Lesson from orange sweetpotato saturation and thought leader experiments for promoting adoption in Uganda

Sweetpotato seed systems Community of Practice, Seventh Consultation

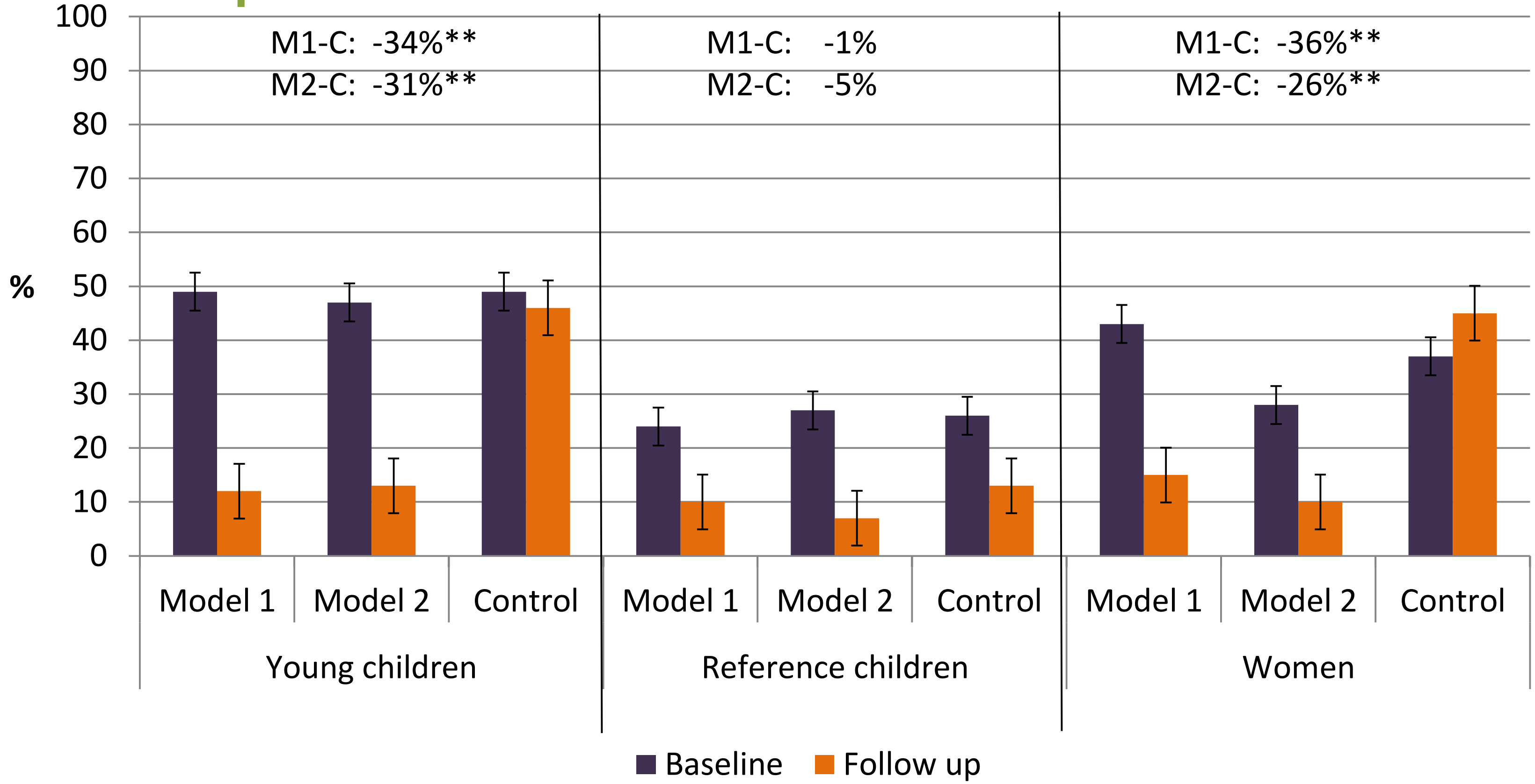
June 13, 2017

Authors: Sarah Baird, Dan Gilligan, Scott McNiven
Presenter: Dan Gilligan

Motivation

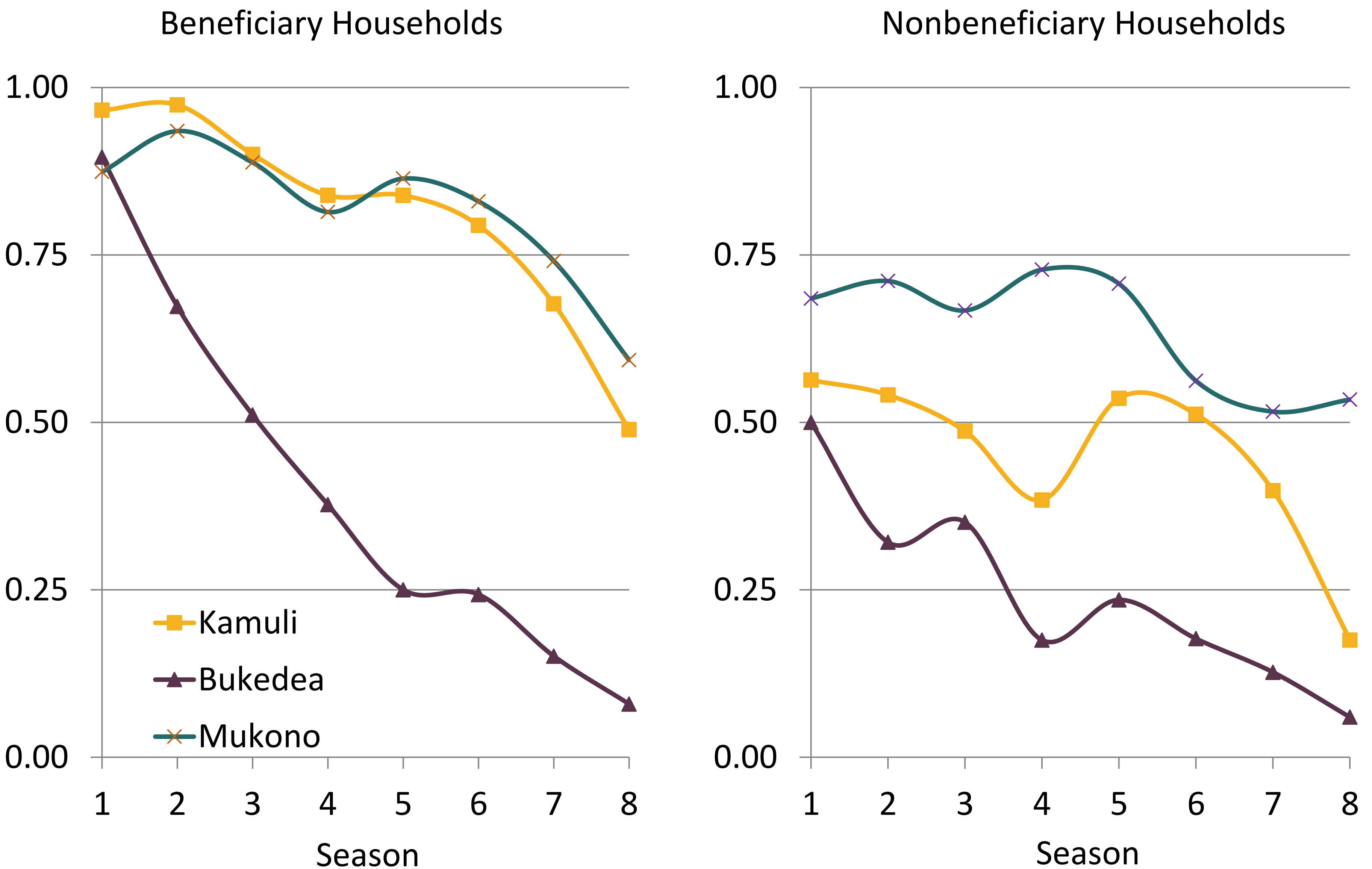
- Micronutrient deficiency affects over two billion individuals globally. The highest prevalence of vitamin A deficiency and iron-deficiency anemia among children is in Africa
- *Biofortification*, the process of breading staple crops with elevated levels of key micronutrients, is one complementary strategy to combat micronutrient deficiencies
- It is an effective strategy to increase dietary intake of vitamin A and improve micronutrient status among populations vulnerable to deficiency (Hotz et al. 2012a, 2012b; Low et al. 2007)
- Requires high rates of adoption to be a successful strategy at the population level and to eliminate the need for routine micronutrient supplementation (Gilligan 2012).

