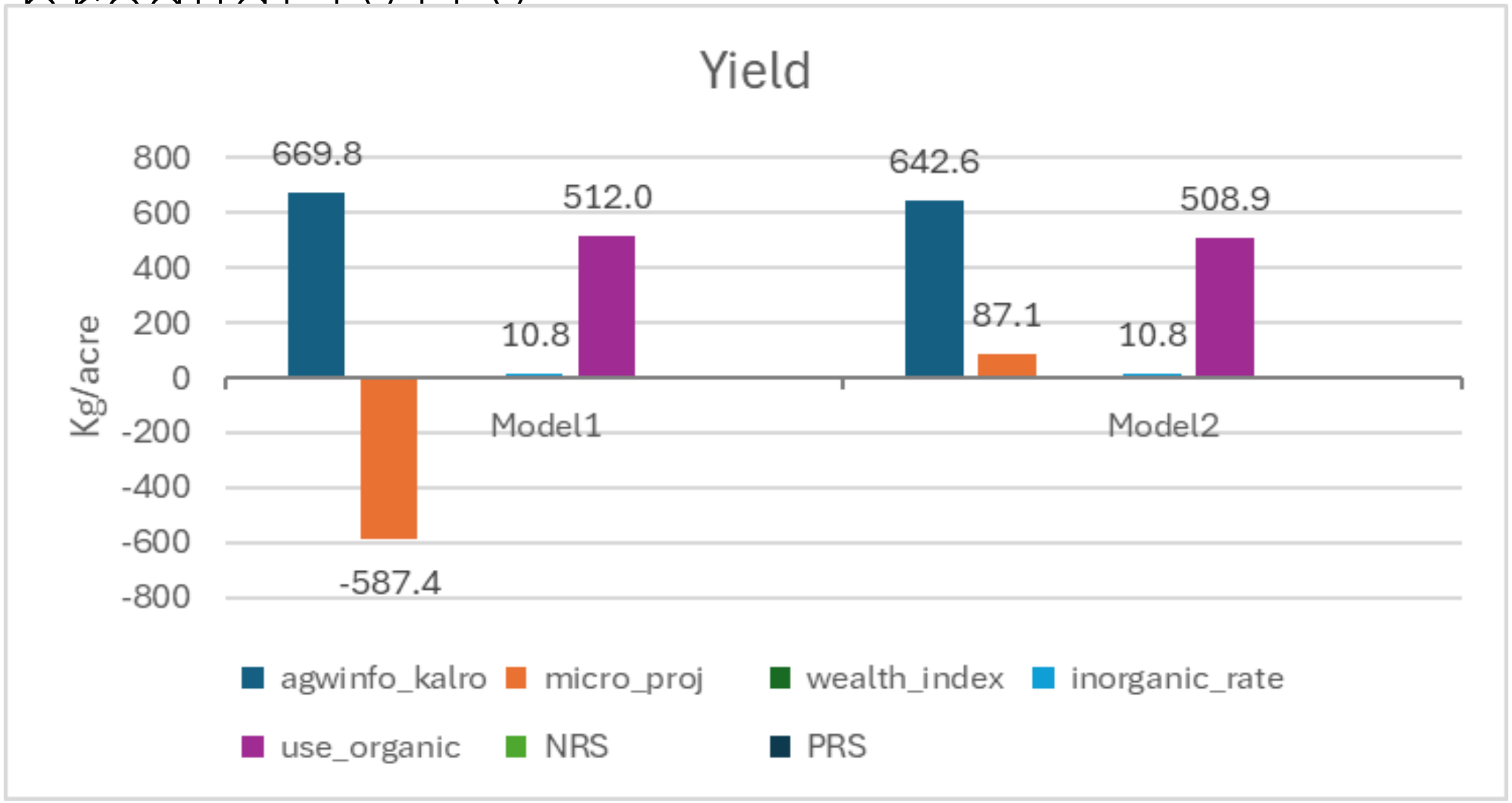
