



# Modeling the Effectiveness of the Lead Farmer Approach in Agricultural Extension Service Provision

## Nationally-representative Panel Data Analysis in Malawi

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Lilongwe | February 27, 2019

# Outline of the presentation

- Motivation for the study
- Study objectives
- Data sources
- Empirical methods (econometric methods and qualitative analysis)
- Results
- Conclusions
- Implications

# Motivation for the Study

- Lead farmers (or model or contact farmers) or farmer-to-farmer extension (F2FE) approaches have been traditionally part of most extension models for decades
  - Under T&V, extension agents are required to work with contact farmers to transfer technologies and disseminate information
  - Model farmers in Ethiopia, *Achikumbi* in Malawi
- Past LF approaches have been criticized for the selection of richer and progressive farmers, also at times linked to clientelism and elite capture, and for limited productivity and development impacts (Lefort 2012; Knorr, Benyata and Hoffmann 2007)
- Revived concept → new batch of farmer trainers who are more representative of the community, with closer ties to social networks, motivated volunteers, and voted for and chosen by participatory processes within the community → DAES (2015)
- Group approaches and social networks (Magnan et al. 2015; Krishnan and Patnam 2014; Ragasa and Golan 2014; Quisumbing and Kumar 2011; Islam et al. 2011; Duflo and Suri 2010; Conley and Udry 2010; IFPRI and World Bank 2009; Barham and Chitemi 2009)
  - Leaders or those most influential within those groups are often targeted as entry points for information and interventions → ideally selected as lead farmers

## Motivation for the Study (2)

- Davis, Franzel and Spielman (2016) did not find any impact evaluation on F2FE (2012-2017)
- Wellard et al. (2013) evaluates LF approach implemented in Malawi, Uganda and Ghana
  - Some indication of positive impacts, but study is based on small sample of 80 farmers per country
- Descriptive reports based on interviews of LFs or organizations using them
  - (Kiptot and Franzel 2015, 2014; Kiptot et al. 2016; Fisher et al. 2018; Khaila et al. 2015; Kalagho 2013; Kundhlande et al. 2015; Masangano and Mthinda 2012)
- Evaluations and assessments of specific design features of LF approach
  - Malawi: Beaman et al. (2015) experimented on incentive systems of contact farmers; similar characteristics as average farmers in the community
  - Mozambique: Kondylis, Mueller, and Zhu (2017) show greater impacts for training extension workers and contact farmers together at the same time; and training women contact workers
  - Malawi: Niu and Ragasa (2018) on pit planting, show that knowledge score of LF and other farmers are similar and that information loss from extension agent to both LF and other farmers is large
  - Malawi: Holden et al. (2018) show that only few LFs fully adopt conservation agriculture (CA)
- ✓ The paper aims to evaluate the implementation and effectiveness of LF approach
  - Malawi's nationwide implementation of the LF approach is very relevant and offers a unique setting to assess the effectiveness and sustainability of the LF approach when scaled-up

## Focus of the study

***Lead farmer = “. . . an individual farmer (male and female) who has been elected by the village to voluntarily assist in the delivery of a maximum of three good agricultural practices/technologies that are enterprise specific and is trained in those technologies” (DAES 2015, p6).***

- Roles of LFs (qual + quant)
  - Assisting or supporting role (in relation to extension agents)
  - Information bridge role (between supply and demand of extension services)
  - Filling gaps role (where there are no extension agents)
  - Community representative role (similar characteristics/conditions as most farmers in the community, most socially connected, and voted for and chosen by participatory processes within the community)
- Impact on LF approach on awareness and adoption of agricultural management technologies being promoted by LF (qual and quant)

# Definition of outcome variables

## ■ Awareness

- *Are you aware or do you have some knowledge on this technology?*
- Binary variable (0/1)

## ■ Adoption

- HH-level: *Have you adopted this technology? Since when did you start adopting this technology? (at least 2 years of adoption)*
- Plot-level: *[In each plot] Is this technology practiced in this plot during rainy season (2017/2018)?*
- Binary variable (0/1)

## ■ Technologies:

- Soil cover, minimum tillage, intercropping/crop rotation (CA) (very few use herbicides)
- Pit planting
- Bunds
- Water management
- Crop residue incorporation
- Composting pits
- Fertilizer or manure making
- Organic fertilizer use

# Indicators used representing LF approach

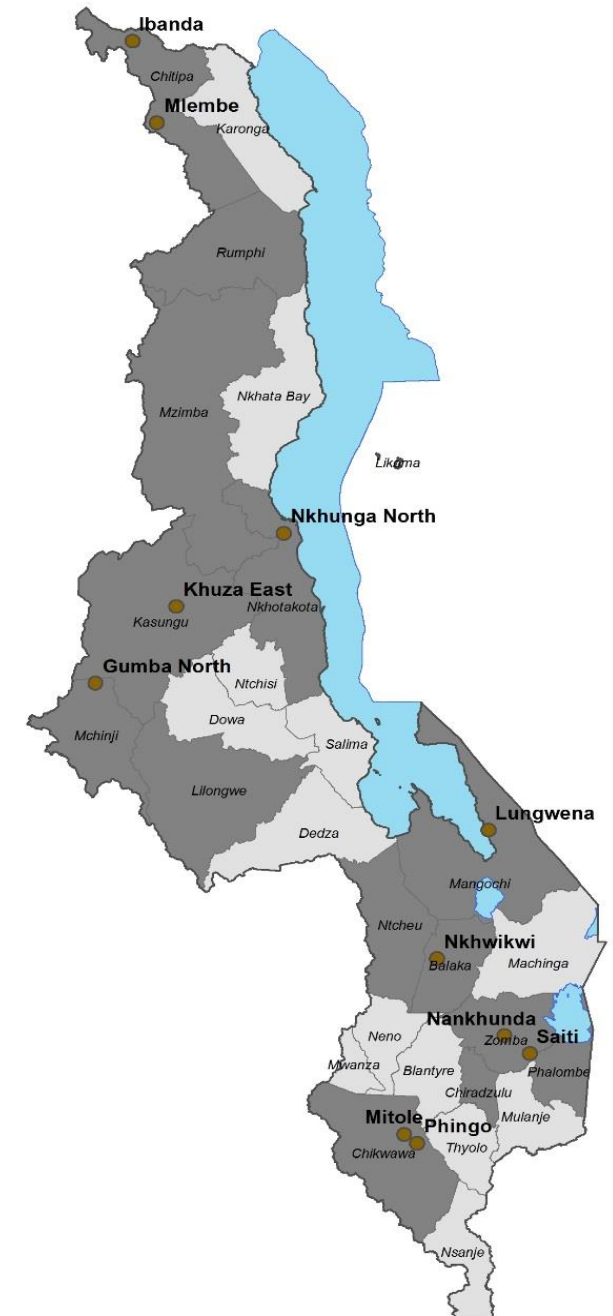
- Farmers' exposure to LFs: Number of LFs in the community that a farmer knows (Number)
- Farmers' access to LF: Farmer's self-reported interaction and participation in activities organized by LF in the last 12 months (0/1)
- Farmers' access to LF advice: Farmer's self-reported access to advice from LFs in the last 2 years (0/1)

## ***We further explored the heterogeneity of LFs and communities:***

- Quality of LF: Farmers are disaggregated based on their access to different quality of LFs based on farmers' rating based on 9-questions (excellent, good, or not good)
- Physical distance from LF: Farmers are disaggregated based on their physical distance or proximity to the nearest LF (km)
- Adoption behavior by LFs: Communities are disaggregated based on whether at least one LF adopts a particular technology being promoted (0/1)
- Gender of LFs: Communities are disaggregated based on % of male LFs in the community (%)
- Regular training received by LFs: Communities are disaggregated based on whether LFs received regular training on LF concept, communication and specific technologies