REU Uganda: Reduced prevalence of inadequate vitamin A intakes



- Prevalence of inadequate vitamin A intakes
  - Fell 33% for children under age 3
  - Fell 26-36% for adult women
  - Impact on children age 3-5 shows no effect due to improvement in control group

Impacts over time and space: Proportion of Beneficiary and Nonbeneficiary Households Cultivating OSP

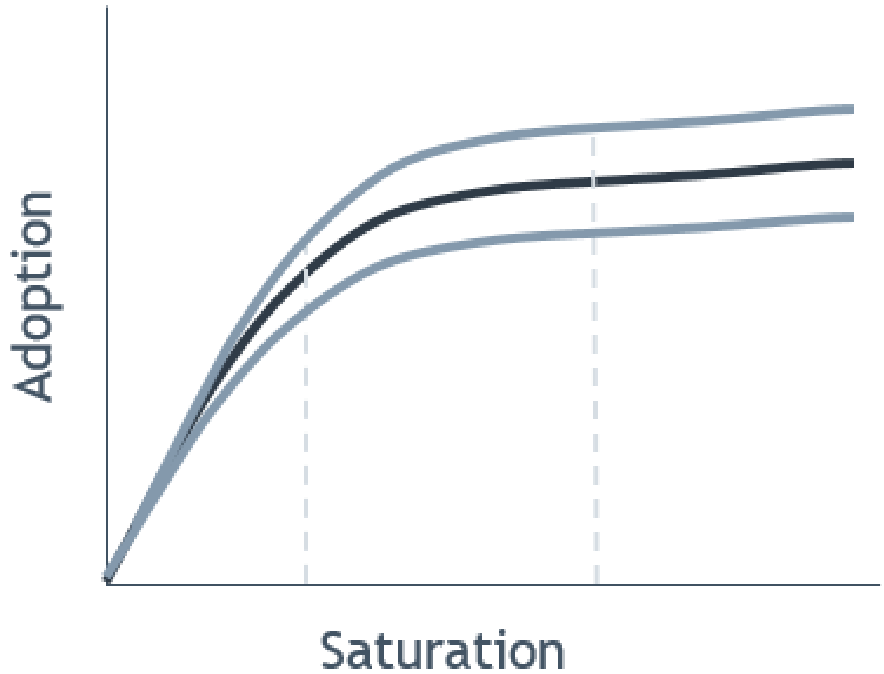


HarvestPlus Uganda

- HarvestPlus Reaching End Users (REU) project in Uganda increased dietary intakes of vitamin A and had large spillover effects
- HarvestPlus scaled up biofortification in Uganda with Developing and Delivering Biofortified Crops (DDBC)
  - Reached 225,000 households across 13 districts from 2012 to 2017 with orange sweet potato and high iron beans
  - IFPRI conducted an impact evaluation of the DDBC project testing varying strategies to encourage broad diffusion of biofortified crops

DDBC Research questions

- Can spillover effects be harnessed to sustainably increase adoption rates?
- Are opinion leaders more effective at promoting adoption?



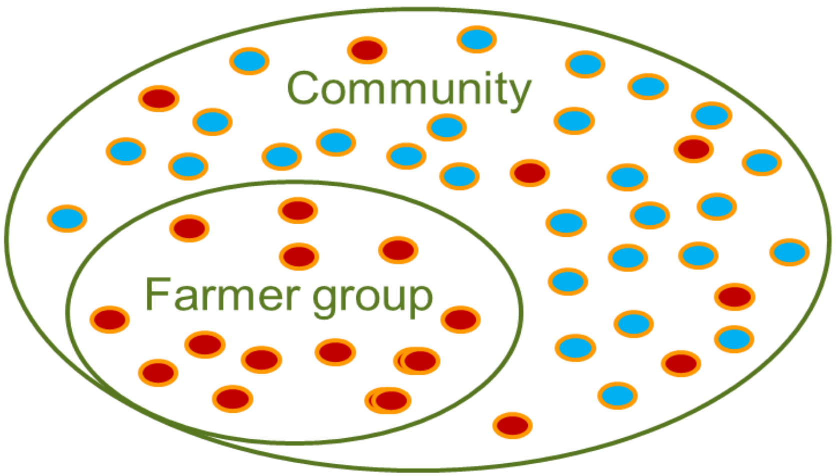
- How does the rate of saturation of planting material in project communities affect overall adoption rates and spillover to non-beneficiaries within the same communities?

