RESULTS OF THE PRE-TEST ASSESSING ADOPTION OF AGROFORESTRY IN WEST TANZANIA

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Outline

I. Background
II. Research Questions
III. Survey Design and Pre-Test Outcomes
IV. Monte Carlo Experiments
V. Future Testable Hypotheses
VI. Relevancy to the PNW

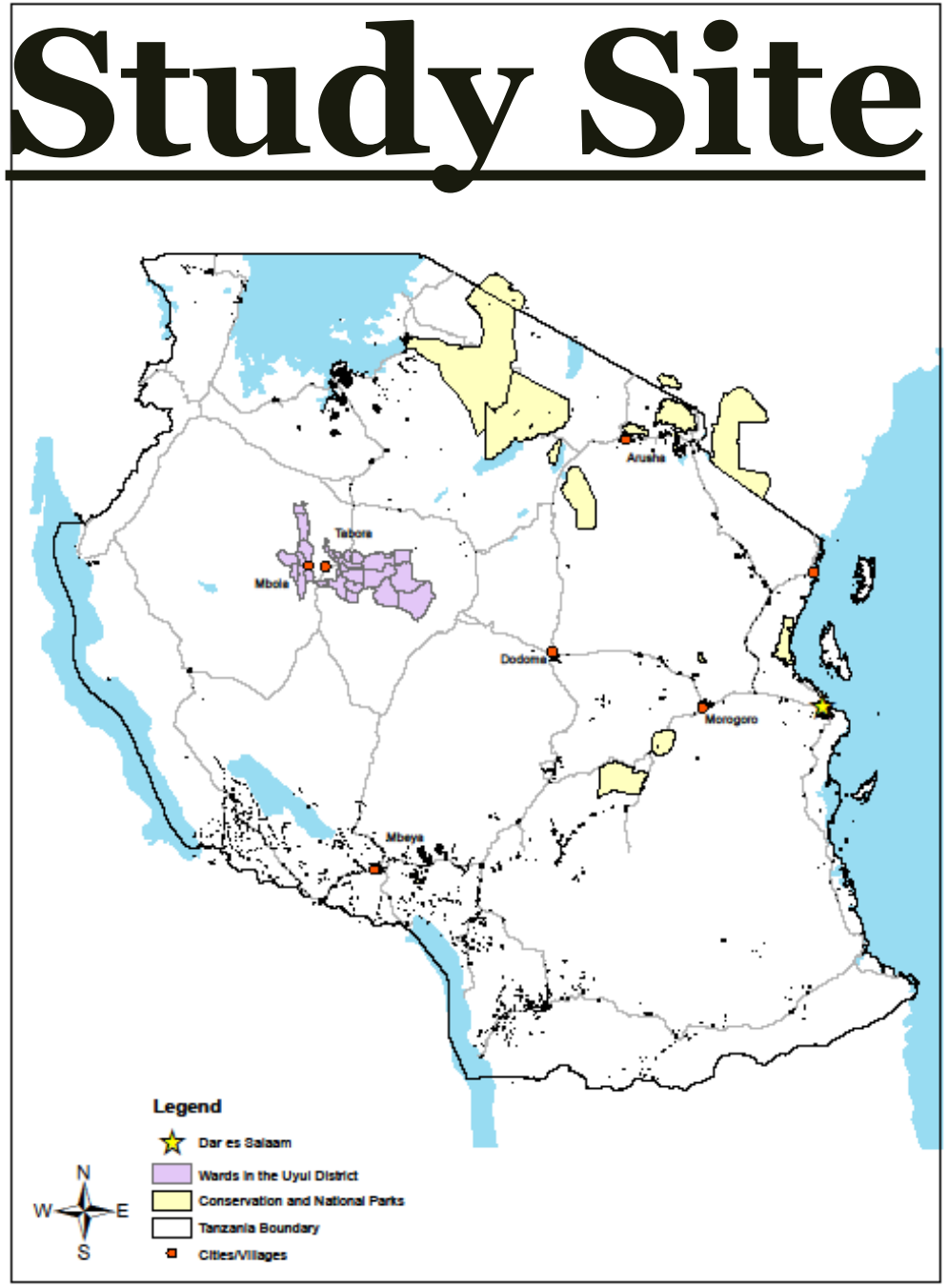
Background

Tobacco, Corn and Banana

Cassava Garden

Collecting Surveys

Study Site


Arusha
Tabora
Mbola
Dodoma
Morogoro
Mbeya
Legend
Dar es Salaam
Wards in the Uyui District
Conservation and National Parks
Tanzania Boundary
Cities/Villages
N
W
E
S
1 0.5 0
1 Decimal Degrees

Arusha
Mbola
Tabora
Dodoma
Morogoro
Mbeya
Legend
Dar es Salaam
Tanzania Boundary
Cities/Villages
Vegetation
RGB
Red: Band_1
Green: Band_2
Blue: Band_3
N
W
E
S
1 0.5 0
1 Decimal Degrees

What is Agroforestry?