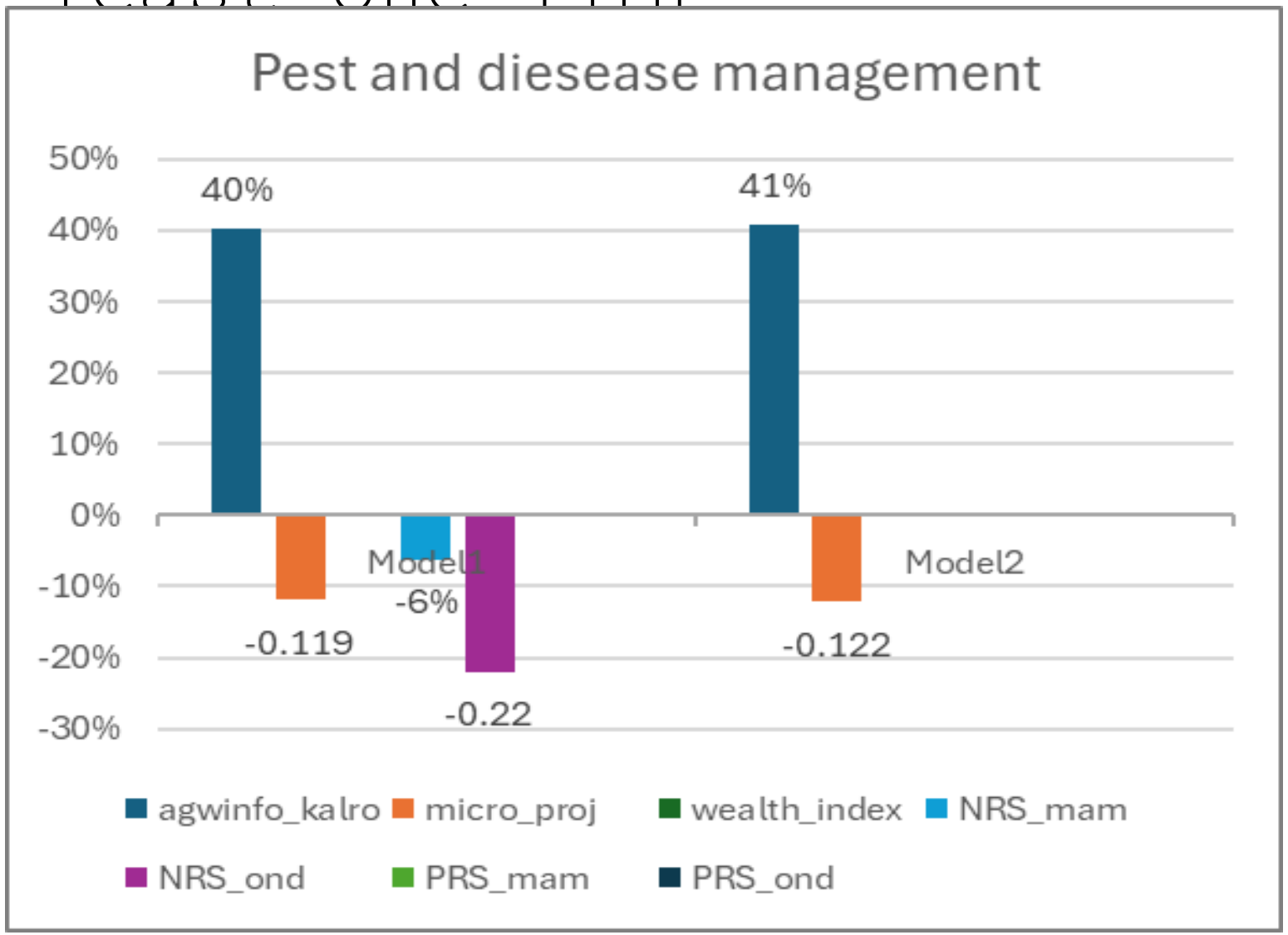




