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Impact Evaluation of The Innovation for Agribusiness (InovAgro) Project in Northern Mozambique

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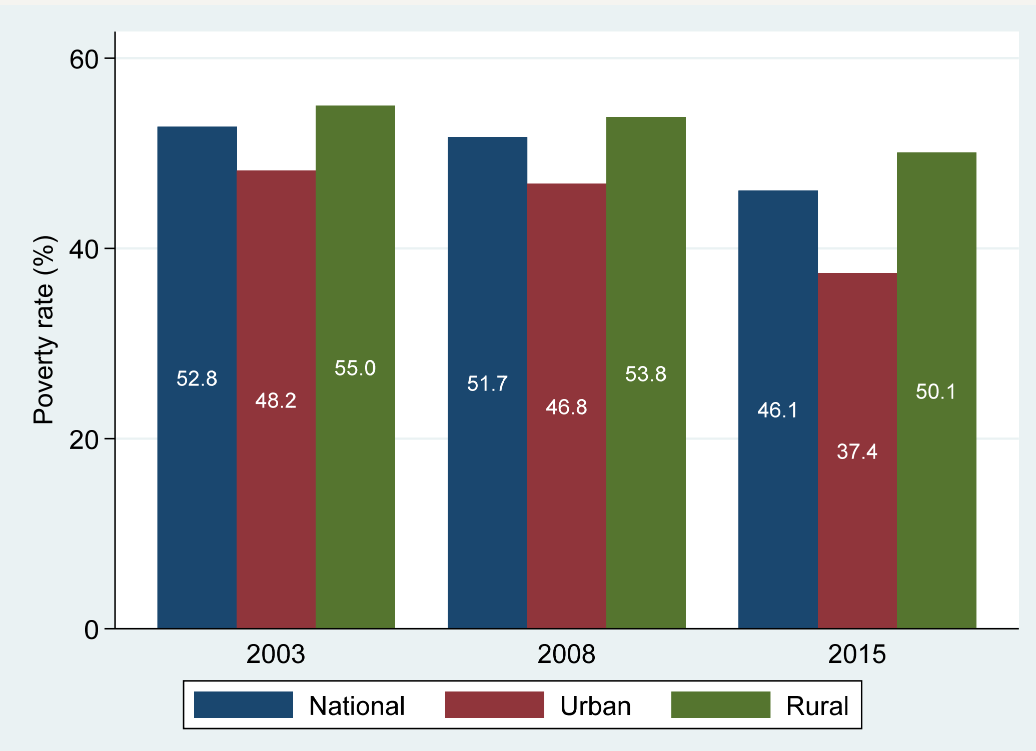
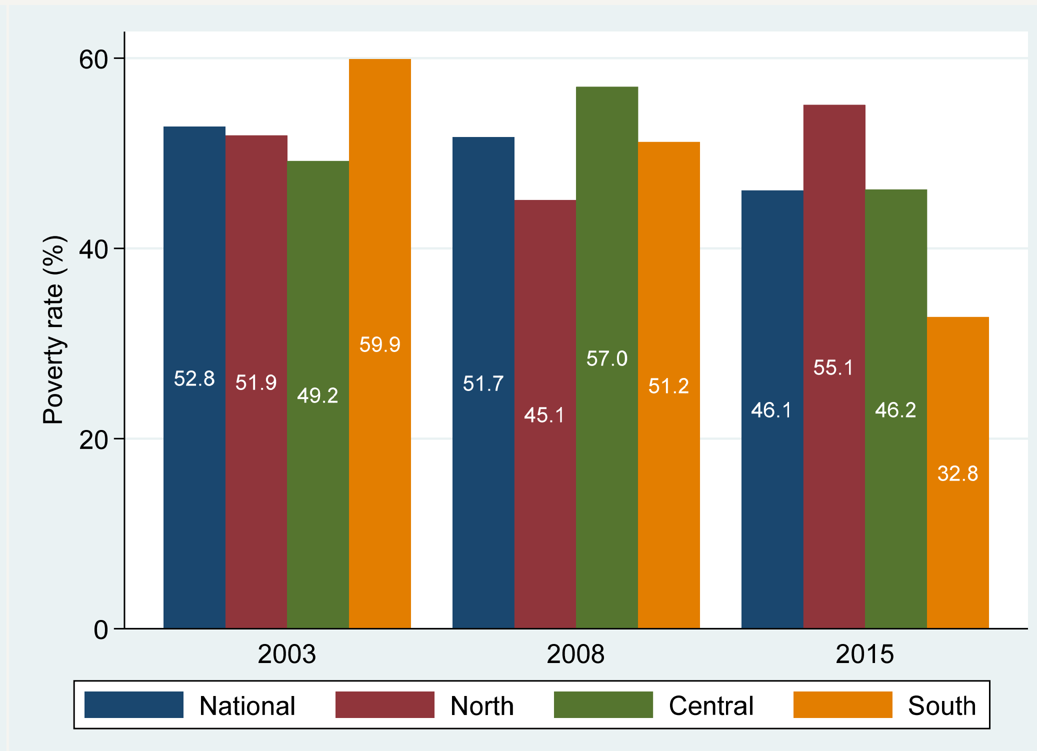
Presentation Structure

- Background and theory of change of the project;
- Challenges in impact evaluation of the InovAgro project;
- Mitigative measures taken;
- Empirical strategy;
- The household level impacts of the InovAgro project;
- The market level impacts of the InovAgro project;
- Conclusions and implications.

Background

- Poverty is higher in rural areas (50.1%) compared to urban areas (37.4%)
- Poverty is more pronounced in Northern and Central than in Southern





Background

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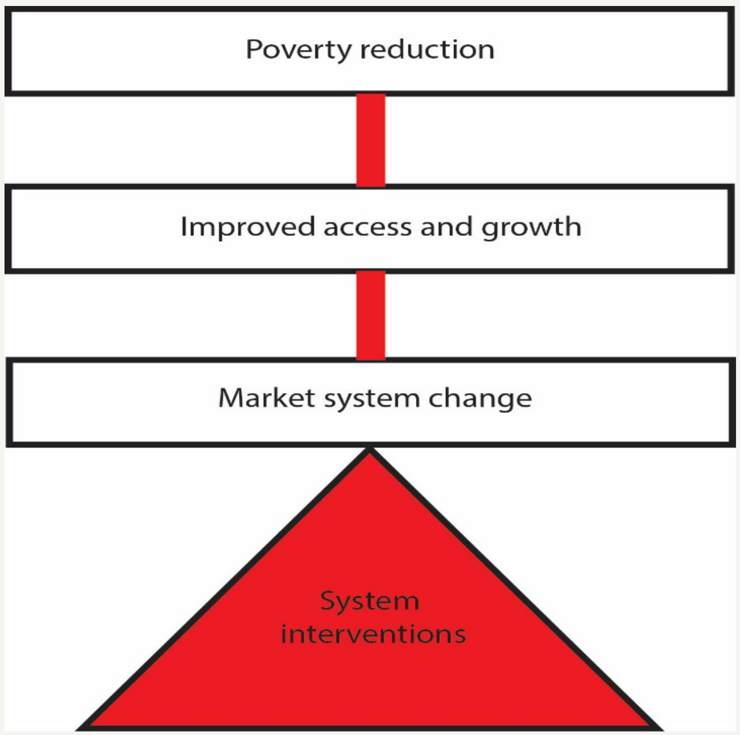
- Agriculture employs about 80% of the country’s labor force.
- Agriculture is characterized by production systems predominantly based on rain-fed coupled with low use of modern inputs which lead to low agricultural productivity;
- However, agriculture has the largest poverty elasticity estimated at -2.7%; more than threefold higher than that of other economic sectors;
- This suggests that agriculture has the largest potential for reducing poverty incidence;

Background

- The InovAgro project was designed aiming at
  - Increasing incomes for poor smallholder farmers in Northern Mozambique through
    - improved agricultural productivity and participation in selected high-potential value chains.
- The InovAgro project's primary approach is to promote the development of inclusive and sustainable market systems;
- This approach is also known as the **Market Systems Development (MSD)** approach;
- The objective of this impact evaluation is to assess the impact of the MSD approach on HH welfare of participating farmers.