Woody perennials **purposefully** planted and managed with livestock or crops.

- *Erosion Control*
- *Fodder, Food, Fuel*
- *Nutrient cycling*
- *Risk mitigation*

Timber, Banana, and Fodder for livestock in Tanga, TZ

Dryland farming with *Gliricidia sepium* in Dodoma, TZ

Biologically Productive Agroforestry Systems for Lowland Tanzania

a) Improved Fallows

b) **Rotational Woodlot Farming (1989)**

c) **Intercropping (2015-2016)**

Pigeon Pea
(Cajanus cajan)

Cassava or Manioc
(Manihot esculenta)

Gliricidia sepium

Lessons from the Literature

Gliriches (1957) – Iowa, USA Hybrid Corn

Feder and Slade (1984) – Northwest India HYV Rice

Binswanger and McIntire (1987) – West Africa Livestock (Transhumance/hired labor)

Von Braun and Webb (1989) – West Africa Rice and other Staple Crops (labor division)

Jaeger & Matlon (1990) – Burkina Faso (Republic of Upper Volta) Draft Power

Jacoby (1993) – Peruvian Sierra Fuelwood

Foster and Rosenzweig (1996) – India Schooling Investments

Ersado, Amacher, and Alwang (2004) – Microdams

Munshi (2004) – India HYV wheat and rice

Johnson, Masters, and Preckel (2005) – Nigeria Hybrid Cassava

Kabwe, Bisby, and Cullen (2009) – Zambia Agroforestry Adoption (tree planting)

Aswaf et al. (2012) – Pigeon Pea & Chickpea in Tanzania and Ethiopia

Bullock, Mithofer, Vihemaki (2013) – East Tanzania Cardamom

- If an innovation is profitable then adoption is faster and more widespread
- Getting the farmer to try the technology increases long-term usage
- Understanding gender roles and distribution of household labor tasks
- Factors such as age, land size, family size, health, and education
- Major inhibitor of adoption is increased managerial skills, knowledge, and labor
- Agroforestry is a long-run solution, may take many years to realize full benefits

Challenges & Research Needs

Low adoption rates of agroforestry

Policy improvements for ICRAF

- *Who to target*
- *Understand Preferences and Barriers to Entry*

Research Questions

(I) What constraints effect agroforestry adoption decisions among rural farmers?

Mr. Matata
In-Field
Collaborator

Research Questions

(II) Are those who have adopted the agroforestry technology better off than those who did not adopt?

Weighing Tomatoes in the market

The Survey

- **Block 1:** Innovation Acceptance
- **Block 2:** Farming Practices
- **Block 3:** Prices
- **Block 4:** Time Allocation
- **Block 5:** Asset Recall and MDP
- **Block 6:** Community Engagement and Self Efficacy
- **Block 7:** Health
- **Block 8:** HFIAS
- **Block 9:** Demographics