Study design

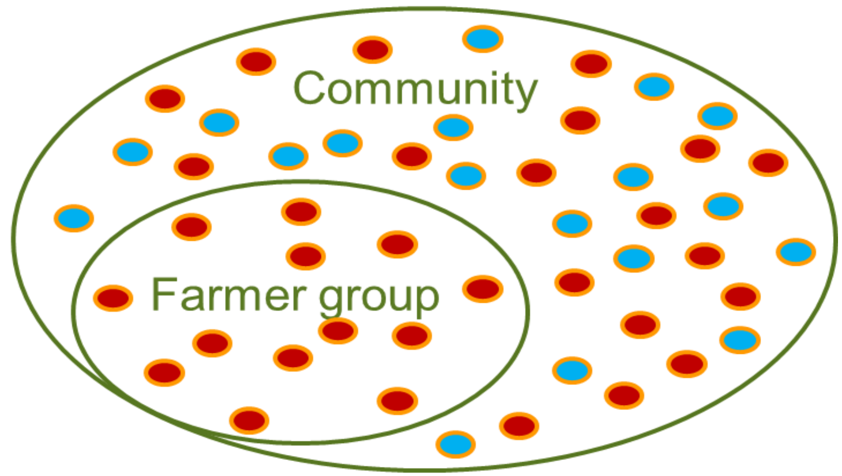
- Design an experiment that varies who gets access to **planting material**: 4 treatment arms
  - Low saturation: Farmer group plus 20% of other HHs
  - High saturation: Farmer group plus 50% of other HHs
  - Thought leaders: opinion leaders and progressive farmers
  - DDBC project: Only farmer groups
- Randomly assign communities to treatment arms (RCT)
  - In this study a cluster is equal to a village
- Assess cost effectiveness
  - Compare the implementation costs between treatment arms

Intervention Arms

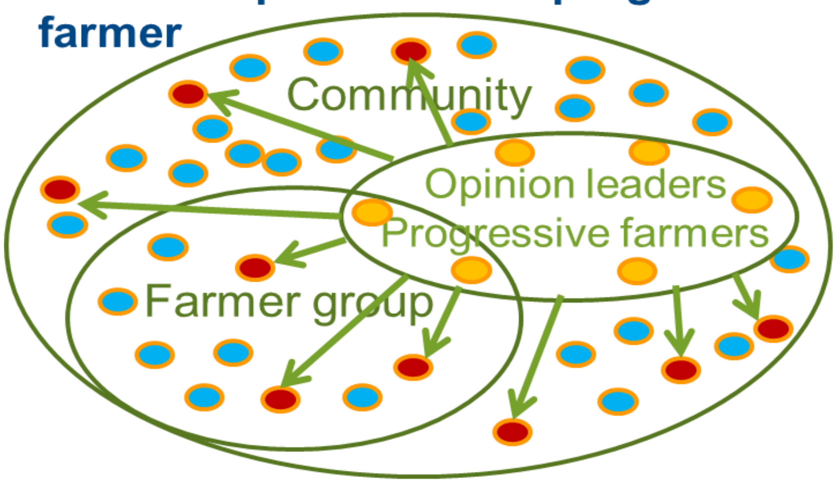
Arm 1 – **Low saturation**



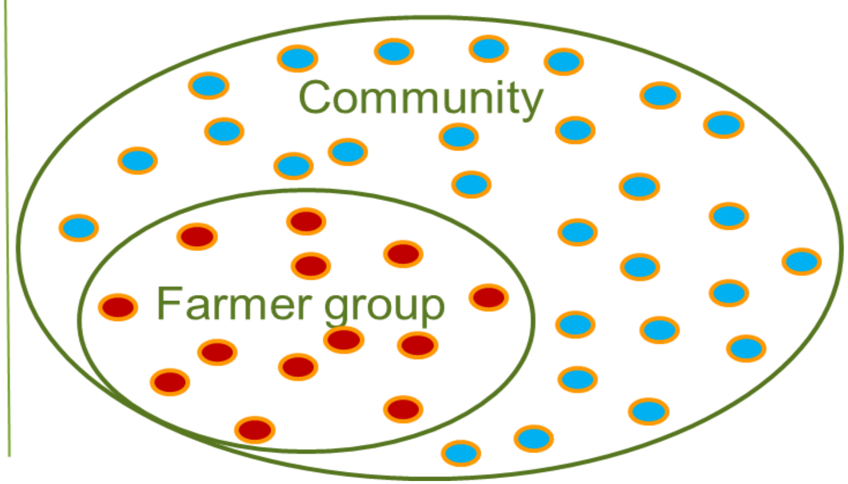
Arm 2 - **High saturation**



Arm 3 – **Opinion leader/progressive farmer**



Arm 4 – **DDBC comparison**



Study Sample and Data Collection

	Baseline	Endline	Overlapping
CLE	8,102	8,942	5,067
Household survey	3,875		

- Endline household sample selection criteria:
  - Number HH members in the DDBC project farmer group
  - HH a child under age 5
  - Stratified to include 8 non-member beneficiary and 10 non-beneficiary HHs (saturation treatment only)
- Households meeting the selection criteria were randomly sampled from the baseline HH survey sample, and then from the baseline CLE