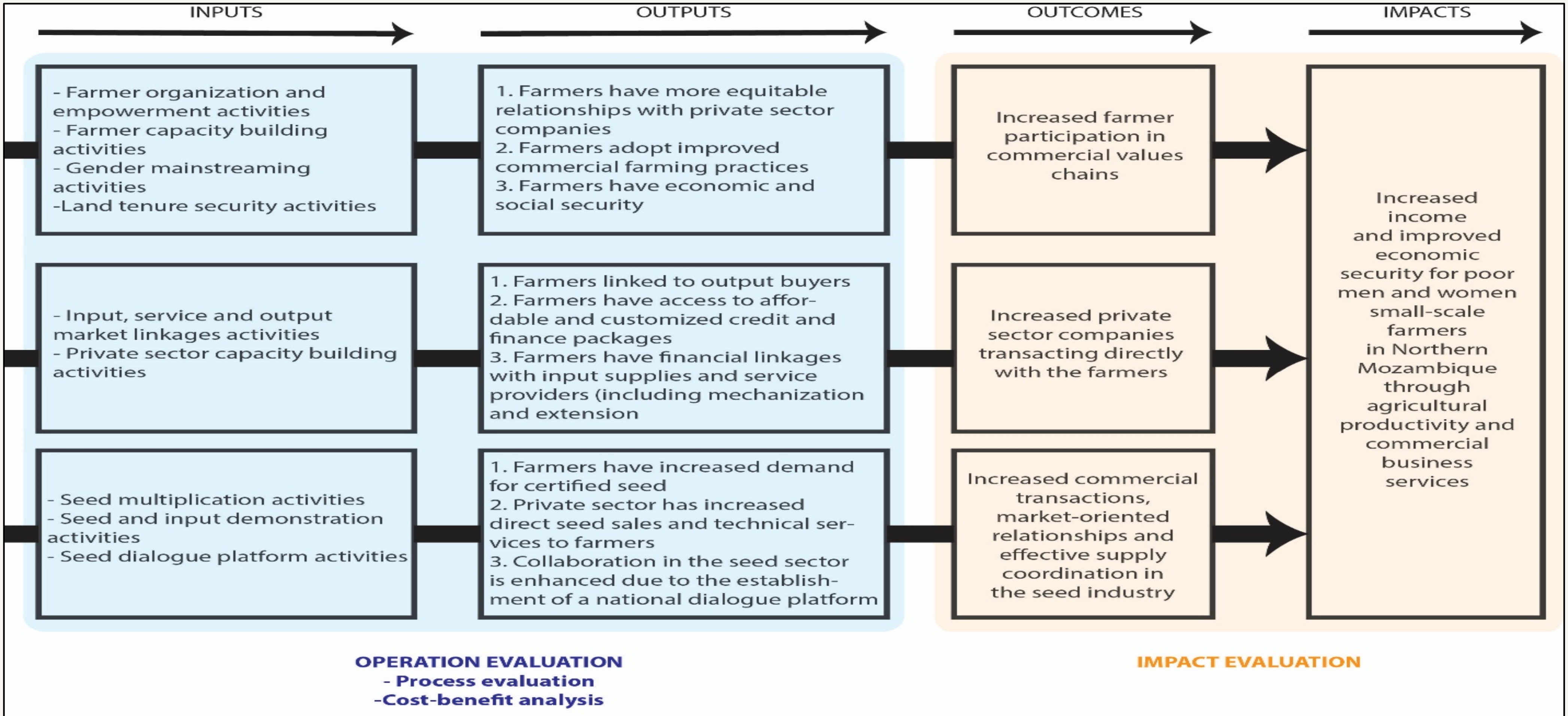
Theory of change of the project

- The InovAgro project consists of three phases
  - InovAgro I: A three-year pilot phase from 2011 to 2013;
  - InovAgro II: A four-year expansion phase from 2014-2017;
  - InovAgro III: A three-year wrap-up phase from 2018-2020.
- Generic MSD theory of change:



Theory of change of the project

- InovAgro has an articulated theory of change.



Source: Adapted from DAI (2013)

Challenges in the impact evaluation

- The initial design: Randomized Controlled Trial (RCT)

- RCT approach was not feasible from an operational perspective mainly due to:
  - Ethical issues: issues involved with exclusion of subjects for a control group

  - Challenges associated with the project implementation
    - Selection bias issues;
    - Contamination effects:

  - Challenges associated with level of impact (scope)
    - Beneficiary versus institutional/systemic level effects
    - The longer the project period the more susceptible to challenges of spillover and contamination;
    - MSD programs usually are designed to have systemic level effects that are prone to unintended effects (positive or negative)

- Not accounting for the potential discrepancy between treatment and intention to treat could understate the impact of the intervention.

Mitigative measures taken

- To account for such potential bias,
  - Three-wave HH panel dataset of intended beneficiary and nonbeneficiary HHs with “intention-to-treat” data are used as an instrument for treatment (Abadie et al. 2002);
  - Supplemented with a unique geo-reference census data of every value chain interventions
  - Define a median distance to these value chain interventions (60 minutes in our case) to define catchment area of the intervention/treatment.

Mitigative measures taken

- Even after such careful approach for definition of treatment, major challenges remain:
  - Natural learning;
  - Self selection, program targeting;
  - The adaptive nature of MSD programs:

- Causes for concern in making causal inferences (or differentiating contribution [correlation] versus attribution [causality]);

Mitigative measures taken

- To isolate InovAgro effects and account for possible influence of external factors, we utilized a before-and-after intervention data and employ a difference-in-difference (DID) approach;
- To disentangle the potential effects of InovAgro from other similar MSD programs, we analyze the number of years since operation (using GIS census data).
  - comparing InovAgro sponsored MSD value chain interventions with those MSD programs that are not directly affiliated with InovAgro;
- Hence, the validity of our identification strategy (our ability to claim causal inferences) depends on whether InovAgro has had an overall systemic (crowding-in) effect;
- Propensity score matching (PSM) was used to produce comparable sub-samples of beneficiary and non-beneficiary HHs;

Empirical strategy

- DID estimation technique to assess the impact of the exposure to InovAgro on selected outcomes using the following regression model:

$$Y_{ijt} = \beta_0 + \beta_1 T_t + \beta_2 C_j + \gamma C_j \times T_t + \varepsilon_{ijt}$$

Y_{ijt} denotes the outcome variable of interest;

T_t is a dummy variable equal to one if year equal to 2017 and zero if year equal to 2015;

C_j is a dummy variable equal to one if community was exposed to InovAgro (treatment community) and zero otherwise (control community);

ε_{ijt} is a random error with mean zero and constant variance;

Empirical strategy

- We assessed potential InovAgro project impacts on (**outcome variables**):
  - Adoption of modern farm practices;
  - Access to agricultural (input and output) market information;
  - Agricultural productivity and marketing;
  - Income diversification and overall HH welfare; and
  - Empowerment of women and other vulnerable groups (youth): Unintended (positive or negative) effects;

Empirical strategy

- One of the key assumptions behind the DID approach is that other covariates – rather than the InovAgro project – do not change between the baseline and midline surveys;
  - However, this assumption is violated in our case.

- We controlled for HH-level characteristics that could affect the difference in trends between treatment and control groups by modifying the above regress as follows:

$$Y_{ijt} = \beta_0 + \beta_1 T_t + \beta_2 C_j + \gamma C_j \times T_t + \boldsymbol{\beta}_3 \mathbf{X}_{ijt} + \varepsilon_{ijt}$$

$\mathbf{X}_{ijt}$ represents a set of HH-level characteristics that could influence outcome variables of interest;

Empirical strategy

- Estimating the average outcome variable among beneficiary HHs, had they not benefited from the InovAgro project suffers from the selection bias problem;
- We control for this selection bias by using the propensity score matching (PSM) approach;

Data

- The treatment unit is the community (*comunidade*). Four communities were selected in each district where InovAgro's intervention carried out;
- All selected treatment communities were located in the same administrative post within each district;
- The control communities were selected from comparable localities in a different administrative post from where the treatment communities are located;

Data

- A different administrative post were selected for the control communities to limit spillovers effects;
- The HH listing information, and the extent of soybean and pigeon pea cultivation was used to select the final set of both treatment and control areas and control communities;
- The final sample was drawn from 16 communities in four administrative posts in two districts.

Data

- Initial estimated sample size of 1,886 HHs, of which 937 from the treatment communities and 949 from the control communities (baseline survey);

- Sample size dropped to 1,733 HHs (880 from the treatment communities and 853 from the control communities) between the baseline survey (2015) and endline survey (2019);

- Overall attrition rate of 8.1% between the baseline survey (2015) and endline survey (2019);

Data

- Using a geographic boundary (community boundary) to define treatment remains a major methodological challenge;
  - HH presumably residing in a control community could be located within close proximity to an InovAgro sponsored intervention in one of the treatment communities.