Irish potato VC - Effect on productivity



Dairy VC – Effect on adoption of at least one TIMP



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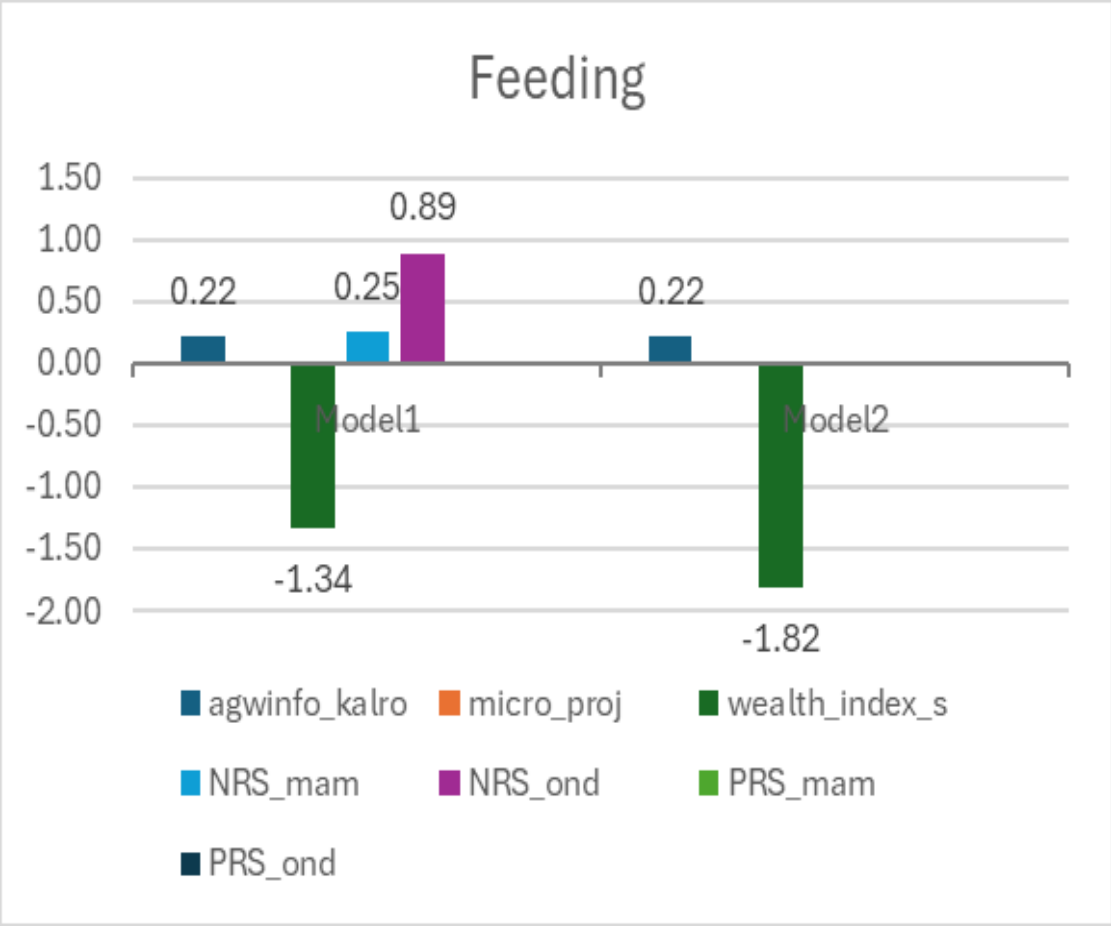