Pre-Test Data Collection

- Enumerator Training
- Village Registries
  - Data Randomization

Enumerator Team

Descriptive Stats

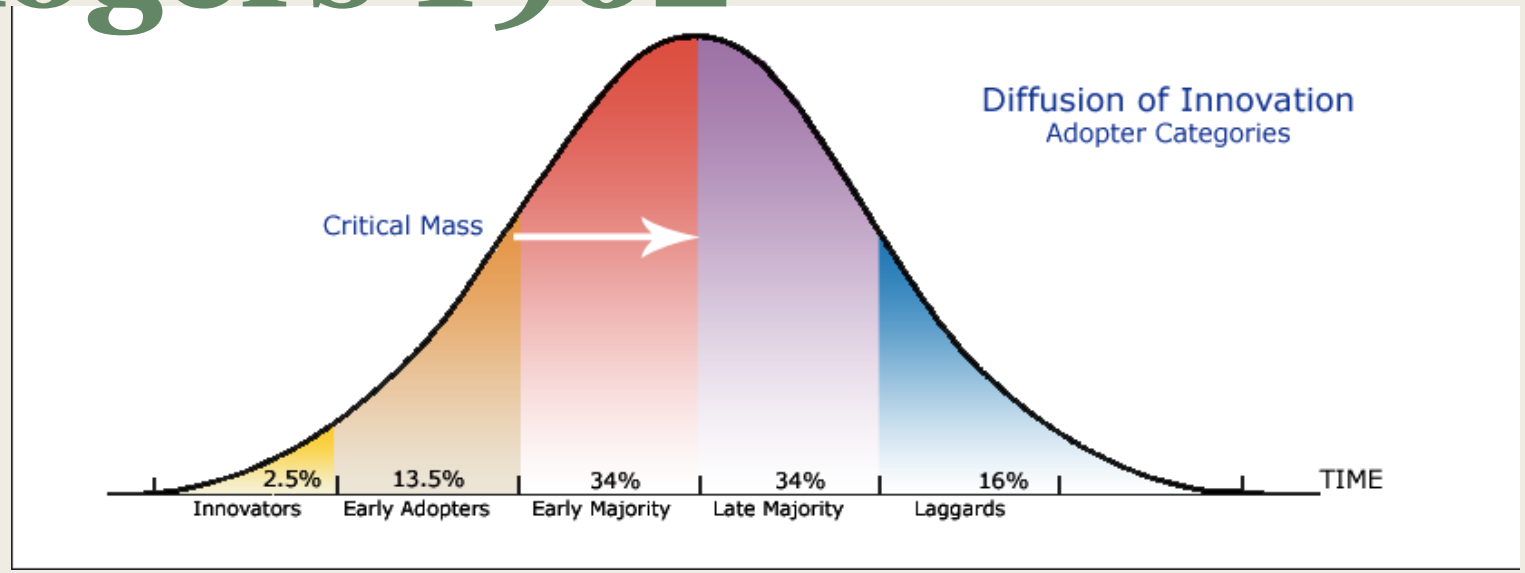
Village	Total Number of Households in Village	Total Number of Households Sampled
Isenga	100	16
Mpenge	147	21
Ngokolo	48	6
Totals	**295**	**43**

Descriptive Stats

Village	Response	Plant Cassava	Plant Pigeon Pea	Plant Gliricidia *sepium*
Isenga	Yes	13	1	0
	Not Sure	0	0	1
	No	3	15	14
Mpenge	Yes	17	3	0
	Not Sure	0	1	2
	No	4	17	17
Ngokolo	Yes	6	0	0
	Not Sure	0	0	0
	No	0	6	6