- Hence, geo-spatial data (collected during the midline & endline survey) was used to define "physical accessibility" as an identification strategy to define comparable treatment and control HHs;

Data

- To assess the potential InovAgro effect on **overall macro (market) level** effects, we combined primary, secondary and geo-referenced data;
  - HH presumably residing in a control community could be located within close proximity to an InovAgro sponsored intervention in one of the treatment communities.

- Complementary data was also acquired via key informant interviews (KIIs) and focus group discussion (FGD with local stakeholders;

- These approaches allowed us to group all geo-referenced value chain intervention into three groups:
  1. MSD – InovAgro facilitated;
  2. MSD – Non-InovAgro facilitated; and
  3. Non-MSD value chain interventions.

Results: HH level InovAgro impacts

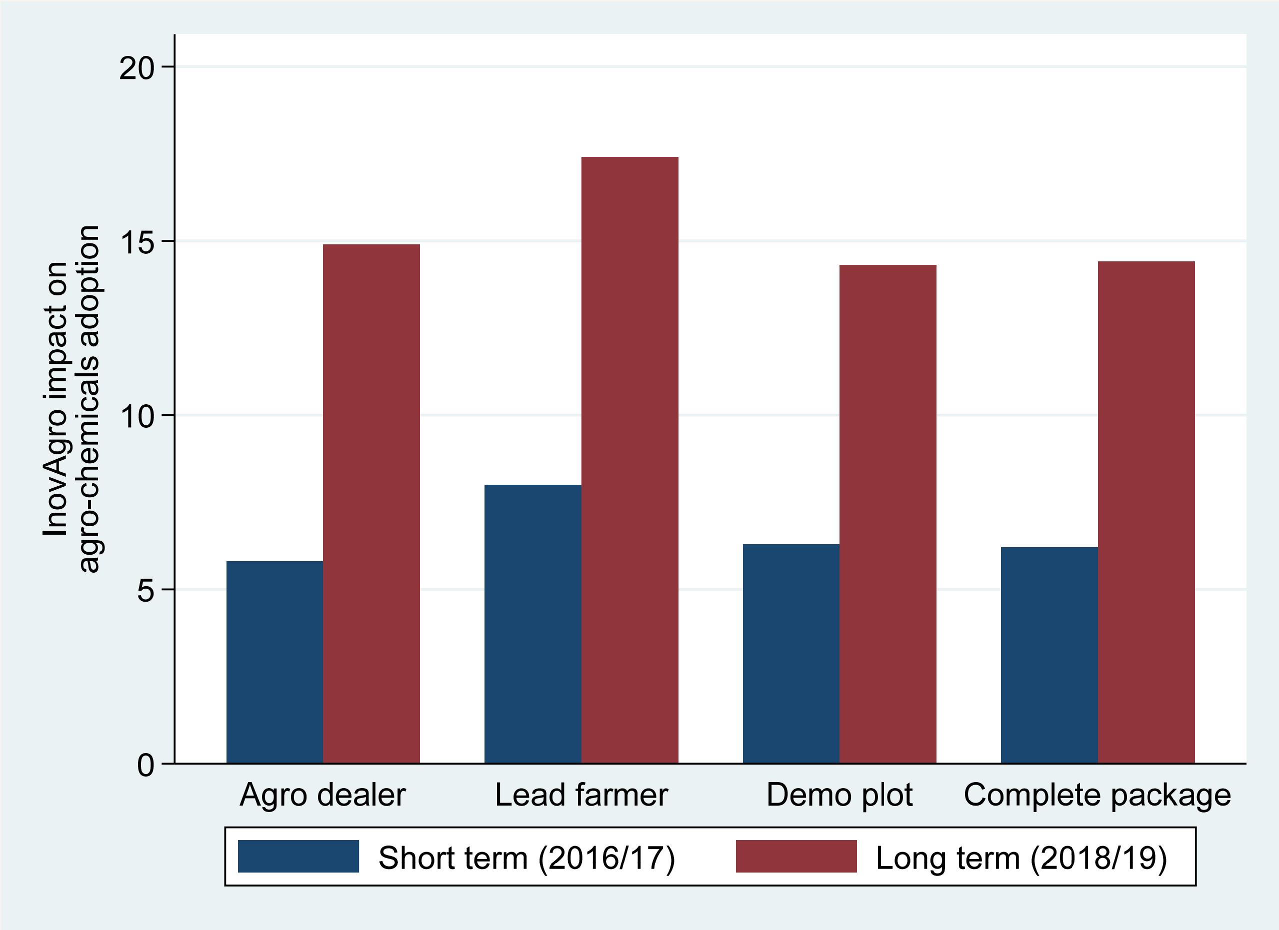
- We differentiate whether the channel of intervention (agro-dealer, a lead farmer or a demonstration plot; and exposure to the three value chain interventions simultaneously) plays any role in dictating the magnitude of program outcome;

- We defined treatment based on exposure to each of three value chain interventions and compare the magnitude of impact with those HHs that have benefited from exposure to the three value chain interventions simultaneously;

- We also aim to differentiate potential differences on short-term (a two-year gap) versus long-term (a 4-year gap) impacts.

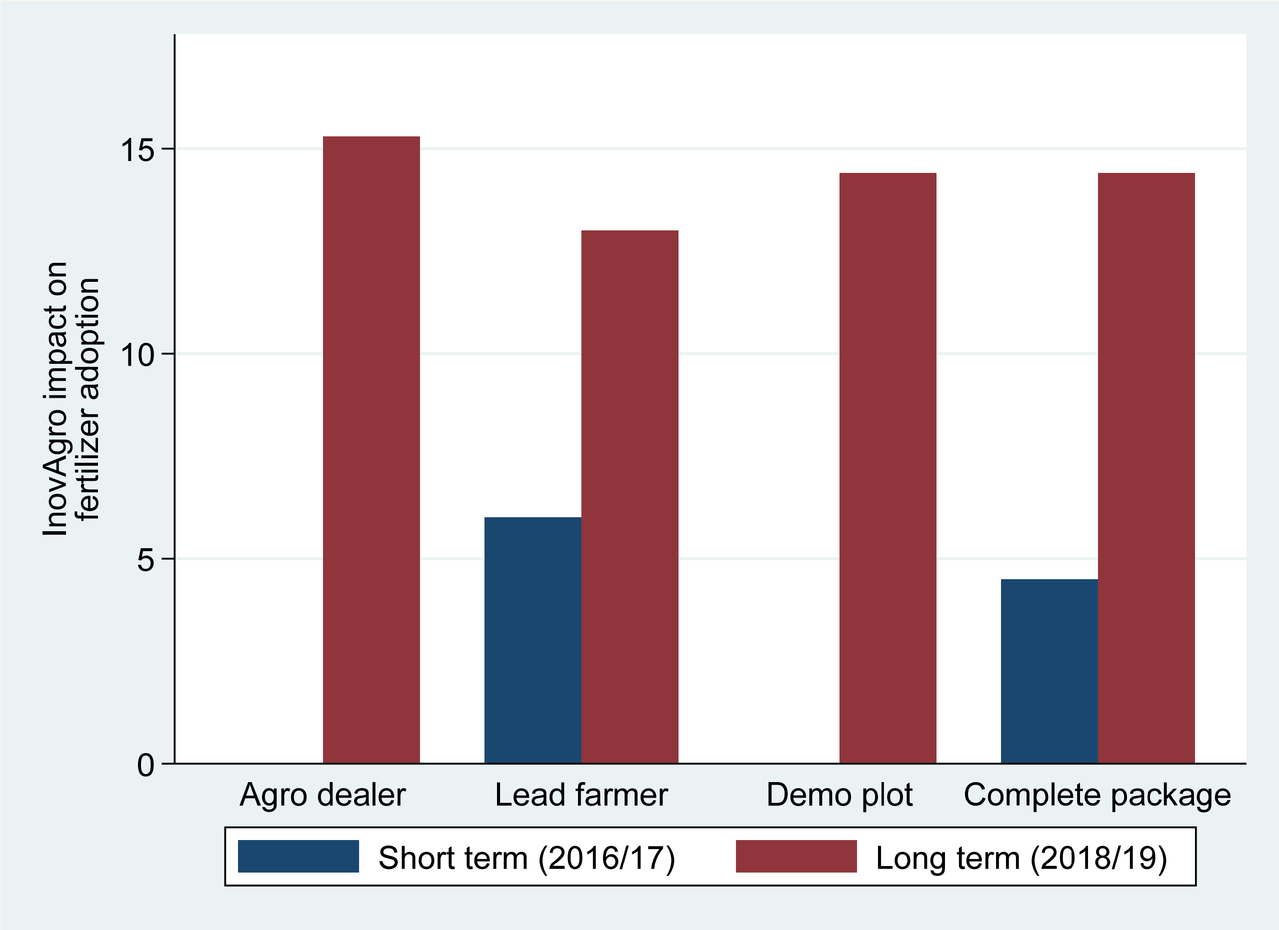
Results: HH level InovAgro impacts

- InovAgro has a positive and significant impact on HHs' likelihood of adopting (using) agro-chemicals like pesticide, herbicide, etc