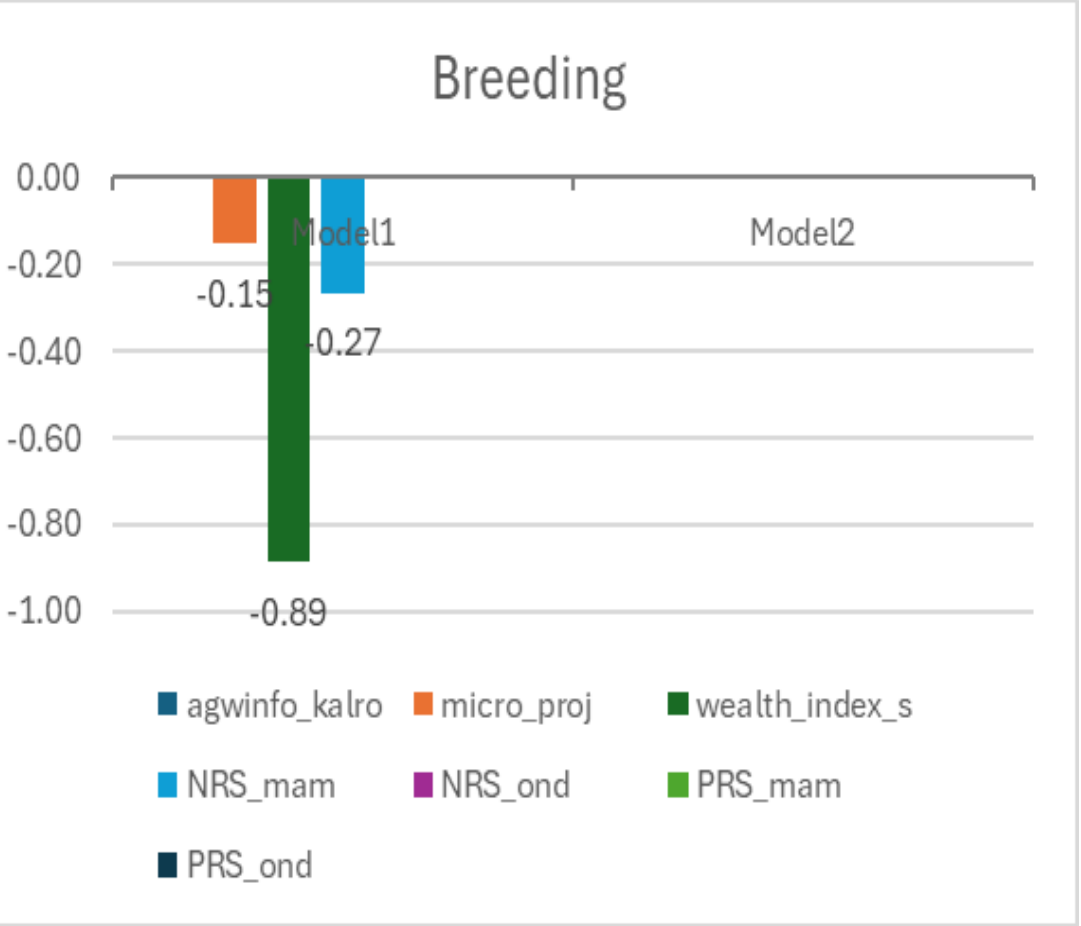

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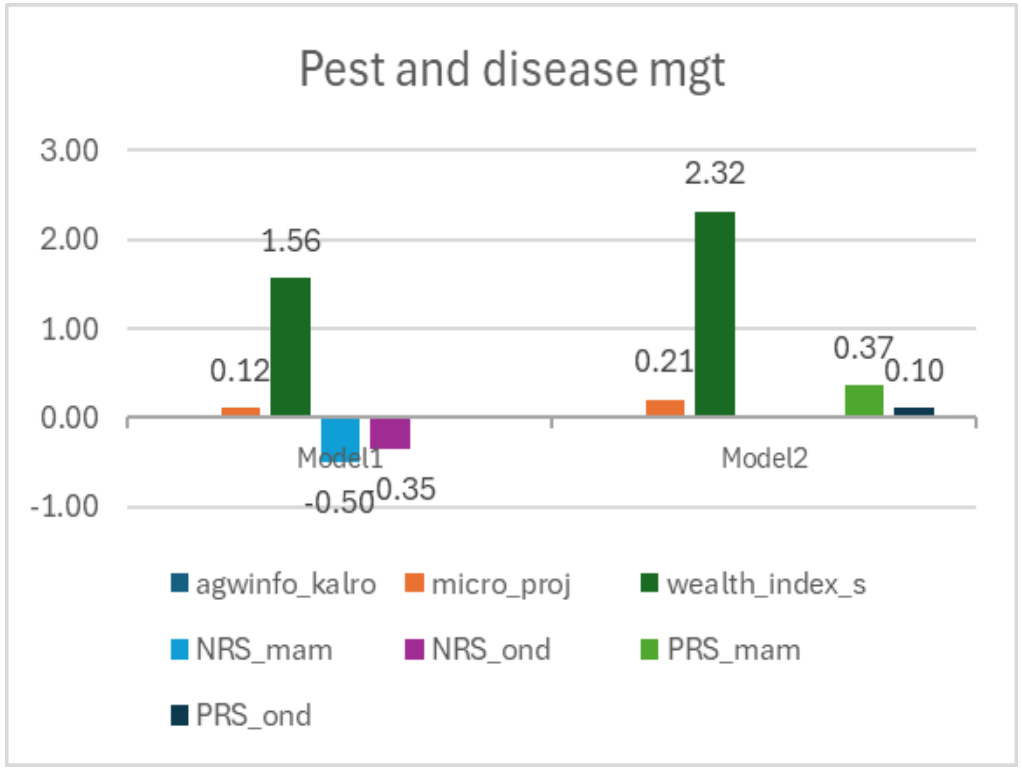