# Data Sources

- Household and community surveys (nationally representative; 3000 HH; 299 sections): July-Sep 2016; July-Sep 2018
- Census and monitoring of state and non-state extension service providers in 15 districts (**shaded districts in map on the right**): Dec 2016 - Mar 2017
- In-depth interviews with 30 service providers and 71 extension workers: Dec 2016 - Mar 2017
- Focus group discussions (22 FGDs) (**dots on map**); Jan/Feb 2017, Jan/Feb 2019
- In-depth interviews of 531 LFs (linked to survey, 2016)





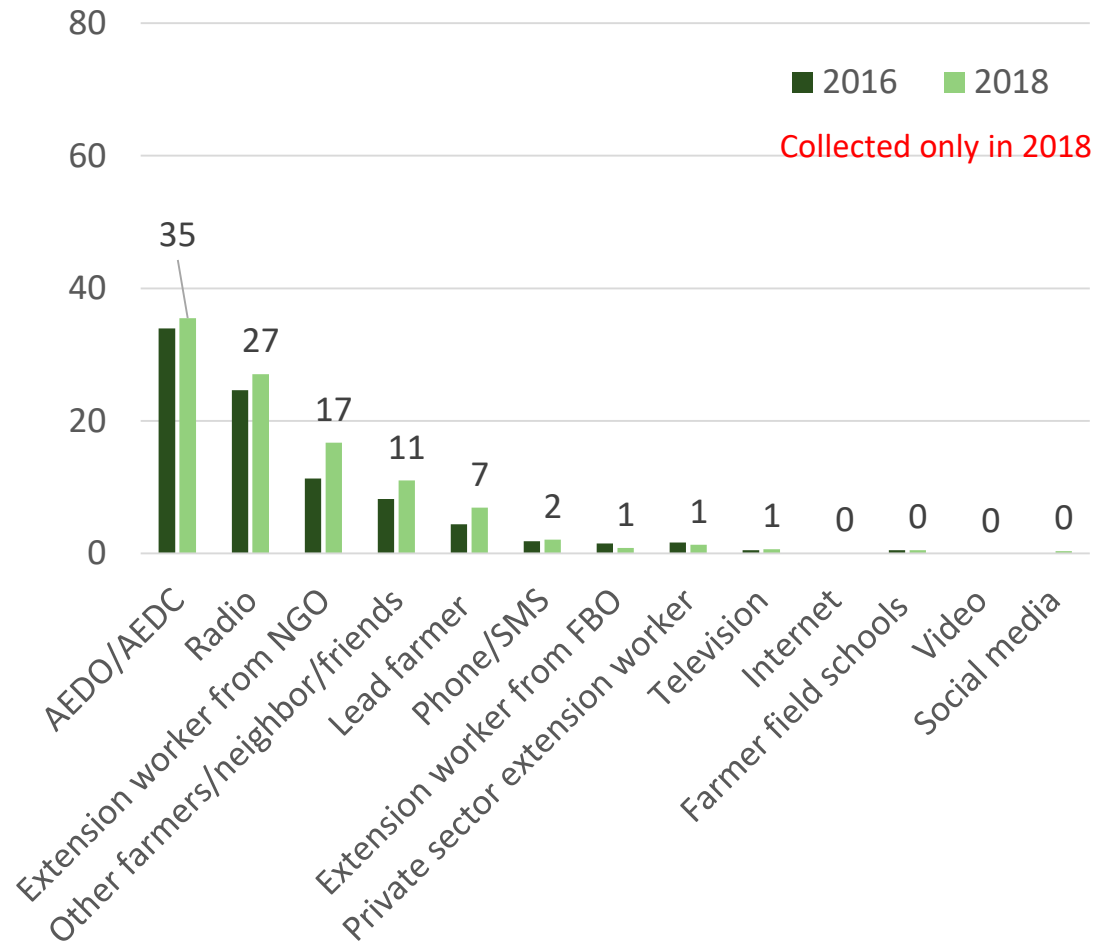
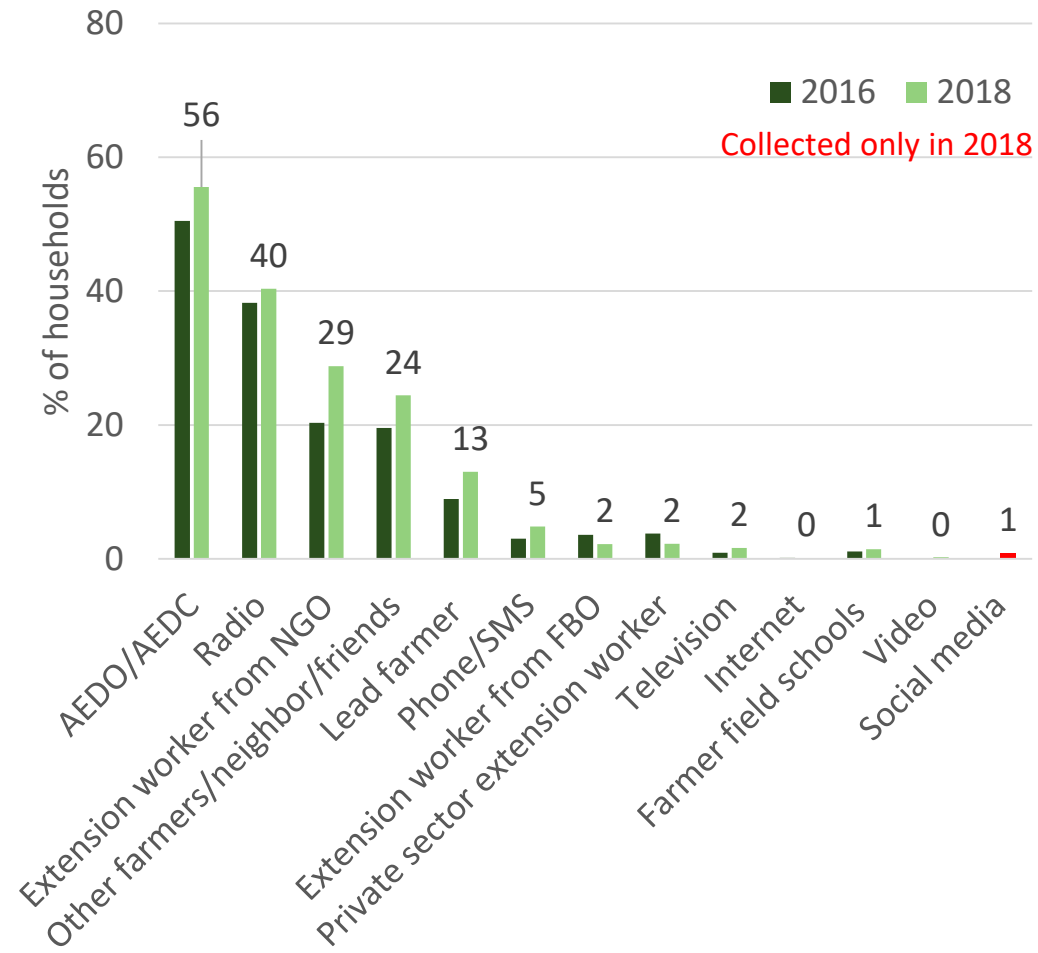
# Empirical methods