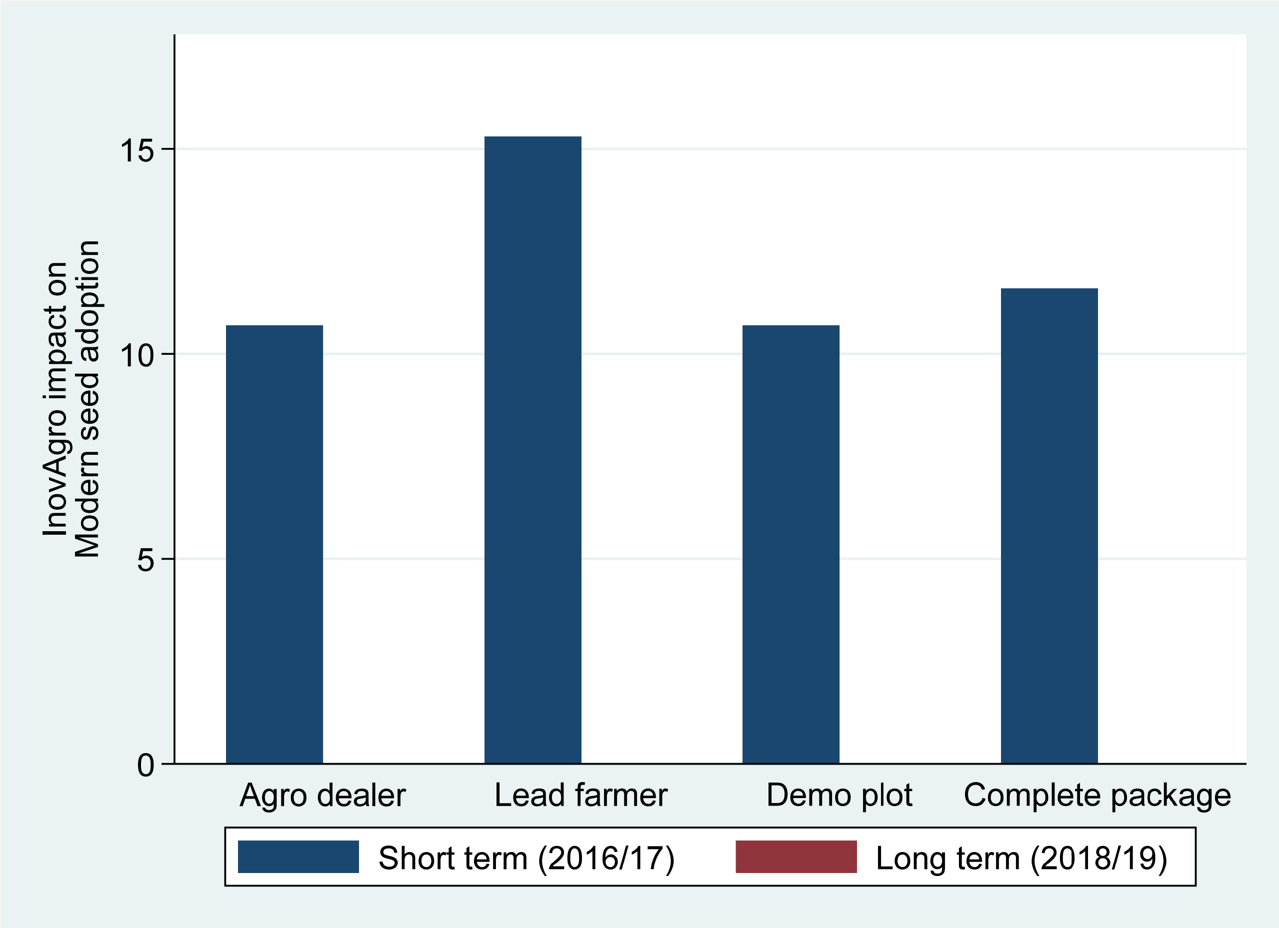
Results: HH level InovAgro impacts

- The likelihood of fertilizer adoption within 2-years after InovAgro exposure seems to depend on project beneficiaries getting exposure to the complete package



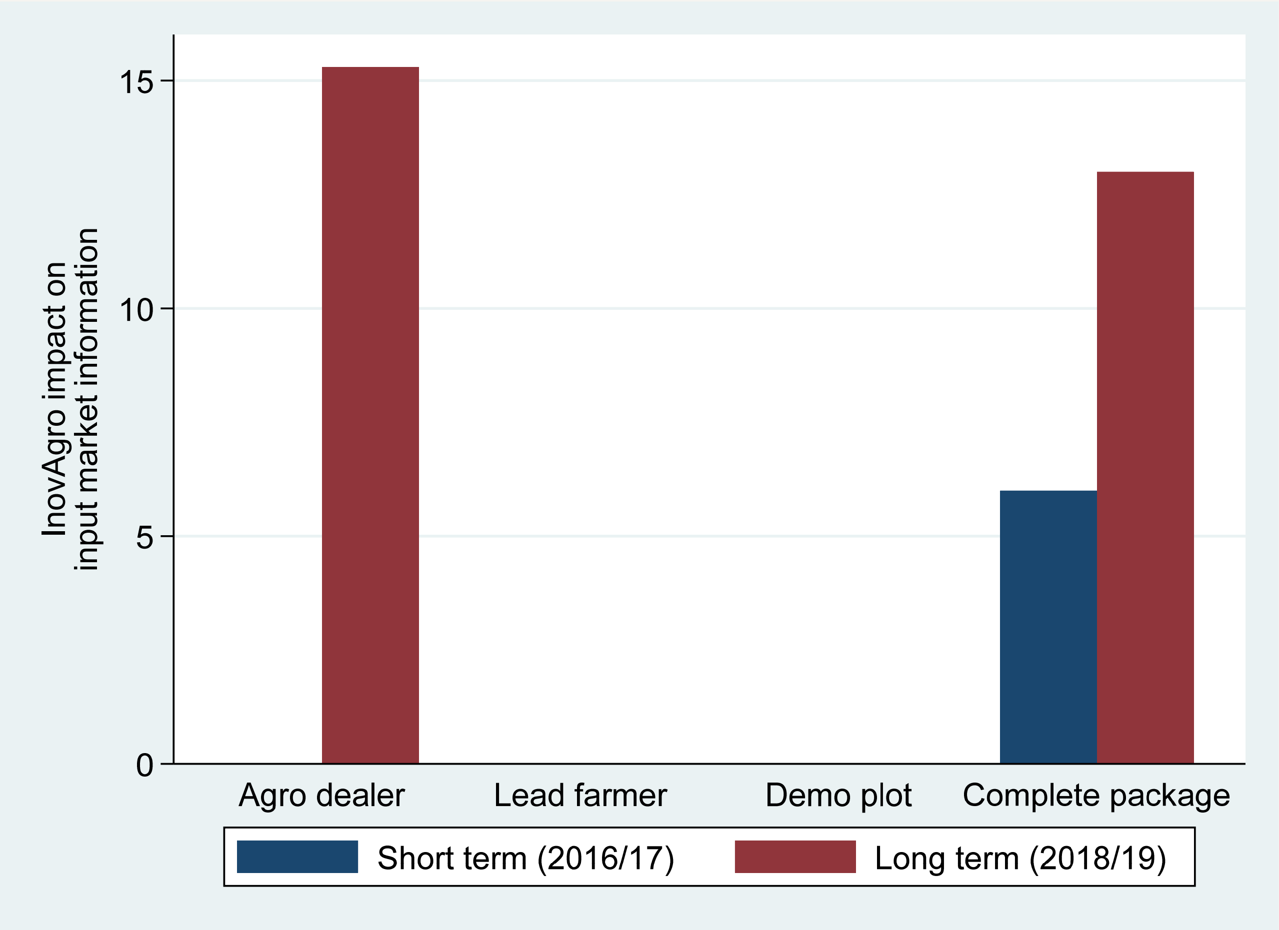
Results: HH level InovAgro impacts

- The positive InovAgro effect is wiped out in the long-term as the impact remains positive but not significant