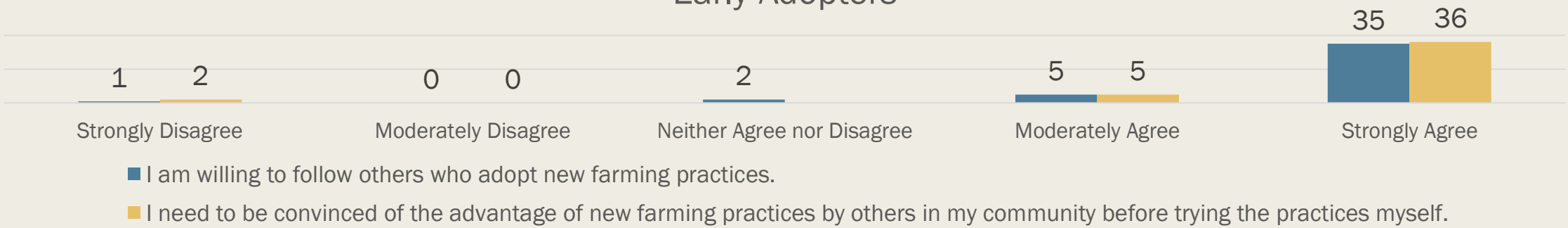
Diffusion of Innovations

Rogers 1962

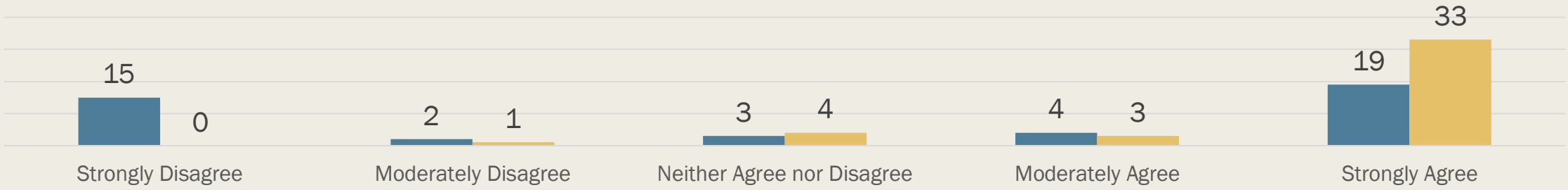


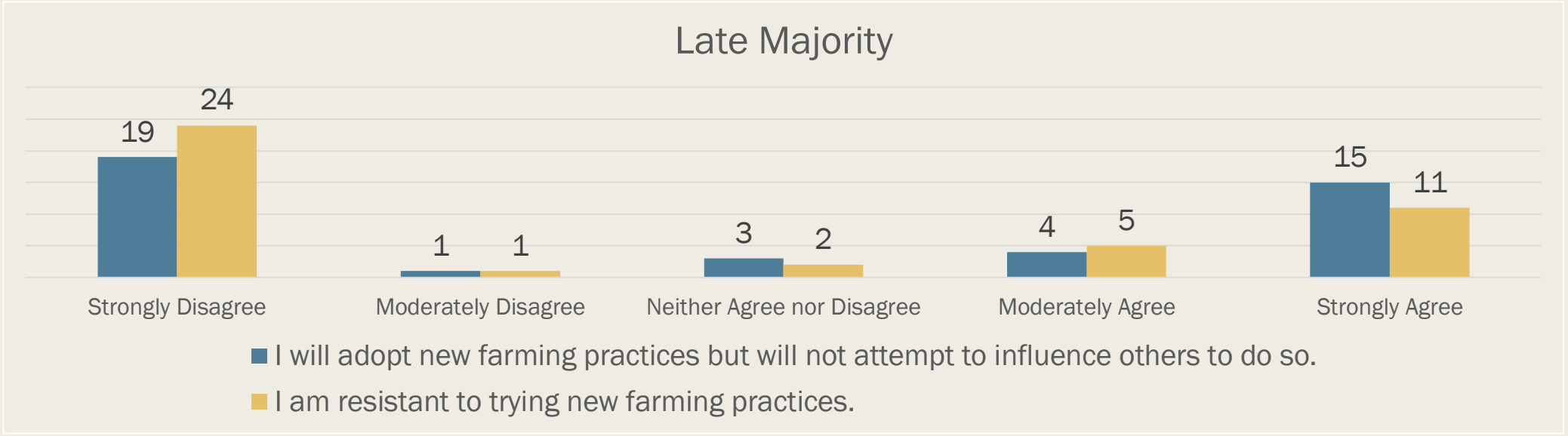
Innovators

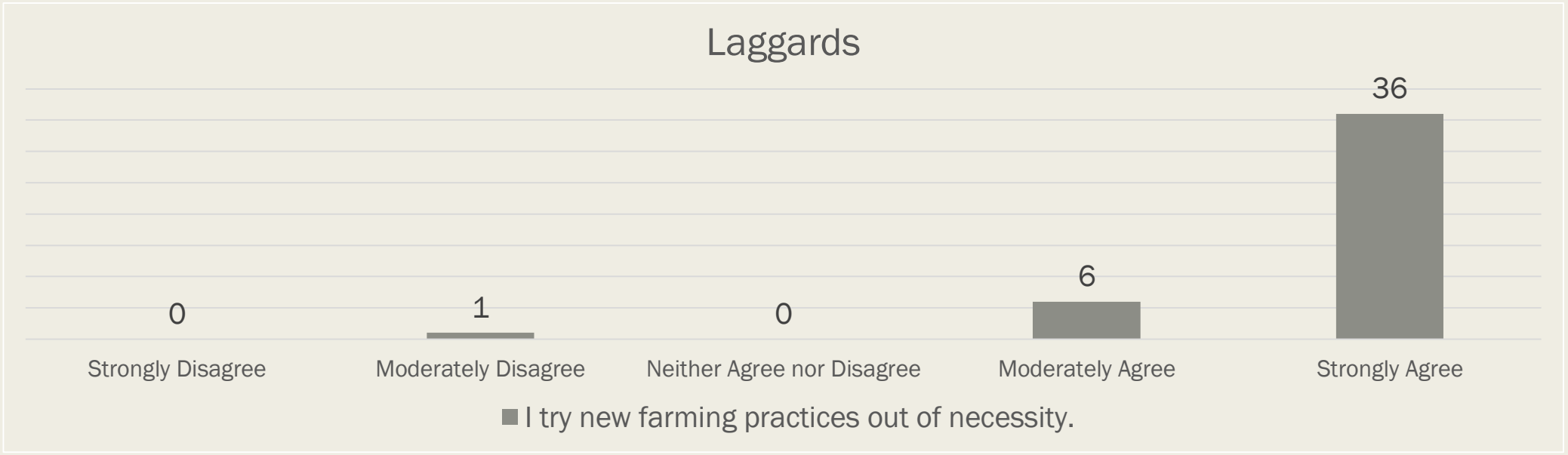
Early Adopters



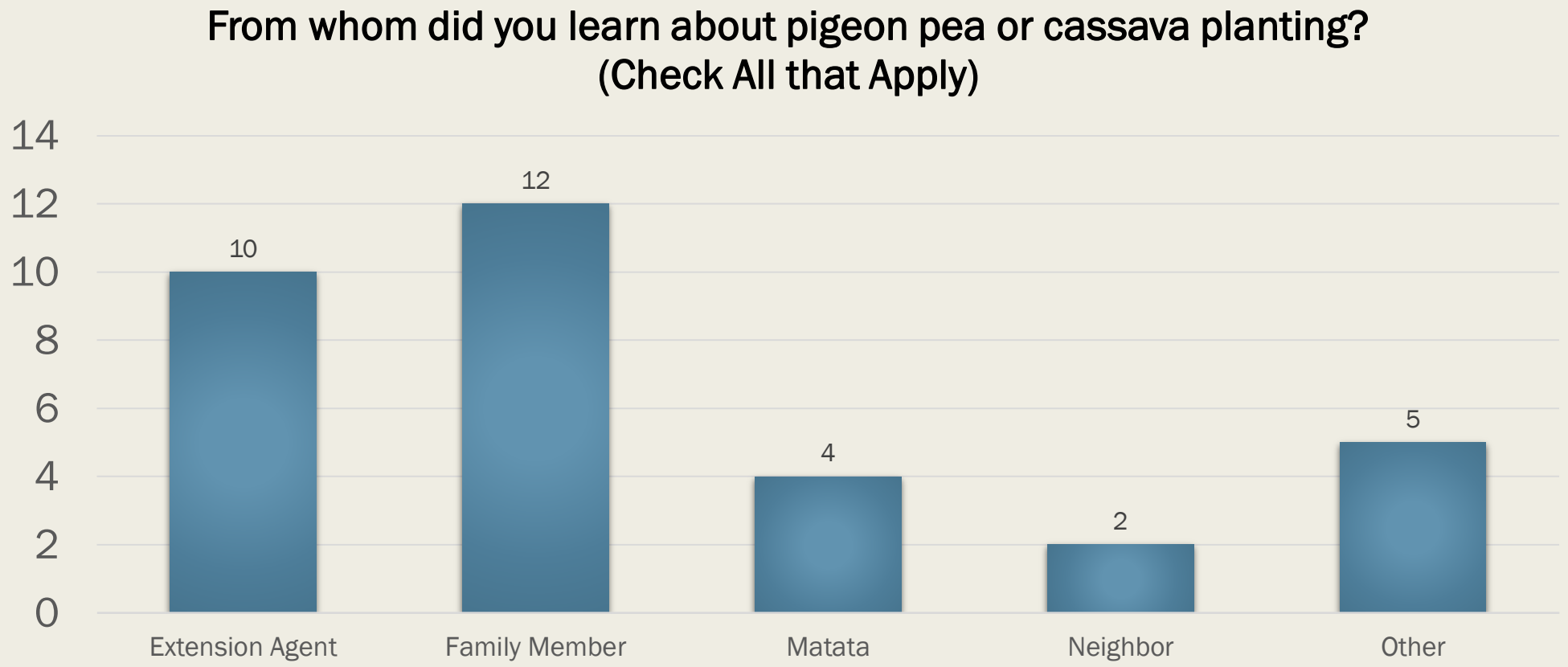
Early Majority




Late Majority
19
24
1
1
3
2
4
5
15
11
Strongly Disagree
Moderately Disagree
Neither Agree nor Disagree
Moderately Agree
Strongly Agree
I will adopt new farming practices but will not attempt to influence others to do so.
I am resistant to trying new farming practices.