- Estimation methods in order to address:
  - Non-exposure bias (Diagne and Demont 2007; Kabunga et al 2012) → by implementing a two-step process, modeling adoption conditional on awareness → limiting the adoption model to only those who are aware
  - Non-random program placement and selection bias (Feder 1997) and potential unobserved heterogeneity issues (Ragasa and Mazunda 2018) →
    - Mundlak-Chamberlain (MC) or Correlated random effects (CRE)
    - Heckman selection probit (modeling the selection)
    - Bivariate probit – simultaneously modeling awareness and adoption
- Mixed methods
  - Insights from 2 rounds of FGDs and in-depth interviews are weaved into the discussions
  - Local enumerators fluent in Chichewa, Chibandya, and Chinyika
  - Enumerators were experienced in qualitative data collection and facilitators to encourage active participation and articulation of differing viewpoints
  - Discussions were recorded, transcribed, and translated and then thematically coded using NVivo 11

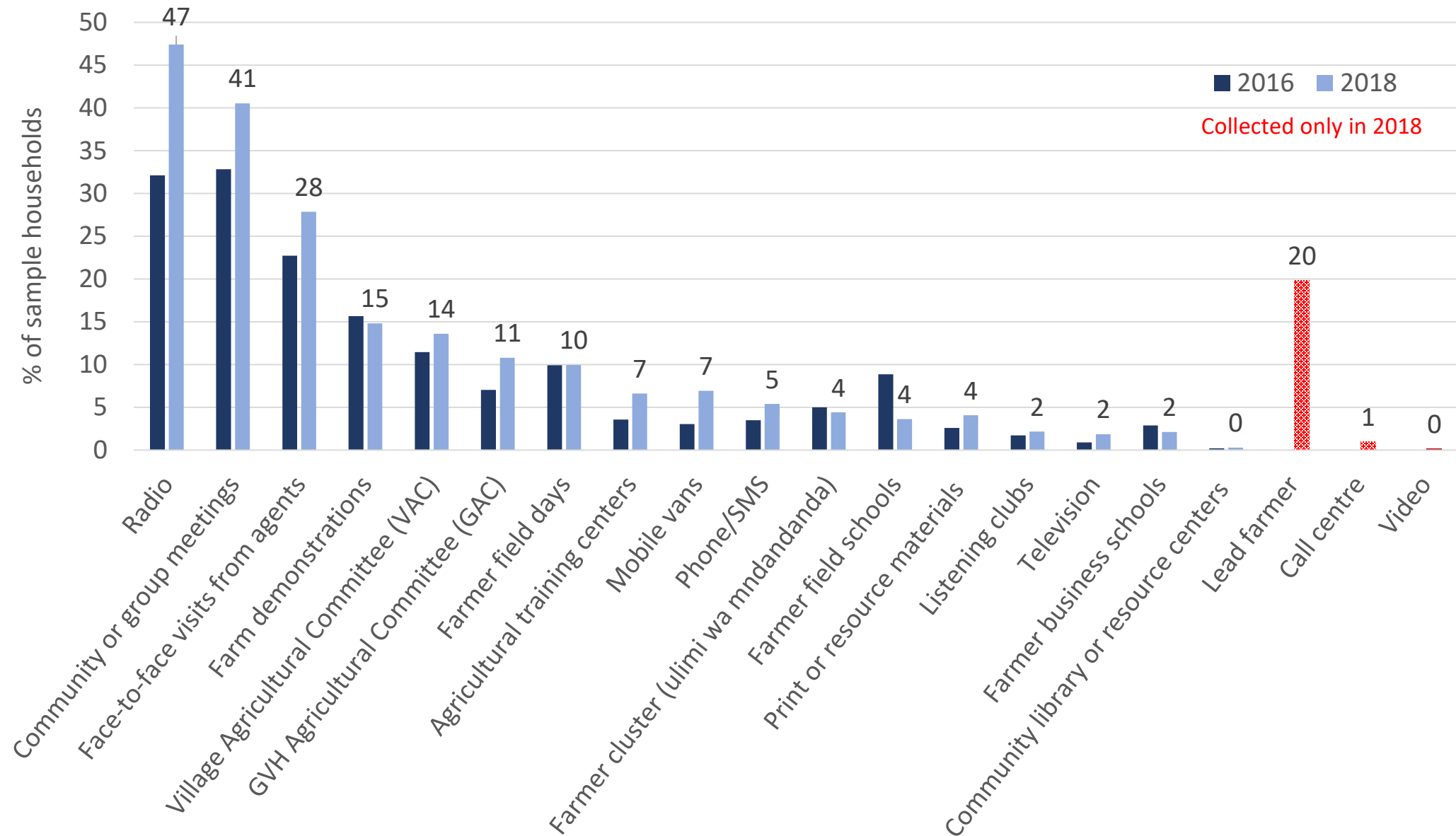
# Access of agriculture advice, by source