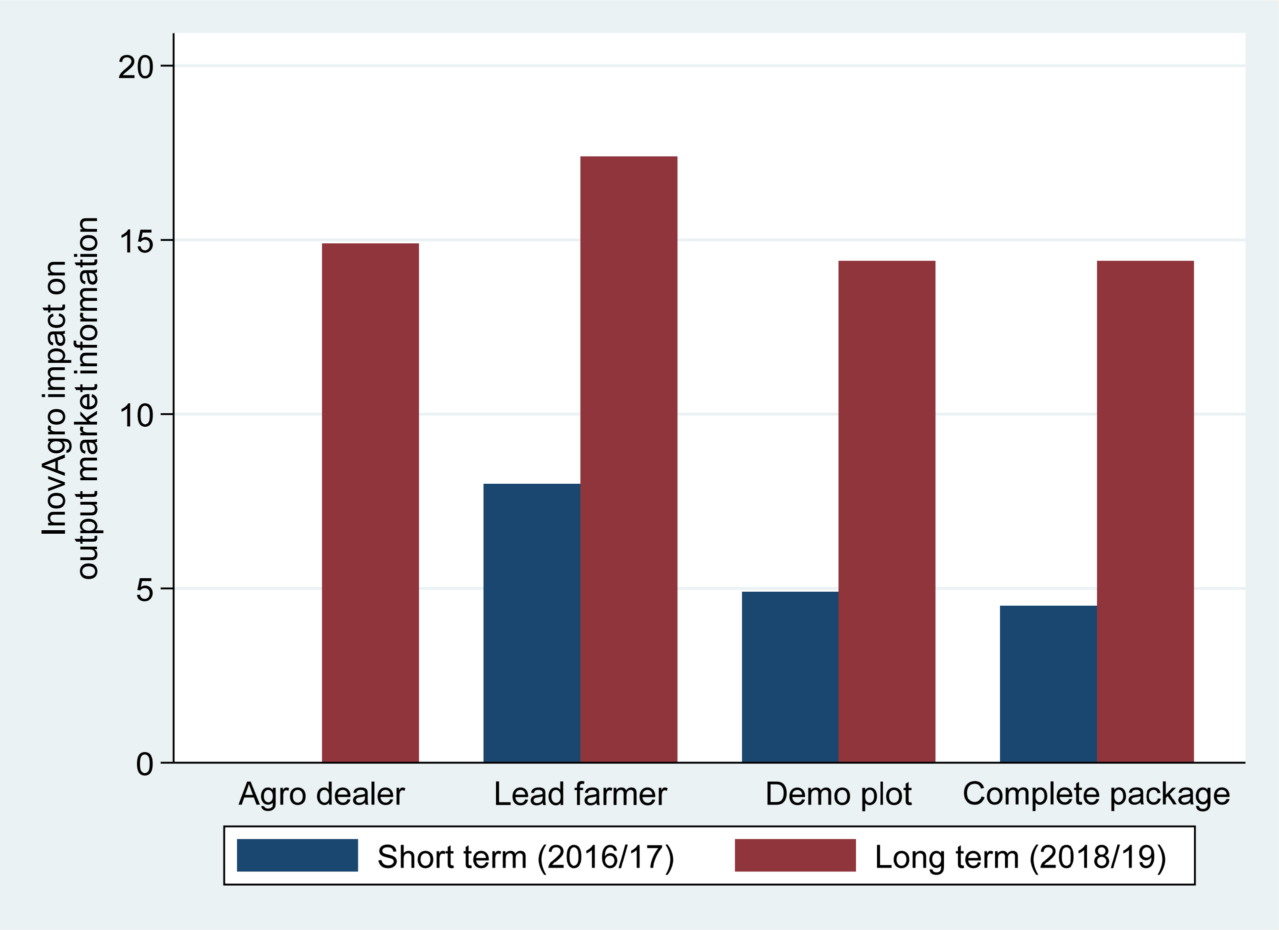
Results: HH level InovAgro impacts

- The positive and significant InovAgro effect on access to agricultural input market information for beneficiary HHs who are exposed to all three value chain interventions



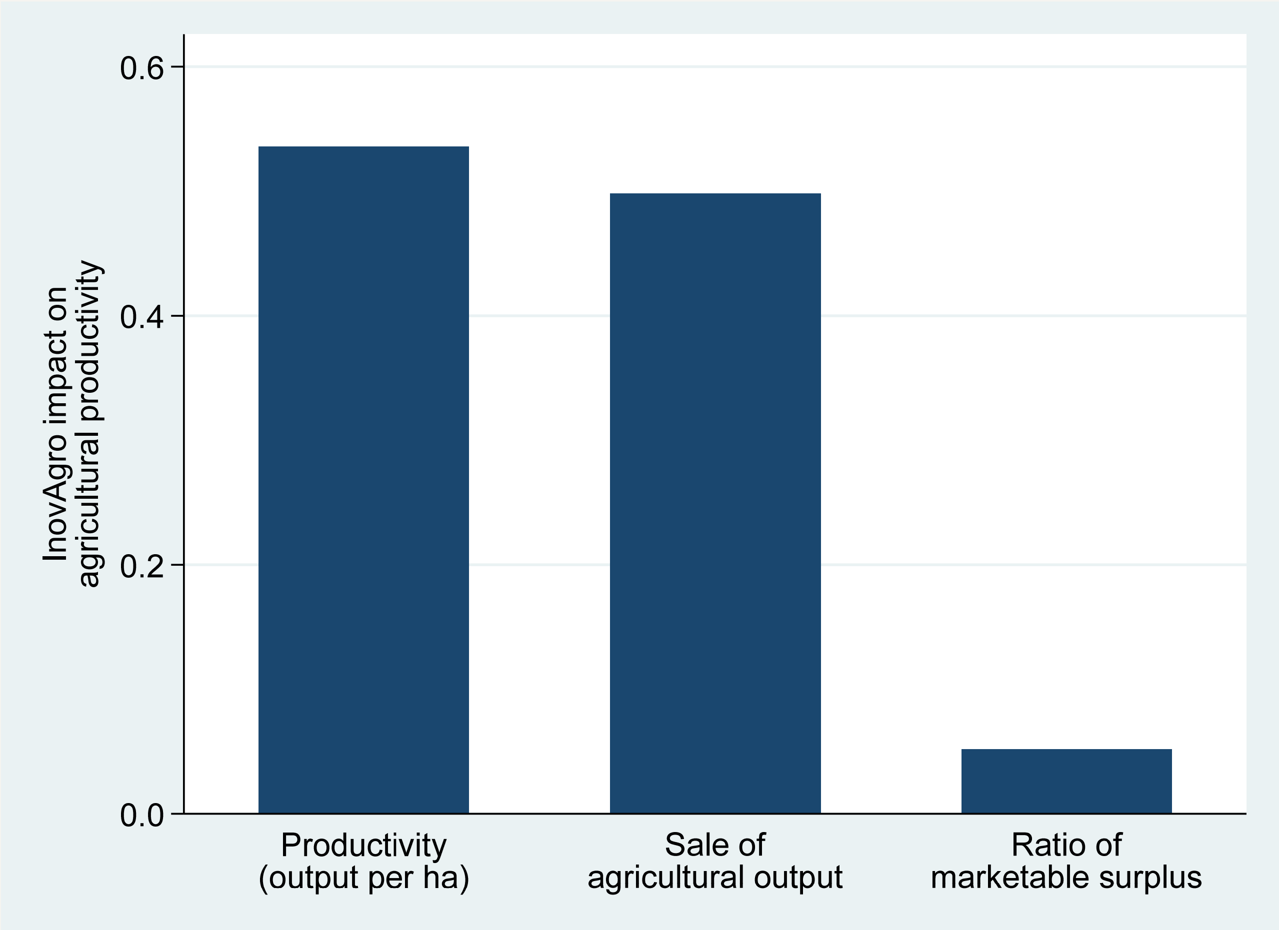
Results: HH level InovAgro impacts

- The positive and significant InovAgro impact on access to output market information by beneficiary HHs compared to non-beneficiary households: Robustness to single value chain intervention or complete package