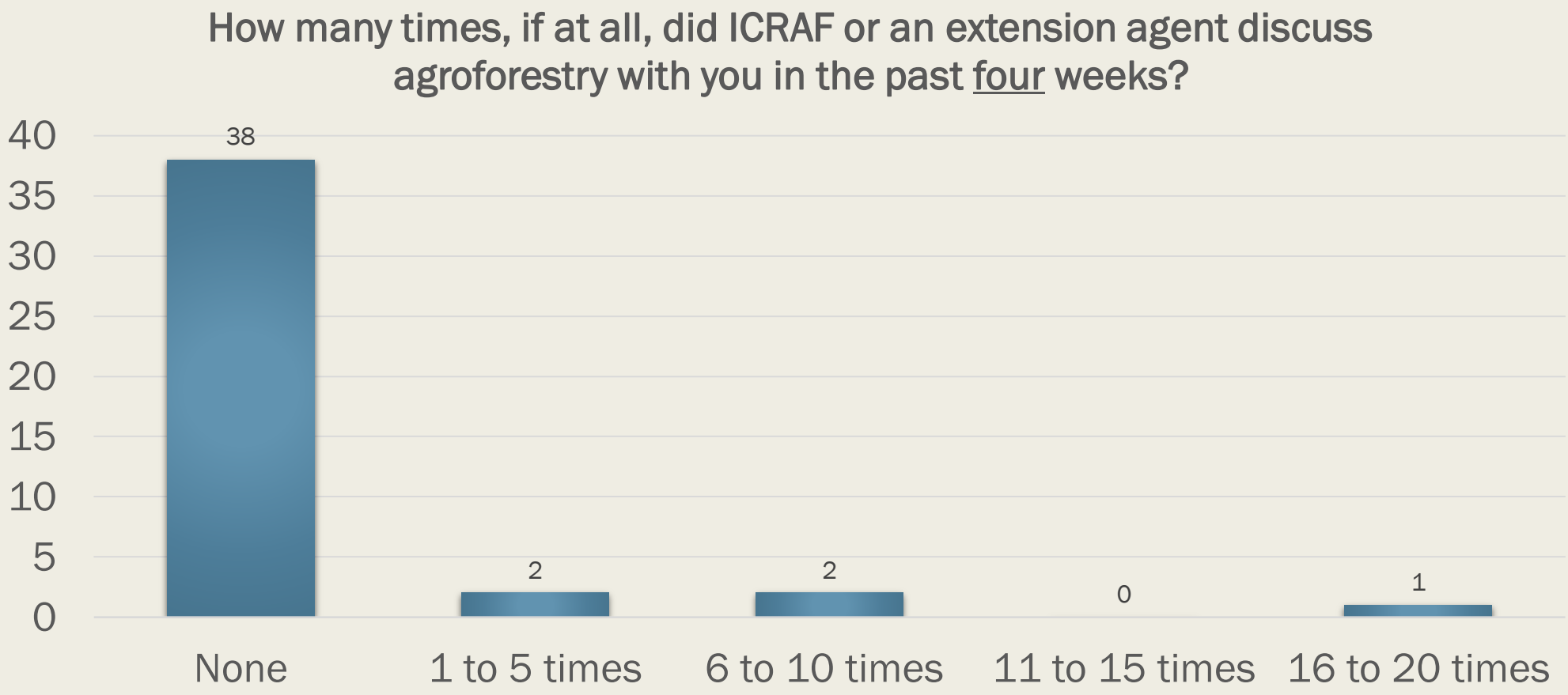

Laggards
0
1
0
6
36
Strongly Disagree
Moderately Disagree
Neither Agree nor Disagree
Moderately Agree
Strongly Agree
I try new farming practices out of necessity.