a. In the last 2 years

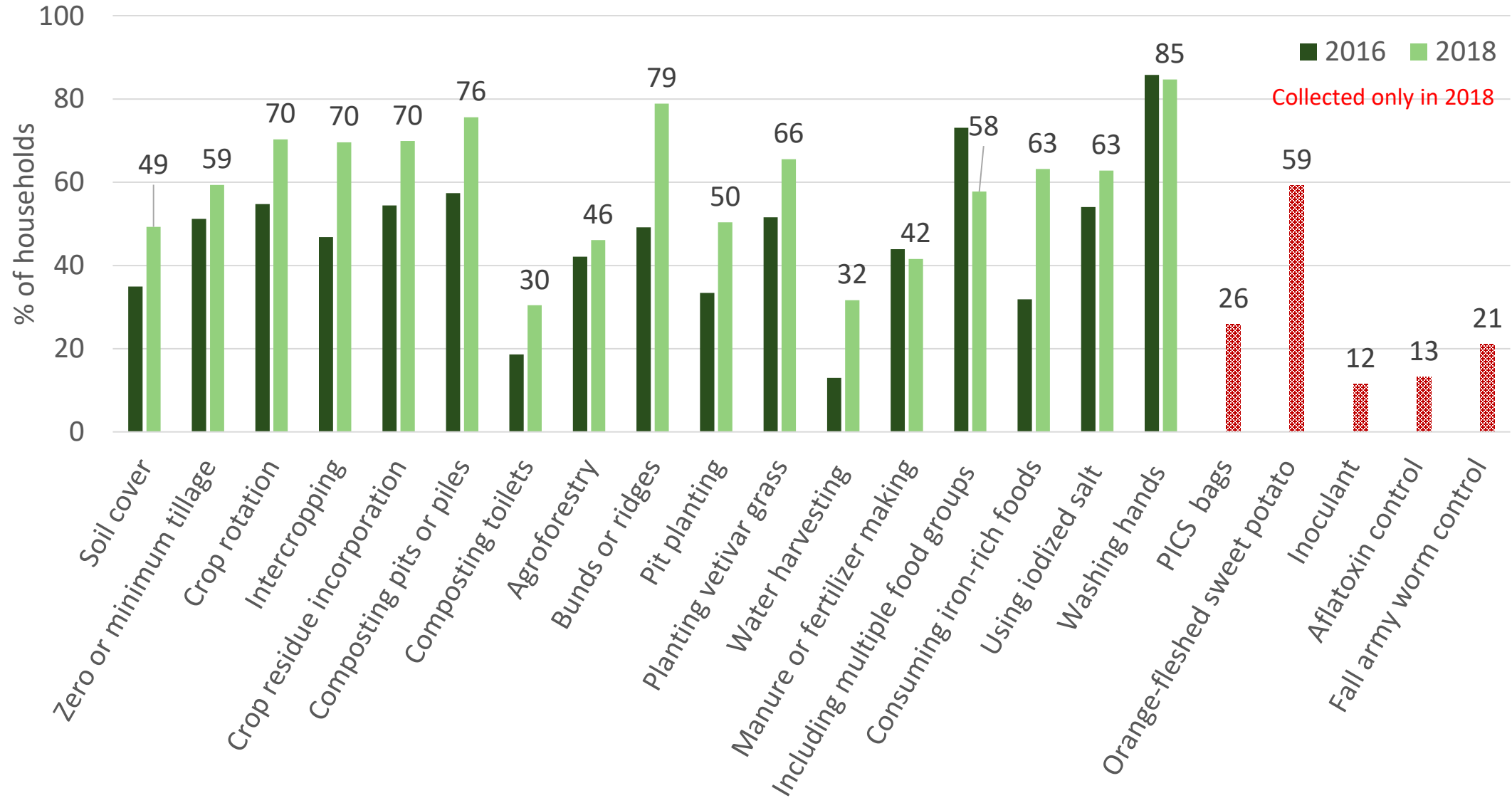
b. In the last 12 months



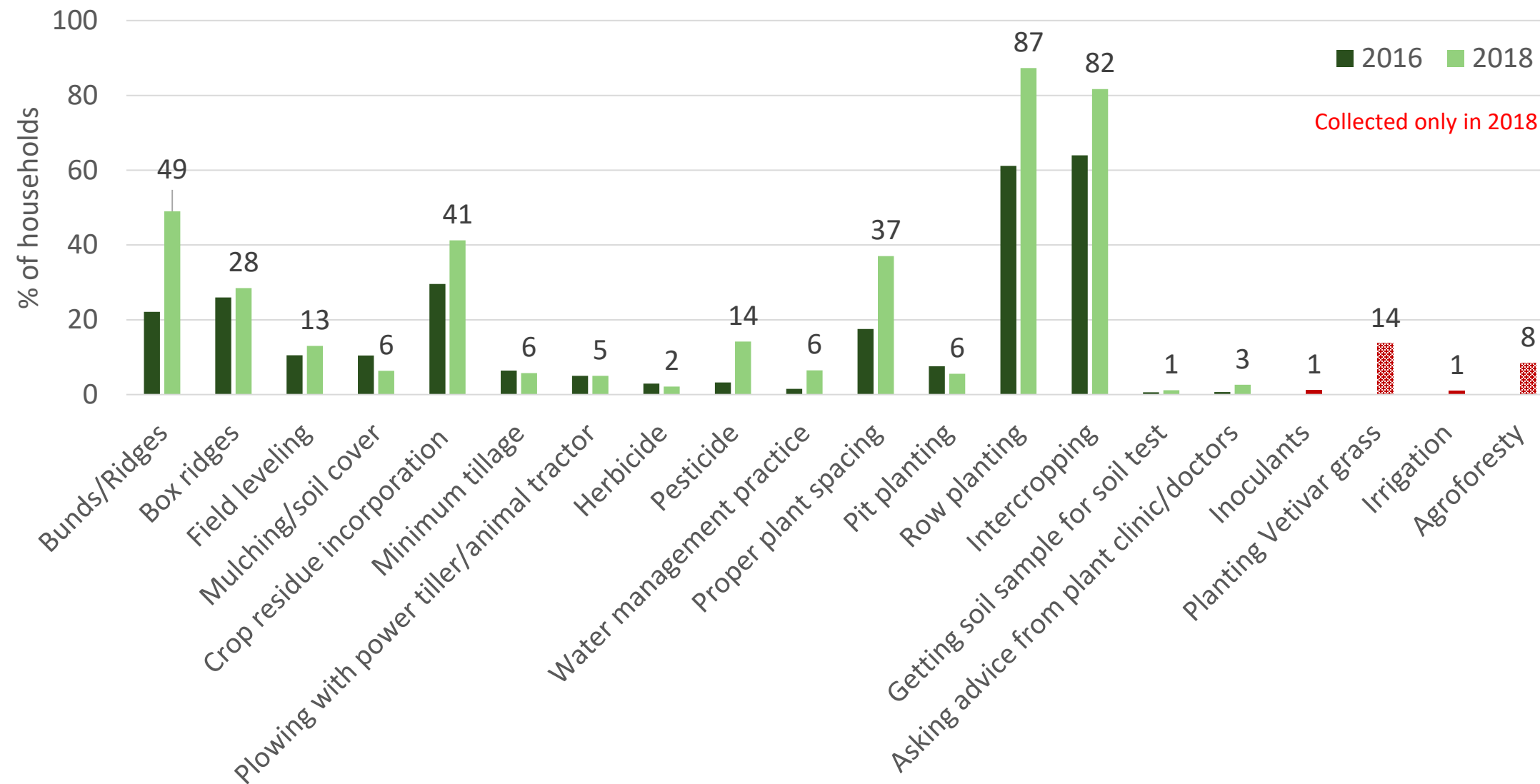
# Access to extension services, by method/approach