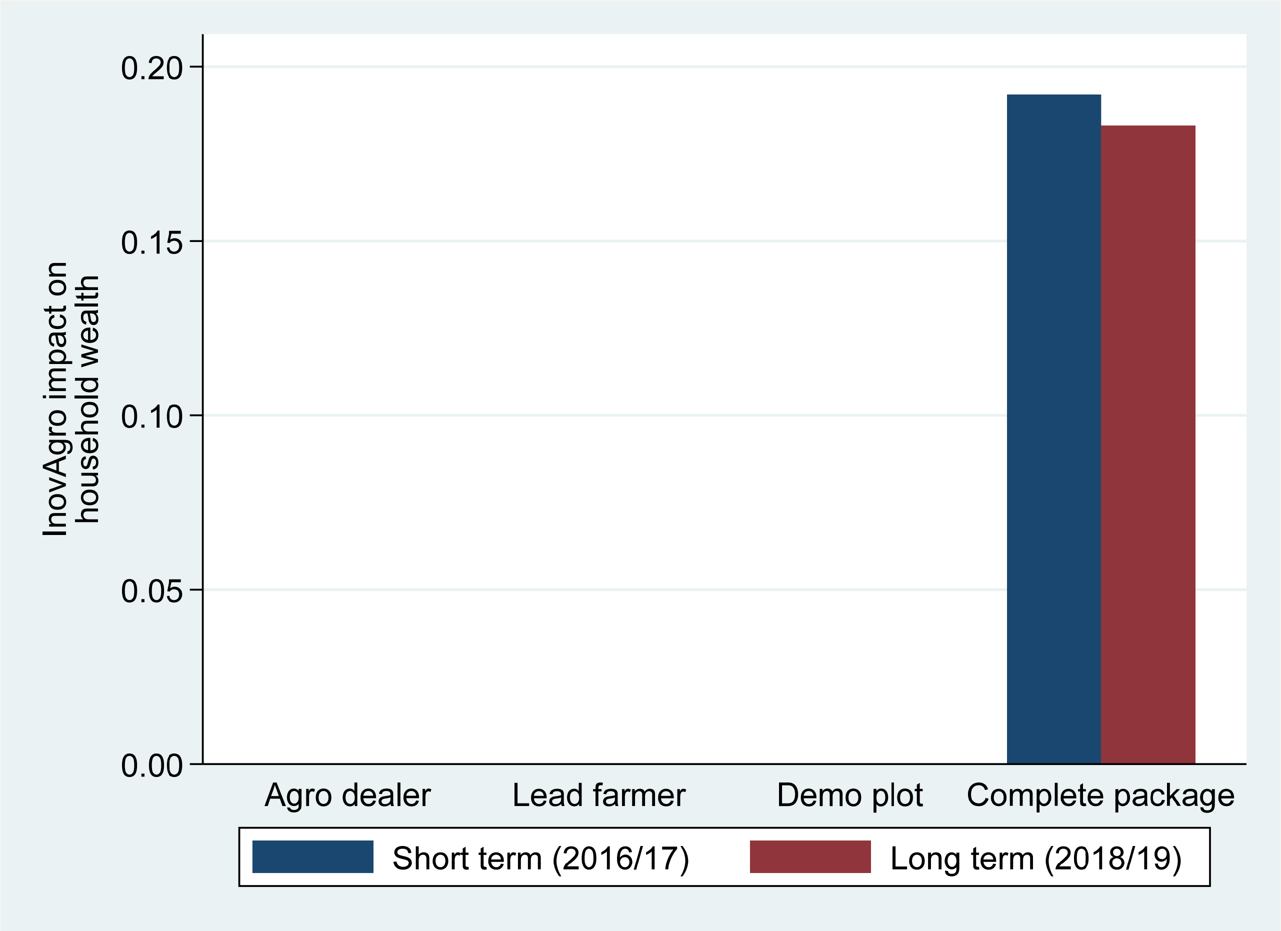
Results: HH level InovAgro impacts

- A positive and significant InovAgro effect on not only in boosting agricultural productivity of beneficiary HHs but also their likelihood of agricultural output market participation as well as the ratio of marketable surplus



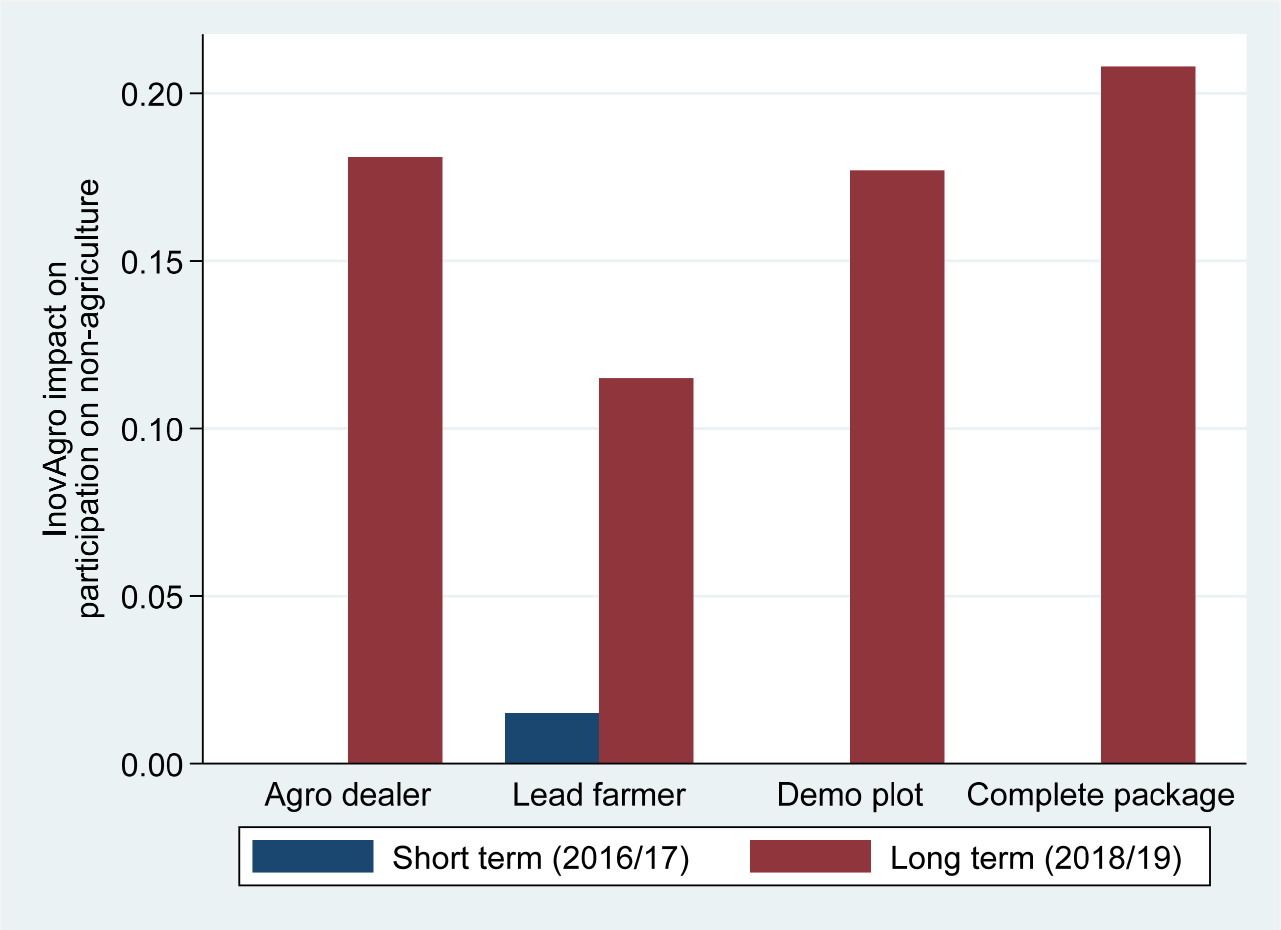
Results: HH level InovAgro impacts

- A positive and significant InovAgro effect on HH welfare is only shown when beneficiary HHs are exposed to the most intense (complete package) treatment