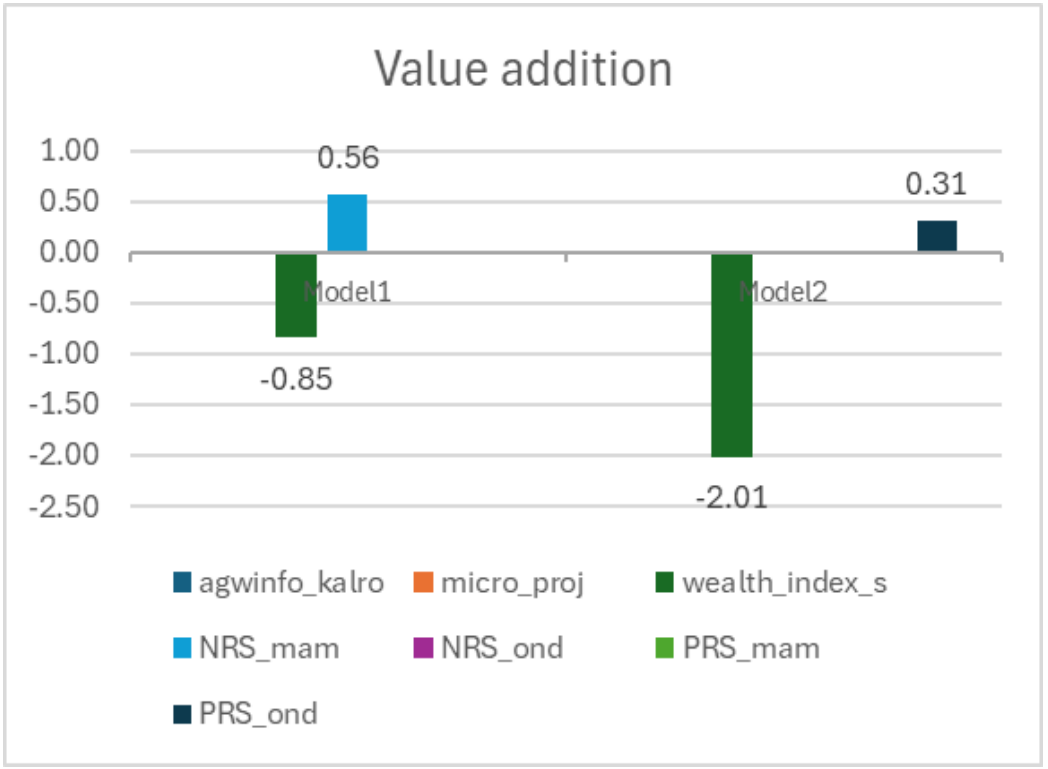

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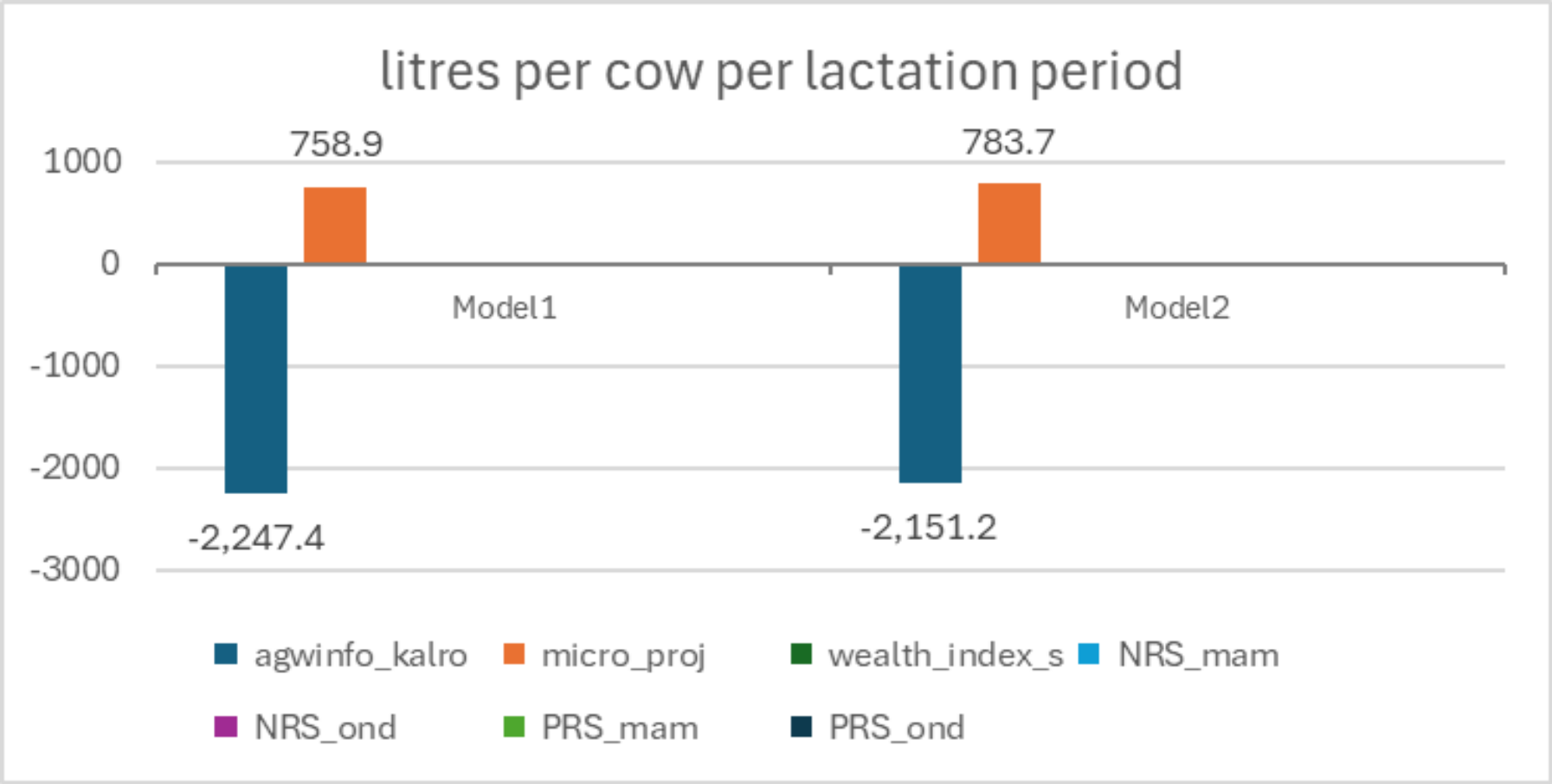