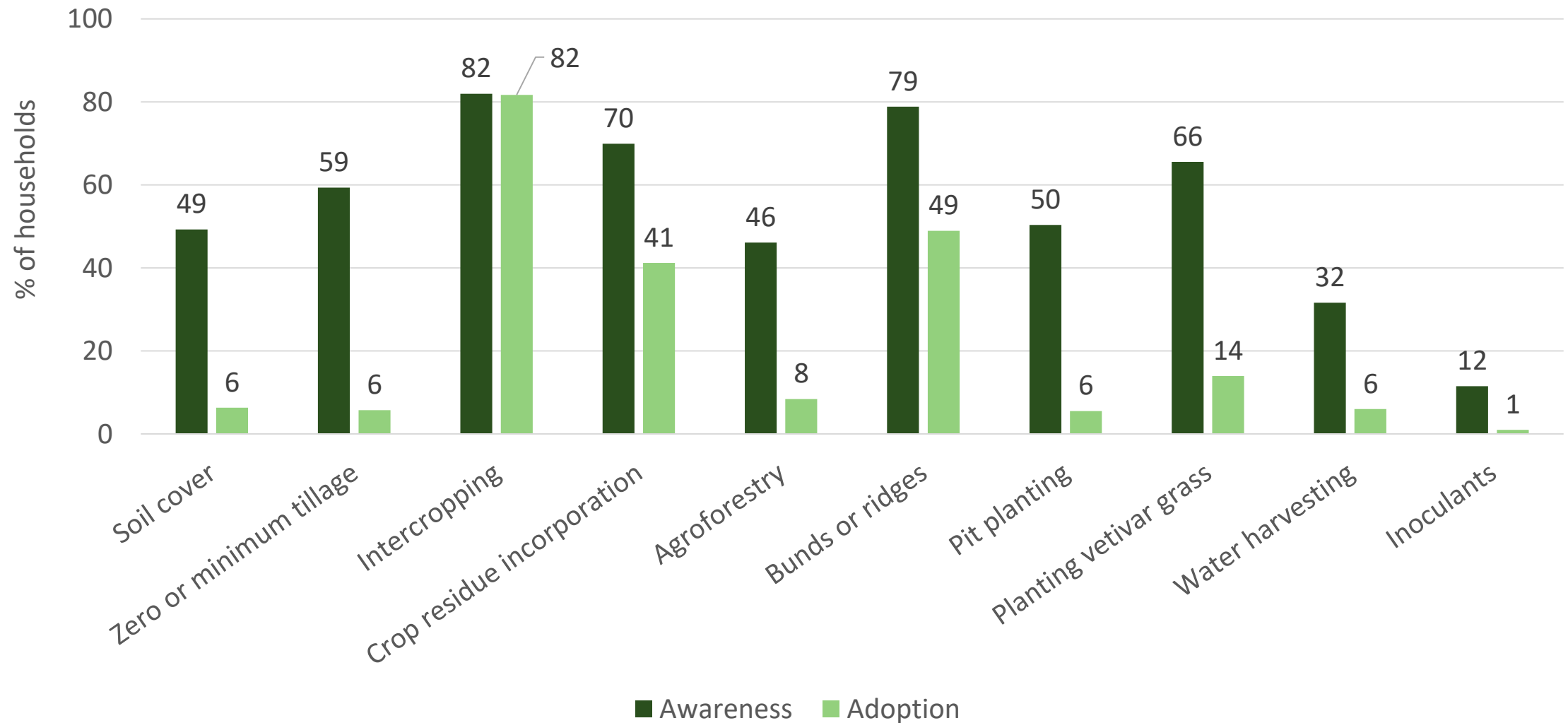
# Greater technology awareness



# Improved adoption in some technologies; decline in others

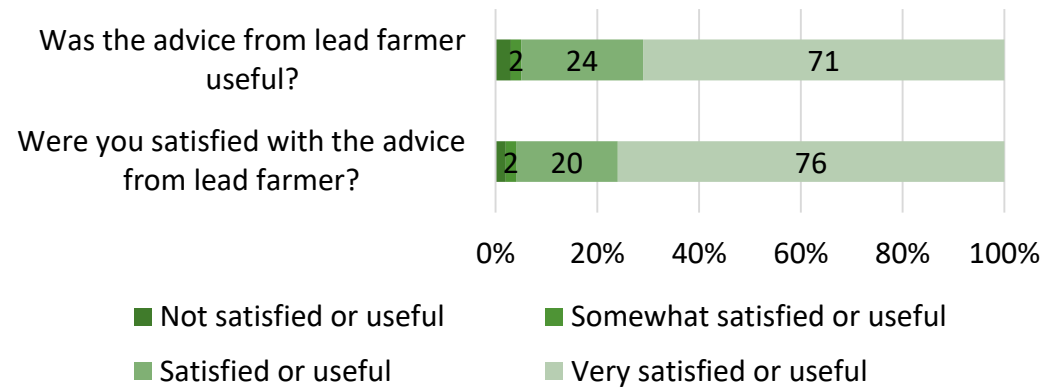


# Large gap between awareness and adoption (2018)

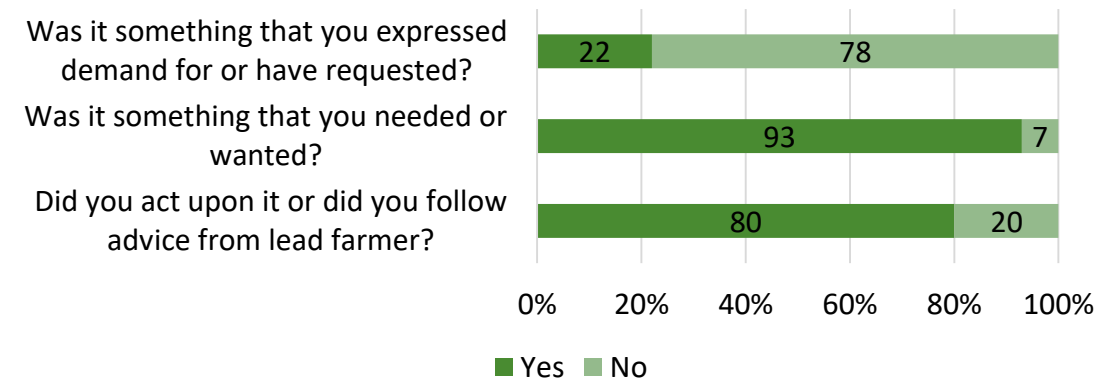


# Generally high ratings on quality of LFs (household level)

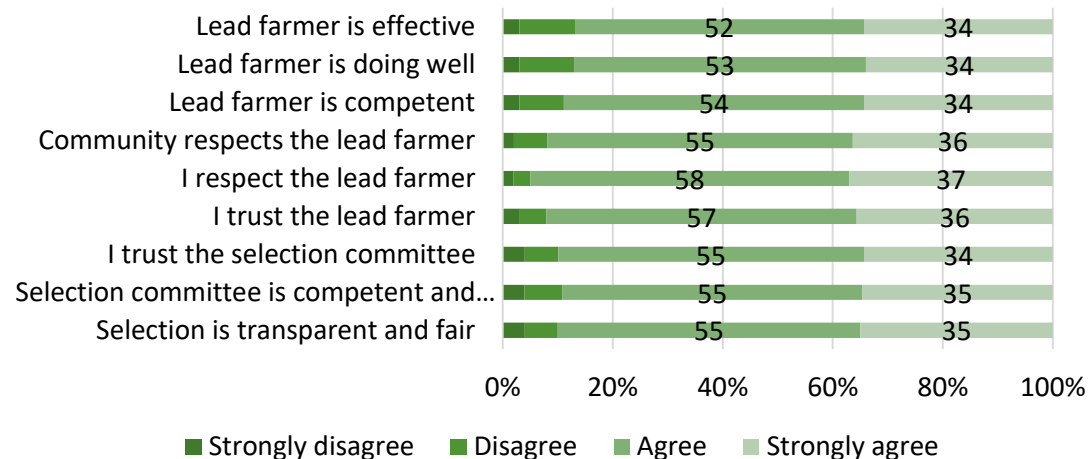
**panel a. % of household satisfied with advice received from LF (N=138)**