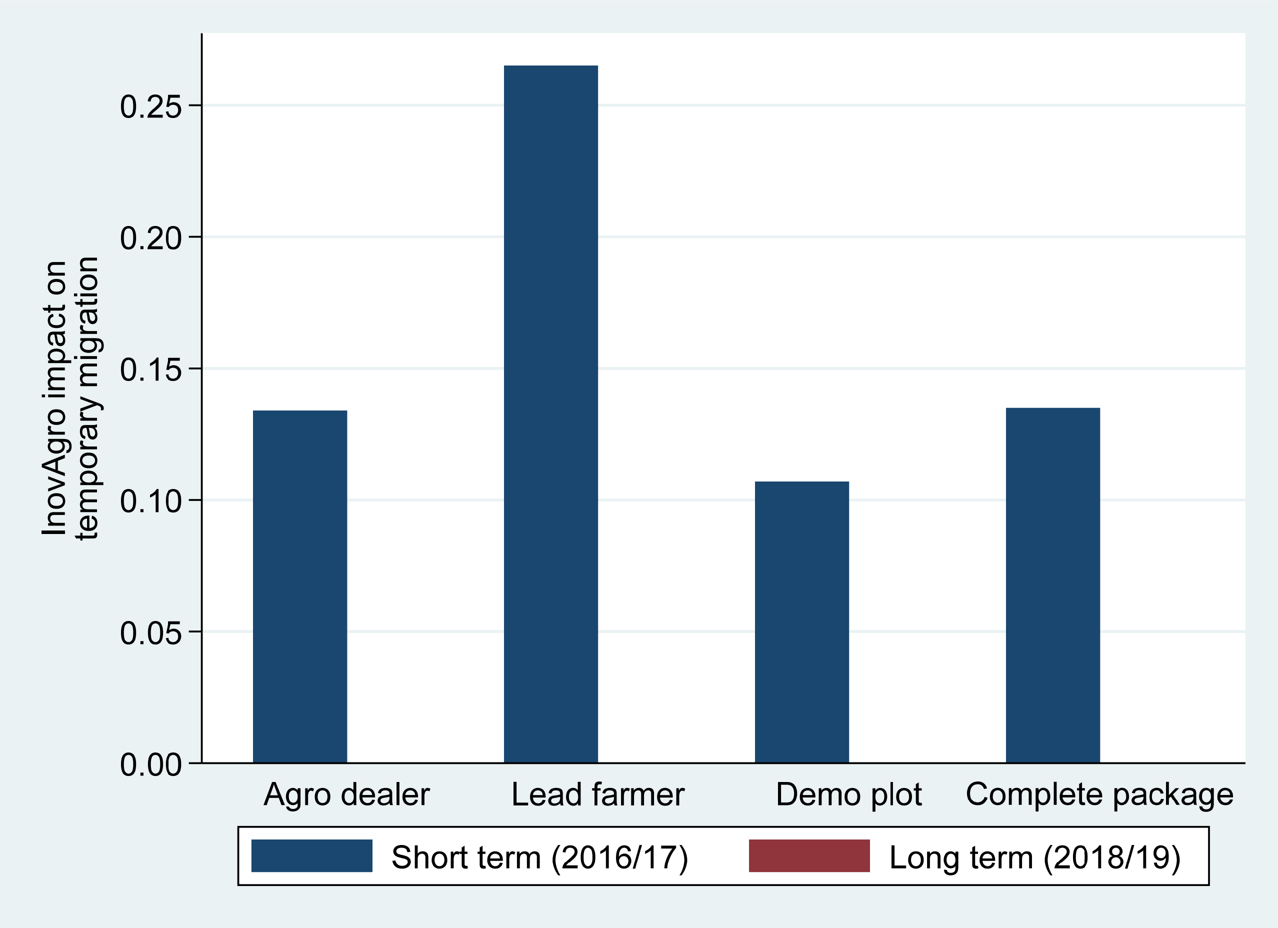
Results: HH level InovAgro impacts

- InovAgro impact on income generation from non-agricultural is only positive and significant in the long term



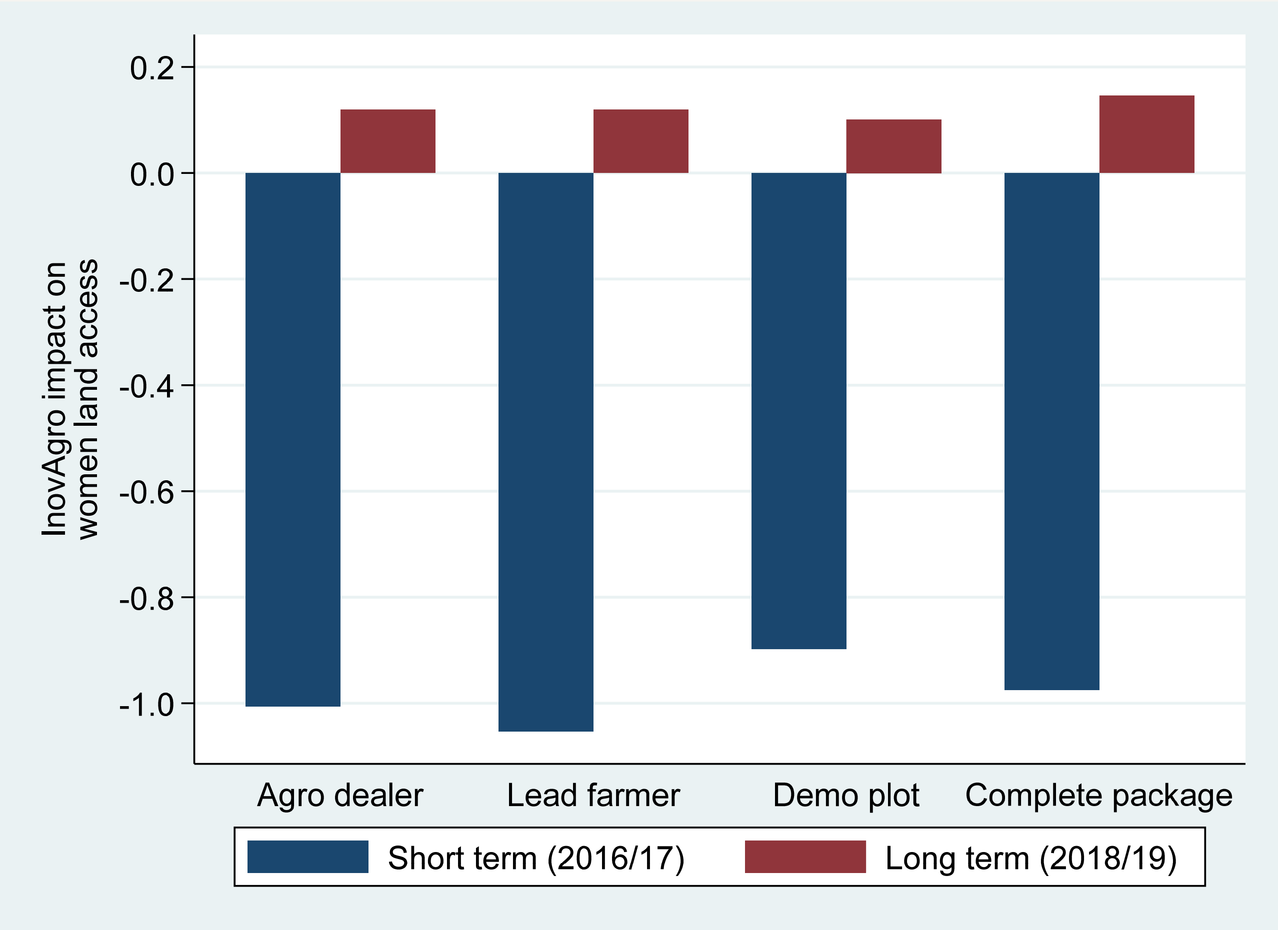
Results: HH level InovAgro impacts

- A positive and significant InovAgro effect on temporary migration among members of beneficiary HHs in the short term while no impact of such effect in the long-term