Treatment effects from saturation treatments

	Orange Sweet Potato			High Iron Beans		
	Last Five Seasons	Last Year	Last Season	Last Five Seasons	Last Year	Last Season
Combined saturation treatment	0.351*** (0.054)	0.156*** (0.049)	0.142*** (0.048)	0.357*** (0.057)	0.138*** (0.048)	0.123*** (0.047)
Low saturation treatment	0.337*** (0.078)	0.147** (0.065)	0.154** (0.063)	0.349*** (0.071)	0.233*** (0.064)	0.250*** (0.063)
High saturation treatment	0.359*** (0.059)	0.160*** (0.055)	0.130** (0.056)	0.362*** (0.066)	0.059 (0.050)	0.018 (0.042)
Mean in the control group	0.376	0.243	0.209	0.289	0.136	0.111
Number of observations	875	875	876	794	794	795

Standard errors in parenthesis are clustered at the community level. Statistical significance of parameter estimates is indicated by: * 0.10, ** 0.05, *** 0.01.

Spillover effects from saturation treatments

	Orange Sweet Potato			High Iron Beans		
	Last Five Seasons	Last Year	Last Season	Last Five Seasons	Last Year	Last Season
Combined saturation spillover	0.160***	0.138***	0.108**	0.185***	0.093**	0.058
	(0.057)	(0.053)	(0.050)	(0.060)	(0.047)	(0.039)
Low saturation spillover	0.093	0.073	0.051	0.154**	0.106*	0.068
	(0.065)	(0.056)	(0.056)	(0.067)	(0.061)	(0.049)
High saturation spillover	0.228***	0.206***	0.167**	0.215***	0.083	0.052
	(0.069)	(0.074)	(0.066)	(0.076)	(0.053)	(0.046)
Mean in the control group	0.376	0.243	0.209	0.289	0.136	0.111
Number of observations	875	875	876	794	794	795

Standard errors in parenthesis are clustered at the community level. Statistical significance of parameter estimates is indicated by: * 0.10, ** 0.05, *** 0.01.

Spillover effects from the opinion leader/progressive farmer treatment

	Orange Sweet Potato			High Iron Beans		
	Last Five Seasons	Last Year	Last Season	Last Five Seasons	Last Year	Last Season
Low saturation spillover	0.077 (0.062)	0.068 (0.055)	0.049 (0.053)	0.154*** (0.058)	0.106* (0.054)	0.057 (0.048)
High saturation spillover	0.212*** (0.071)	0.204** (0.078)	0.163** (0.072)	0.224*** (0.080)	0.091 (0.056)	0.045 (0.046)
Opinion leader/Progressive farmer spillover	-0.008 (0.049)	-0.009 (0.046)	-0.009 (0.042)	-0.015 (0.046)	-0.036 (0.035)	-0.044 (0.031)
Prob > F(LS spillover = OLPF spillover)	0.160	0.165	0.279	0.004	0.008	0.035
Prob > F(HS spillover = OLPF spillover)	0.003	0.009	0.024	0.004	0.031	0.060

Standard errors in parenthesis are clustered at the community level. Statistical significance of parameter estimates is indicated by: * 0.10, ** 0.05, *** 0.01.

Preliminary cost estimates

Table 6: DDBC implementation costs per individual beneficiary household by treatment arm (USD)

	DDBC	HS	LS	OL/PF
HarvestPlus project costs	50.48	17.21	30.24	36.77
Planting material	4.24	4.05	4.06	4.11
Field extension worker time	12.85	5.60	8.89	6.31
NGO transportation costs	9.72	4.19	6.36	6.35
All other NGO costs	36.39	11.82	22.02	21.82
Total	113.67	42.87	71.57	75.36

- High saturation treatment was lower cost per beneficiary and similarly effective as the low saturation treatment
- High treatment saturation appears to be very cost effective

Conclusions:

- The small added cost of distributing planting material for biofortified crops to more farmers in a beneficiary community is expected to show high returns in increased adoption and diffusion, even to the point of covering more than 50% of all households in a community
- Natural diffusion process can be harnessed to substantially increase adoption rates over 5 seasons
- As a public health intervention with potential for sustainable adoption leading to ongoing health benefits, higher community saturation is the preferred delivery strategy

Thank you

Contact: d.gilligan@cigar.com