**panel b. % of household rating the relevance of the advice received from LF (N=138)**

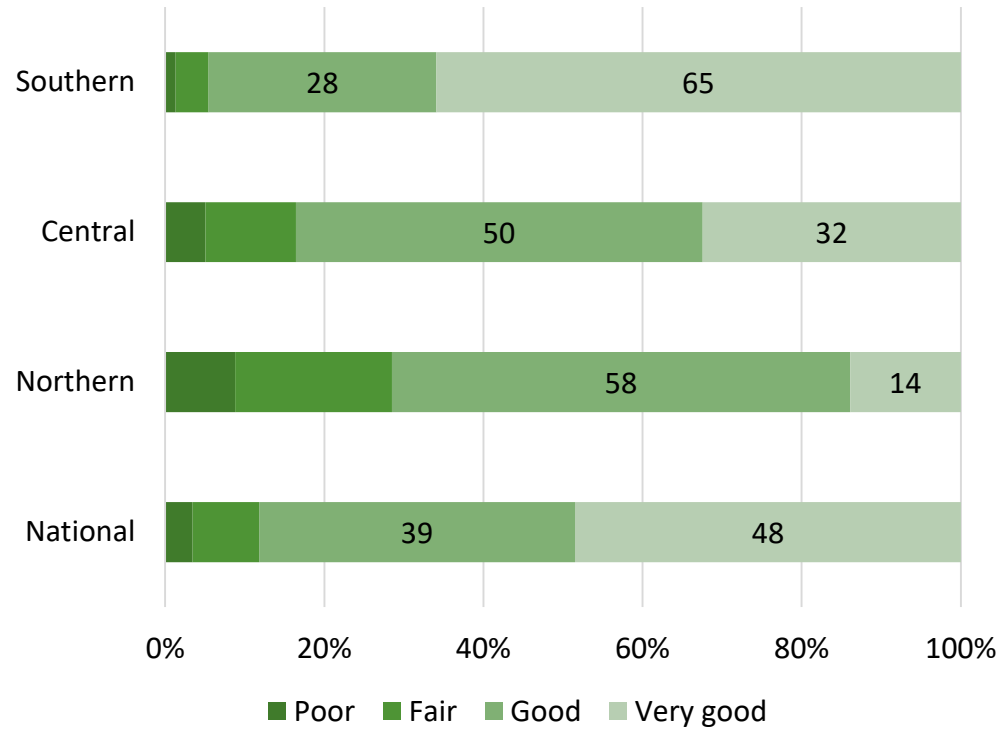


**panel c. % of households rating the LFs they know in their community (N=4500)**

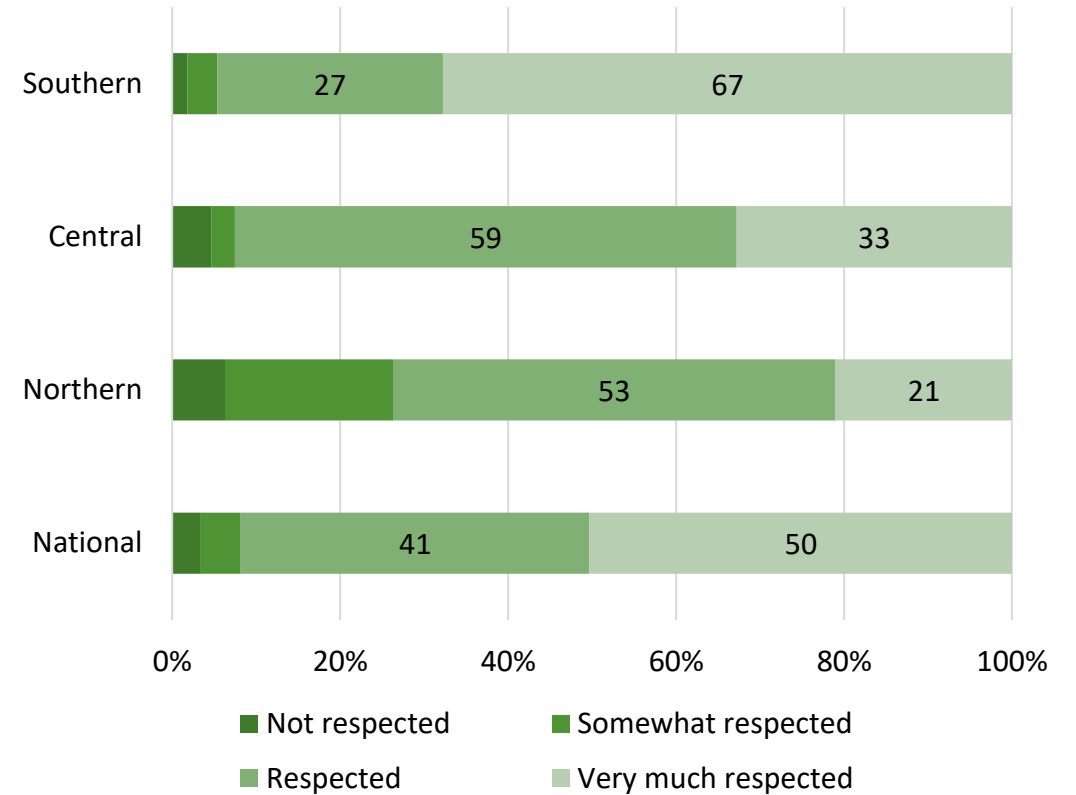


# Generally high ratings on quality of LFs (community level)

panel d. % of communities rating the effectiveness of their LFs (N=299)



panel e. % of communities rating how respected their LFs are in the community (N=299)





# Is exposure or access to LFs associated with greater awareness and adoption of technologies?

→ *No. Limited to 1-2 technologies and not consistent across indicators and models*

| LF variable                  | → | Significant effects on <u>Technology Awareness</u>   | Significant effects on <u>Technology Adoption</u>  |
|------------------------------|---|--|--|
| Farmers' exposure to LFs     | → | <b><u>Pit planting</u></b> : Additional LF that a HH knows increases the likelihood of that HH is being knowledgeable about pit planting by 9% | No effect  |
| Farmers' access to LF        | → | No effect  | No effect  |
| Farmers' access to LF advice | → | <b><u>Soil cover</u></b> : A HH receiving advice from LF is associated with 10% greater likelihood of being knowledgeable of soil cover        | <b><u>Soil cover</u></b> : A HH receiving advice from LF is associated with 9% greater likelihood of that HH adopting soil cover<br><br><b><u>Organic fertilizer</u></b> : A HH receiving advice from LF is associated with 8% greater likelihood of that HH adopting organic fertilizer |

# Are different types of LFs associated with greater awareness and adoption of technologies?

→ *Yes, quality of LF, adoption behavior by LFs, and regular training of LFs affect the awareness and adoption of most technologies*

| LF variable →                      | Significant effect on <u>Technology Awareness</u>   | Significant effect of <u>Technology Adoption</u>  |
|------------------------------------|---|---|
| Quality of LFs →                   | <b><u>Soil cover, minimum tillage, crop rotation, crop residue incorporation, composting pits:</u></b> HHs having access to “excellent” LFs have greater likelihood of being knowledgeable about these technologies | <b><u>Crop residue incorporation:</u></b> HHs having access to “excellent” LFs have greater likelihood of adopting this technology  |
| Physical distance from LF →        | No effect   | No effect   |
| Adoption behavior of LFs →         | N/A   | <b><u>Minimum tillage, pit planting, and organic fertilizer:</u></b> HHs in communities with at least 1 LF adopting this technology have greater likelihood of adopting that technology |
| Gender of LFs →                    | No effect   | No effect   |
| Regular training received by LFs → | <b><u>Composting pits:</u></b> HHs in communities with regularly-trained LFs have greater likelihood of being knowledgeable about this technology   | <b><u>Minimum tillage, soil cover, pit planting, and intercropping:</u></b> HHs in communities with regularly-trained LFs have greater likelihood of adopting these technologies        |

# What roles do LFs effectively perform?

|  | Evidence   | Implications  |
|--|--|---|
| <p>Assisting or supporting role (in relation to extension agents)</p>            | <p>YES. FGD and interviews with LF show that LFs help AEDOs in organizing community/group meetings and farm demonstrations.</p> <p>LFs are closer to farmers and more readily available than AEDOs</p> <p>FGDs - LFs are viewed as “assistants only” to AEDOs not necessarily as source of info.</p> <p>One FGD participant - “lead farmers are ‘hidden’ in the armpits of an extension worker.”</p> <p>While these help explain reported low coverage of LFs, they also mirror the limited value and recognition of LFs’ role in extension provision.</p> | <p>Greater recognition and value of LFs</p> <p>Greater sensitization of community on LF approach</p> <p>Build greater capacity of LF so that they can fully assist and support AEDOs</p> <p>→ Our data show only 60-70 percent of LFs have these trainings, and re-trainings are rare.</p> <p>→ Niu and Ragasa (2018): no difference in the knowledge score between LFs and other farmers, implying no particular knowledge advantage of LFs over other farmers</p> <p>→ Models consistently show that access to regularly trained LFs have effects on adoption of several technologies</p> |
| <p>Information bridge role (between supply and demand of extension services)</p> | <p>Yes, partly. Surveys/FGDs - LFs support activities on articulating farmers’ needs, concerns and demands to EA, village chief and other SPs.</p> <ul style="list-style-type: none"> <li>Organizing community/VAC meetings where farmers can express concerns/demands.</li> <li>The ‘eyes and ears’ of AEDO and other EAs in the community.</li> </ul> <p>However, the low coverage and limited interactions of LFs with the community beyond the few followers, also show limitations in their <b>role as a information bridge</b></p>                   | <p>More outreach and inclusion of farmers in LF activities could be a strategy forward</p> <p>→ FGD: “Sometimes the lead farmer is focused on people who are organized in groups. The people who are not in groups cannot mention a lead farmer as their source of information”</p> <p>More mobility support to LFs</p>   |