SUMMARY

- Late onset of rains and/or short length of seasons result to significantly low productivity, so dependable information on probability of the onset dates of the rainy season and length of growing season is critical

- Beyond rainfall variability which the agro-weather advisories sought to address, the experience of rainfall shocks is widespread in the study areas

- KALRO's intervention under KCASAP project caused an increase in farmers' access to agro-weather advisories

- Farmers' exposure to agro-weather advisories resulted in a statistically significant impact on adoption of TIMPs in some value chains but not others

- Lack of effect on productivity of indigenous chicken may be attributed to: i) deaths and fatalities due to partial or lack of sustained adoption of TIMPs (after initial adoption), particularly of TIMPs on pest and disease management

- The low or negative effect of a *micro-project* grant in most of the value chains

  Finding consistent with KCSAP project targeting – the project was intentional in picking wards that were less well off. The baseline data shows that farmers in KCSAP areas were less educated, dwellings were constructed with poorer/low-cost materials, belonged to fewer groups and had fewer income earning activities

- Wealth increased adoption of information TIMPs in the indigenous chicken value chain –

  Finding consistent with the finding that the micro-project, which targeted low resourced/poorer households, and TIMPs are costly to adopt – such as potato VC

- Negative effect of negative rainfall shock

  Associated with drought, heat stress which affects productivity in dairy cows (less fodder, diseases, lower fertility etc.

  In chicken value chain, heat stress impacts include: the reduction of egg production, egg quality, chicken feed intake, and increased mortality

CONCLUSIONS

- Digitalisation (ia SMS) resulted in increased farmer access to agro-weather advisories

- Exposure to the SMS-based agro-weather advisories had an impact

  Albeit mixed effect on productivity, with no effect in some value chains. mixed effect on uptake of TIMPs

- Wealth is important in adoption of TIMPs – still!

Why was the effect of agro-weather advisories not as envisioned?

i. Very generic advisories/messages sent to farmers
ii. Farmers are already aware about some of the TIMPs and have probably use or have dismissed
iii. After the household learns about the importance of a TIMP e.g drought tolerant varieties, other challenges kick in – e.g. poor access to improved seed , low quality inputs

RECOMMENDATIONS FOR IMPLEMENTATION OF CIS INTERVENTIONS

- **Feedback loop**/interaction with farmers
  - Incorporate feedback loops and encourage farmers to read/respond – make service interactive, not a one-way messaging service

- Higher frequency, higher resolution messaging & specificity of messages would have greater impact

- Close monitoring during implementation important

- Interrogate **impact pathway** to understand how weather-based advisories influence farmer decision; cause impact; & interact with other factors

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Many Areas Experienced a RAINFALL SHOCK!

Rainfall shocks	Season	Percent of wards (%) (n=70) Baseline Year	Endline Year
Negative	Main	**98.57**	**34.29**
	Short	4.29	2.86
Positive	Main	0	8.57
	Short	15.71	35.71
No shock	Main	1.43	57.14
	Short	80	61.43