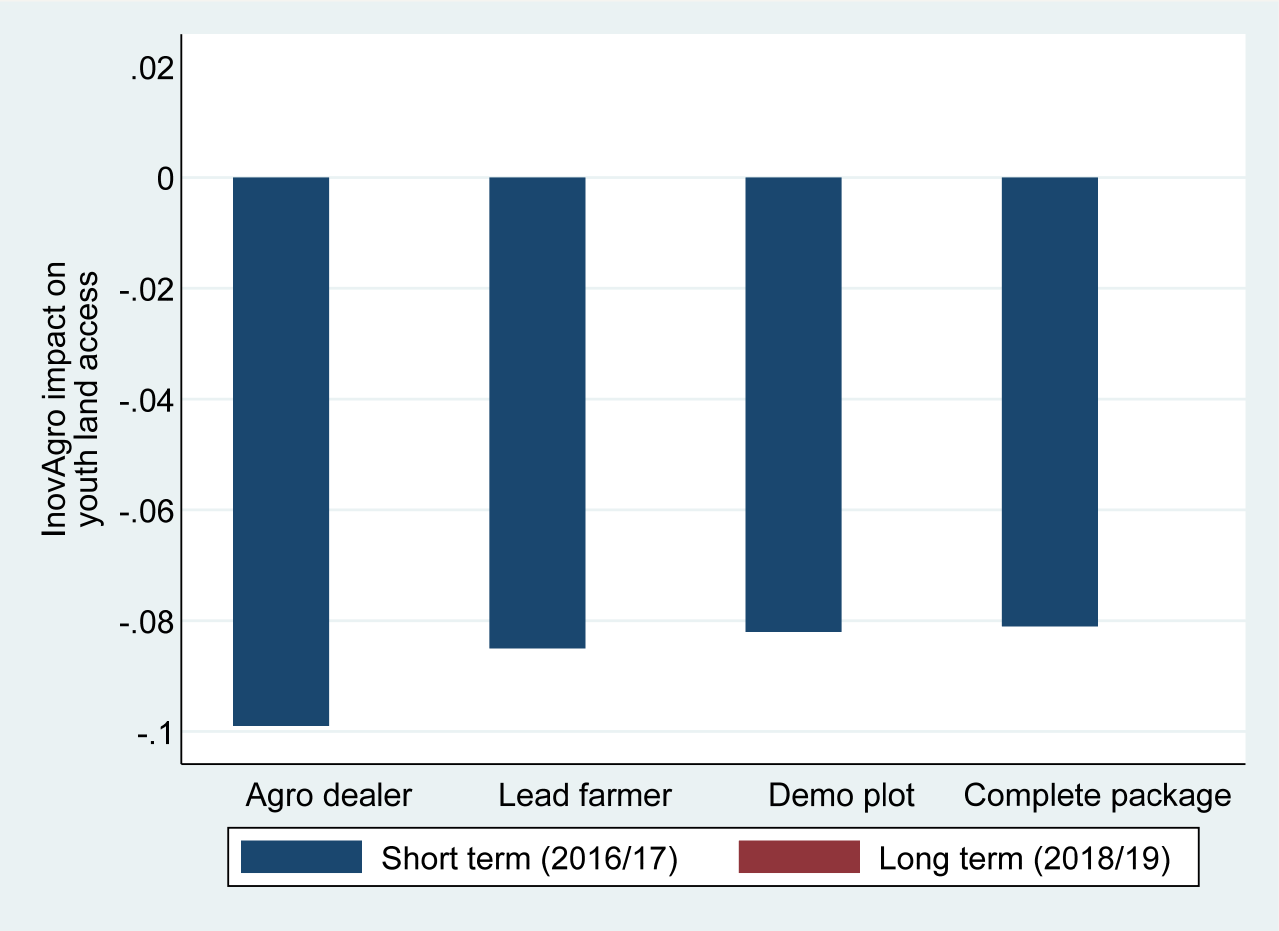
Results: HH level InovAgro impacts

- A positive and significant InovAgro effect on women land access in the long term while negative and significant impact the short term



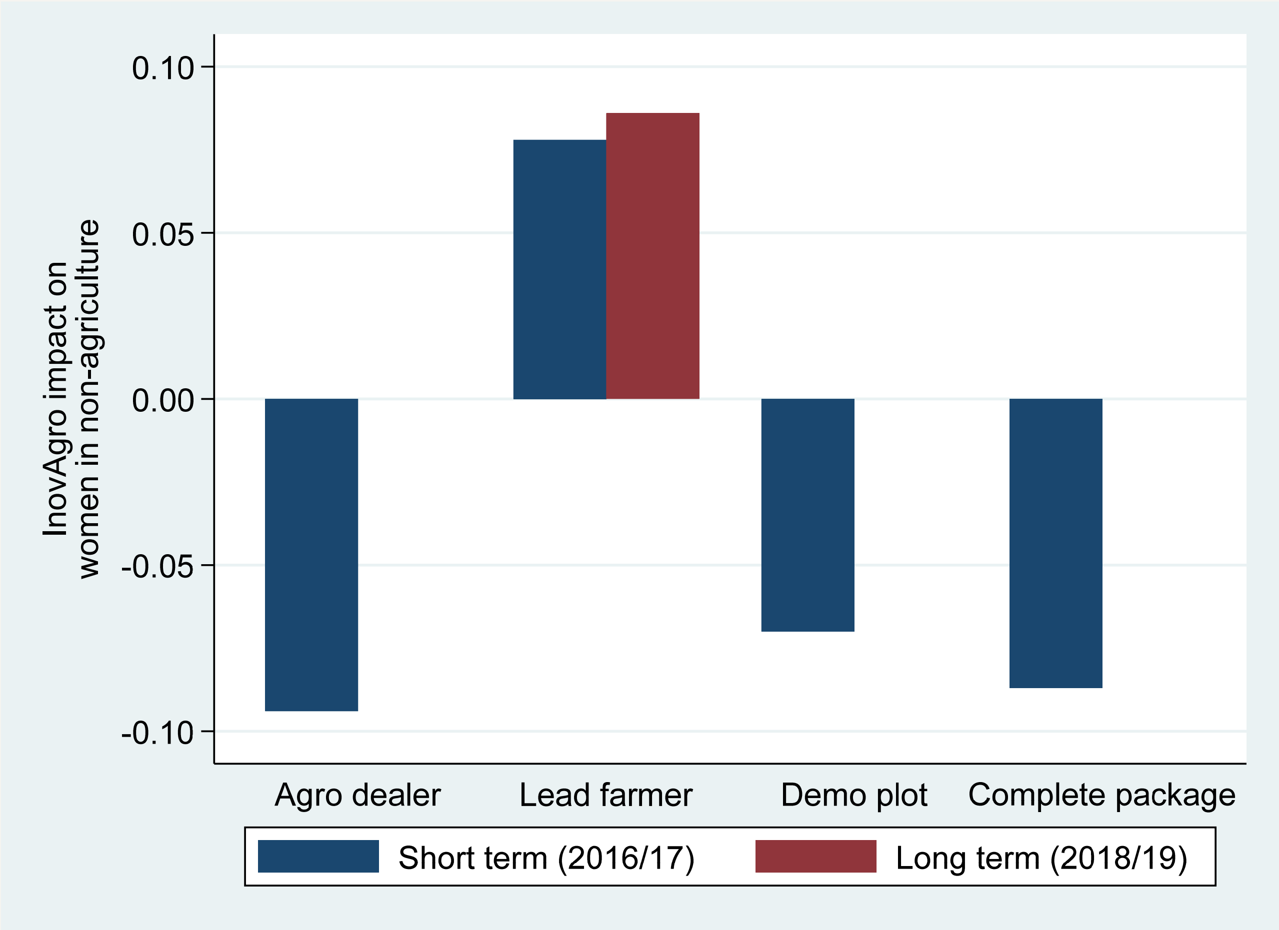
Results: HH level InovAgro impacts

- A negative and significant InovAgro effect on youth land access in the short term while no impact in the long term



Results: HH level InovAgro impacts

- A negative and significant InovAgro effect on women income generation in non-agriculture in all value chain interventions except lead farmer in the short term while no impact in the long term except for those exposed to lead farmers. Similar findings for youth



Conclusions

- InovAgro interventions increase farmers' use of yield-enhancing agricultural inputs, productivity and welfare.
- InovAgro interventions improve in the number of non-InovAgro facilitated or sponsored value chain interventions.
- The InovAgro MSD program has more sustainable impact than non-MSD programs.
- The InovAgro project benefited large numbers of smallholder farmers beyond the project's direct sphere of influence and intended beneficiaries.

Conclusions

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- The InovAgro MSD program has a negative unintended effect of both MSD and non-MSD programs on HHs' crop diversification.
- The study provides evidence in support of the project's having a systemic market-level effect, as well as sustainable long-term effects on HHs' adoption of good agricultural practices and access to market information,
- A more intense, combination approach of using agro-dealers, lead farmers and demonstration plots appears to be necessary to achieve long-term positive effects on the overall welfare of HHs.

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