# What roles do LFs effectively perform?

| Role  | Evidence  | Implications  |
|---|---|---|
| Filling gaps role (where there are no extension agents) | <p>No. LFs support or assist AEDOs in areas where they are present and active, not otherwise</p> <p>No evidence for LFs being the solution to the high farmer-to-EA ratio and high vacancy of AEDOs in Malawi.</p>  | <p>LFs are not substitutes to AEDO or other extension approaches. They complement AEDO's work, rather than substitute it. Without strong AEDOs to work with them and monitor them, LF will not be active and will be performing at sub-standard level.</p> <p>We need active, empowered and committed AEDOs in order to support and monitor active, empowered and committed LFs.</p>  |
| Community representative role                           | <p>Mixed results.</p> <p>Surveys/FGDs - LFs are different from the other farmers in the community</p> <ul style="list-style-type: none"> <li>• more economically well-off,</li> <li>• larger plots and more assets, and</li> <li>• more progressive farmers.</li> </ul> <p>In some FGDs, participants value the closeness (both physical and social) and representativeness of LFs, compared to the AEDO.</p> <ul style="list-style-type: none"> <li>• For some farmers, closeness to characteristics limit their respect and recognition of the LFs' abilities.</li> </ul> | <p>Need to look at the processes of selection and transparency.</p> <ul style="list-style-type: none"> <li>→ 94% of communities: selection done through community meeting, however not clear how many are present, who are influential or who makes the decisions, and how transparent these selection processes are.</li> <li>→ 6% of communities: selection done by village chief or extension worker, which is contrast to the DAES guide</li> <li>→ Has the selection process really changed from the heavily-criticized Master Farmers or <i>Achikumbi</i> (Progressive Farmer) to LF? If they are similar, we might just be repeating historical failures.</li> <li>→ As the models suggest, "quality" LFs need to be selected in a participatory way to see impact on technology adoption and community development</li> </ul> |

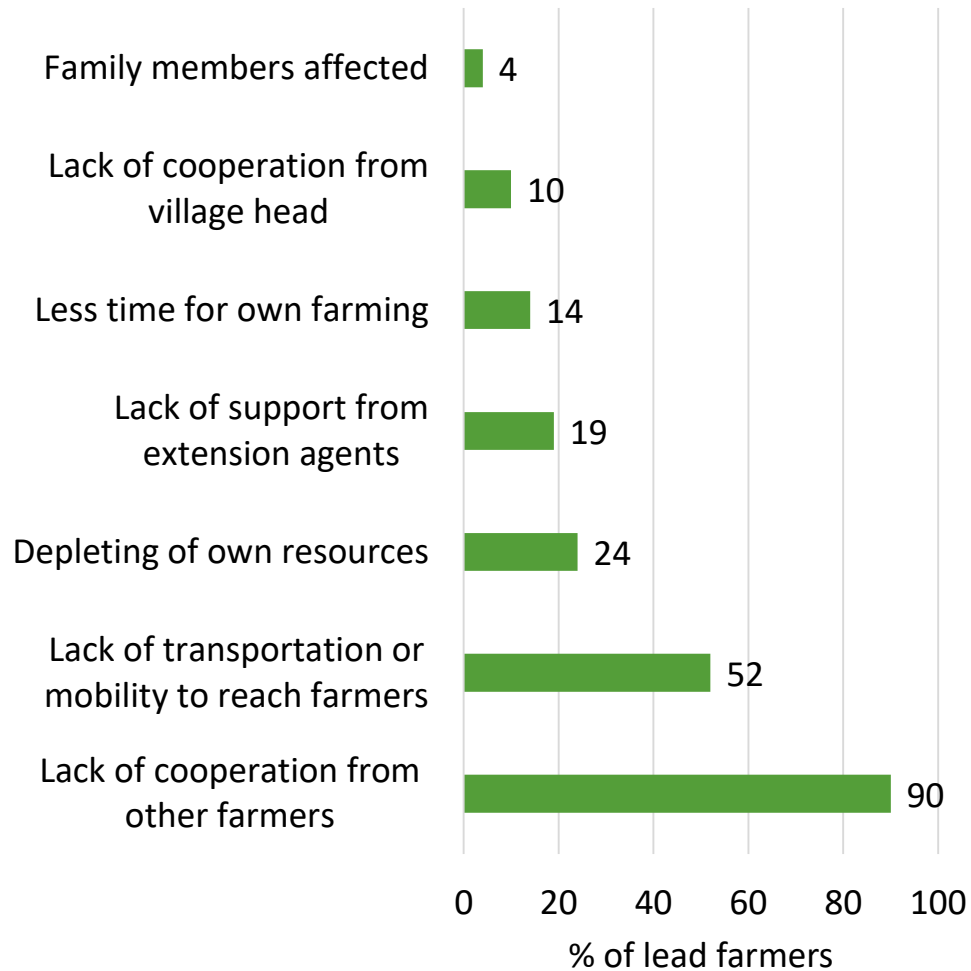
# LFs and average farmers in the community are very different

|  | Other farmer | Lead farmer |
|--|--------------|-------------|
| Male   | 0.74         | 0.82 ***    |
| Age  | 40.43        | 45.79 **    |
| Farming years  | 19.64        | 22.42 ***   |
| Can read Chichewa  | 0.70         | 0.93 ***    |
| Can read English   | 0.29         | 0.55 ***    |
| At least elementary school                                     | 0.19         | 0.35 ***    |
| Household size   | 4.80         | 6.30 ***    |
| Agricultural social network size                               | 0.85         | 1.55 ***    |
| Number of associations   | 0.24         | 0.90 ***    |
| Ever held a political office                                   | 0.05         | 0.13 ***    |
| Ever held a traditional office                                 | 0.11         | 0.21 ***    |
| Has bicycle  | 0.46         | 0.78 ***    |
| Has motorcycle/scooter   | 0.03         | 0.05 ***    |
| Total landholdings (acre)                                      | 2.50         | 4.12 ***    |
| Livestock units  | 5.70         | 15.32 ***   |
| Per hectare value of agricultural production (MWK 000/hectare) | 78.14        | 98.82 ***   |
| Commercialization index (% of harvest sold)                    | 16.84        | 21.31 ***   |
| Tried new agricultural practice                                | 0.05         | 0.16 ***    |
| Tried new livestock practices                                  | 0.04         | 0.14 ***    |
| Engaged in aquaculture   | 0.00         | 0.02 ***    |
| Crop diversification index                                     | 0.44         | 0.56 ***    |
| Dietary diversity score  | 4.66         | 5.55 ***    |