Social Learning

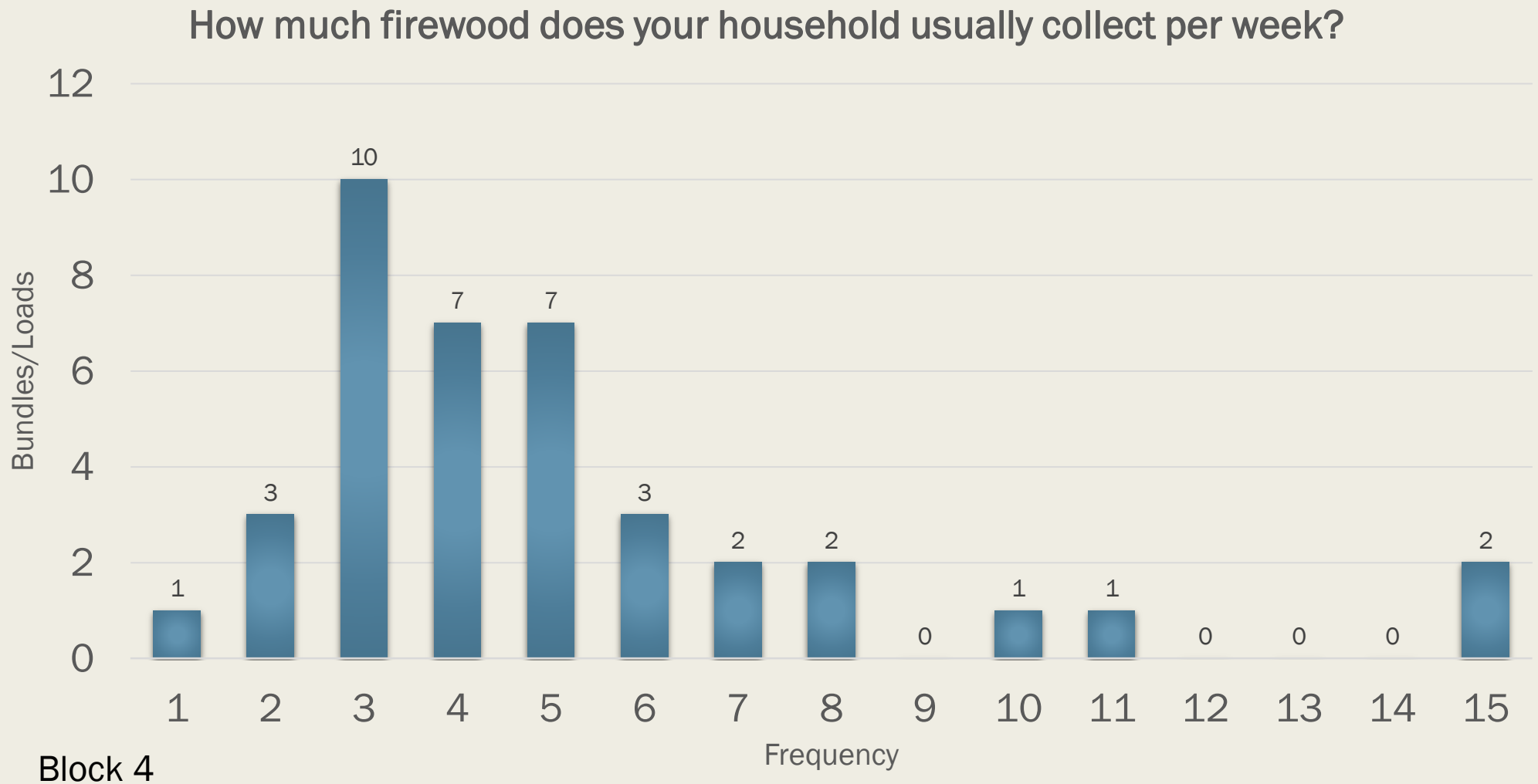


Block 6

Social Learning