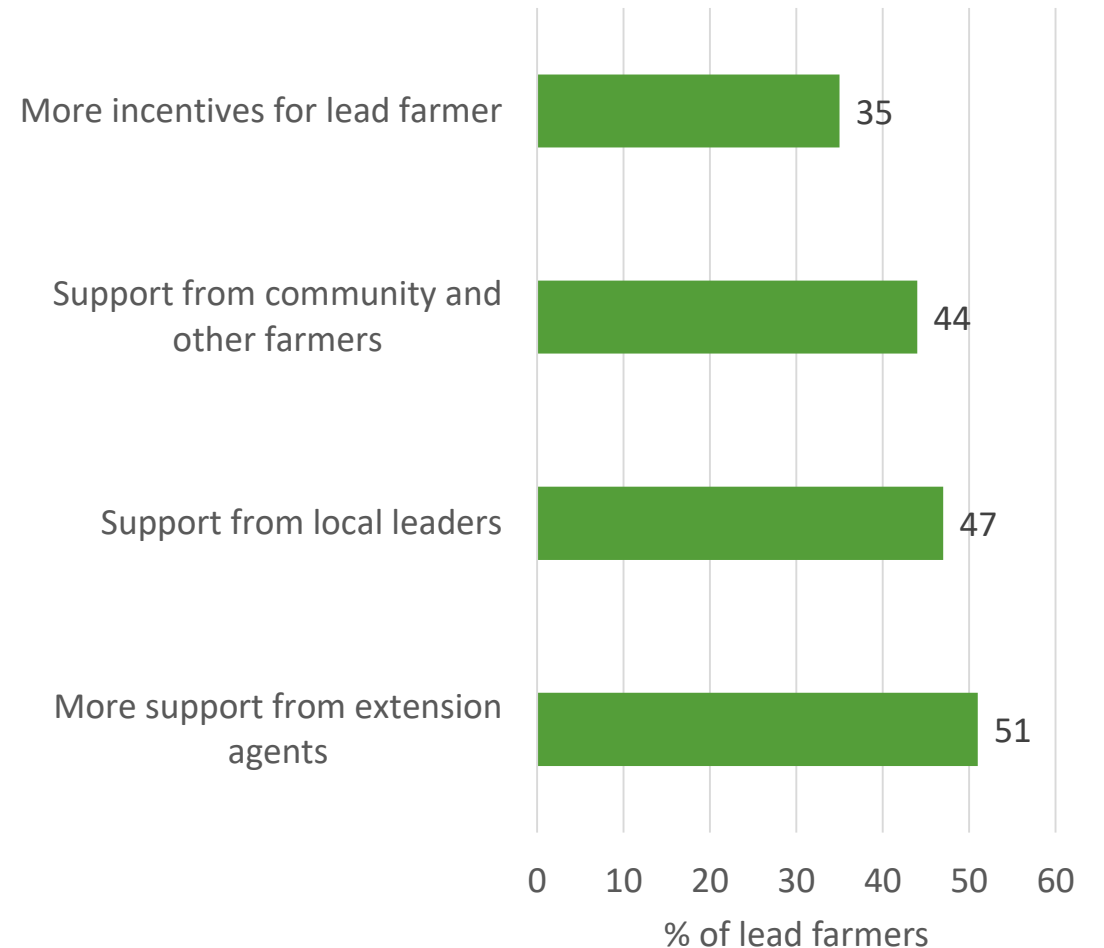
*These are averages of various socioeconomic indicators; \*\*\*, \*\* denote statistical difference between LFs and average farmer in the community at 1% and 5% level of significance.*

# Experiences of lead farmers

a. Challenges faced by LFs



b. Potential solutions to challenges faced by LFs



# COMPARISON OF TRAINING AND SUPPORT GIVEN AND MONITORING OF LEAD FARMERS BY AN NGO PROJECT AND AEDO, DOWA

|  | Project's field officer   | Government AEDO  |
|--|---|--|
| <b>Nature of training</b>                    | 1 week on agriculture (focus on CA); 1 week on gender; 1 week on nutrition; 1 week on market access   | 2 days on lead farmer concept; then join other farmers in a community meeting where AEDO disseminate on technologies   |
| <b>Nature of monitoring</b>                  | Field officer and lead farmer draw a calendar, work plan, and targets/indicators; then field officer meets with lead farmer to discuss progress   | no monitoring; no follow-up  |
| <b>Nature of support</b>                     | Inputs (fertilizer, seed, herbicide) for farm demos only; allowance; gears/supplies; pushbike   | Inputs for their plots (fertilizer, seed) through the FISP   |
| <b>Nature of technologies being promoted</b> | It depends on the project; for the particular lead farmer interviewed, focus on CA  | Depends on whether lead farmer is to promote general agriculture or specific technologies; for the particular lead farmer interviewed, s/he was supposed to be trained and expected to promote general agriculture: CA, pit planting, manure-making, irrigation, early maturing varieties, and soybean and groundnut production. |
| <b>Method of reaching farmers</b>            | Visits with producer groups (those members of VSLA who formed PGs, with 10-25 members); visits will depend on the calendar that each group prepared, but generally 2 visits/group/week (mostly) | Lead farmer usually combines visits and dissemination with the NGO project work. For example, when visiting the groups and the villages for NGO project, he is also disseminating the other practices he learned from extension agents.  |
| <b>Activities/ Performance</b>               | Lead farmer follows the activities set and performs on the targets.   | No activities; but since lead farmer is working under the project, if ever s/he will be evaluated by AEDO, he can report his/her activities under the project as his accomplishments.  |

***LFs work and are active only if there is a project. Otherwise, limited training and support; no monitoring, follow-up and encouragement of LFs. There are active LFs if they are supported by active AEDOs.***

# Conclusions

- LFs play a crucial role in supporting and assisting AEDO's activities in the communities (farm demonstrations, community and group meetings, etc.)
- LFs play an important role as information bridge between farmers (demand) and extension workers and service providers (supply)
- However, their current coverage or interactions with farmers is limited (up to 20% of households)
- LFs cannot fill the gap or areas where AEDOs are absent or not active. They complement AEDO's work, rather than substitute it.
- LFs are not closely similar to characteristics of average farmers in the community, some are still being selected by AEDO or chief head
- No statistical association of farmers' exposure, access to and interactions with LFs on technology awareness and adoption
- When we unpack the type and heterogeneity of LFs, we see that access to quality of LFs, adoption behavior of LFs and regular training received by LFs have strong and consistent effects on awareness and adoption of most technologies being promoted



# Implications

- **Regular training**: LFs need training, and retraining (on LF concept, communication, and the specific technologies)
  - Need to revisit 2-3 technologies per LFs, but combination of technologies and packages to capture farming systems
  - Intensity of training: 2-5 days trainings by government versus 2-5 weeks by NGOs (and more frequent)
- **Ensuring selection of quality of LF**: Revisit the selection process to ensure inclusive and quality of participation in these selection processes, including greater sensitization of communities
  - To emphasize how different the selection and monitoring processes of LFs are than in the past implementation of the heavily-criticized Master Farmers or *Achikumbi* (Progressive Farmer) approaches
  - To help reduce resentment and envy in some communities toward selected LFs, as well as ensuring greater cooperation among farmers to select and support effective LFs for their community's benefit.

## Implications (2)

- **Maintaining and incentivizing quality LFs:** As elaborated in the DAES (2015), much support from AEDOs, community and local leaders, and other service providers are expected and needed for LFs to do their work effectively and sustainably.
  - AEDOs can support by periodic orientation of local leaders on the Lead Farmer approach, conduct joint stakeholder supervisory visits (but AEDOs will also be supported, supply side issue)
  - Mobilize the communities and local leaders to take ownership of the process, to monitor and evaluate and apply needed incentive/rewards and sanctions/replacement based on their performance
- **Incentivizing adoption behavior of LFs:**
  - Few LFs are adopting the technologies that they are meant to be promoting, consistent with Holden et al. (2018) on CA, and this study shows similar for other mgt practices
  - Focus on getting lead farmers to adopt and value the technology:
    - Need to revisit the appropriateness of technologies being promoted at different local contexts
    - Support in farm demonstrations
    - Intensive training of LFs to fully learn the technology packages, and its long-term benefits