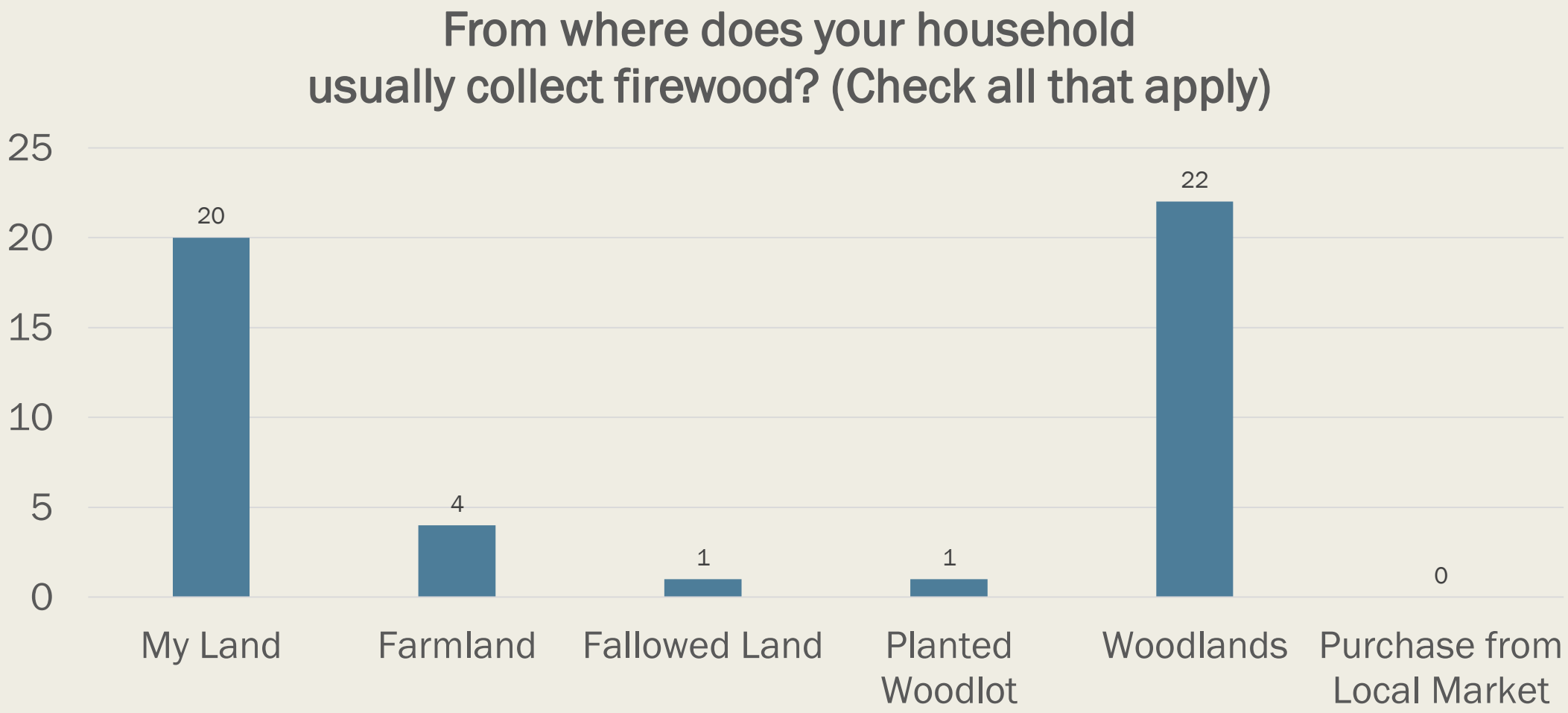


Substitution Effects?

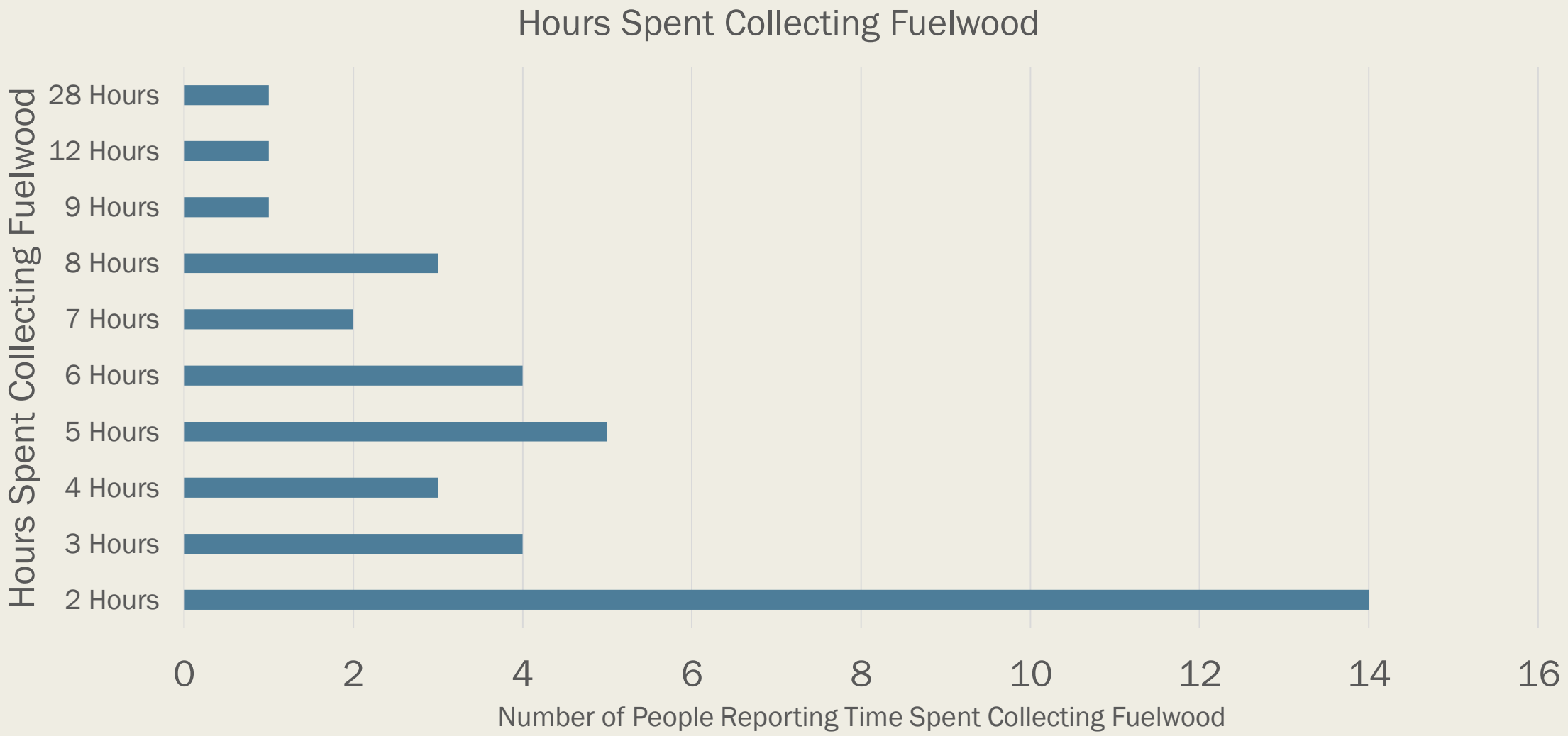


Block 4

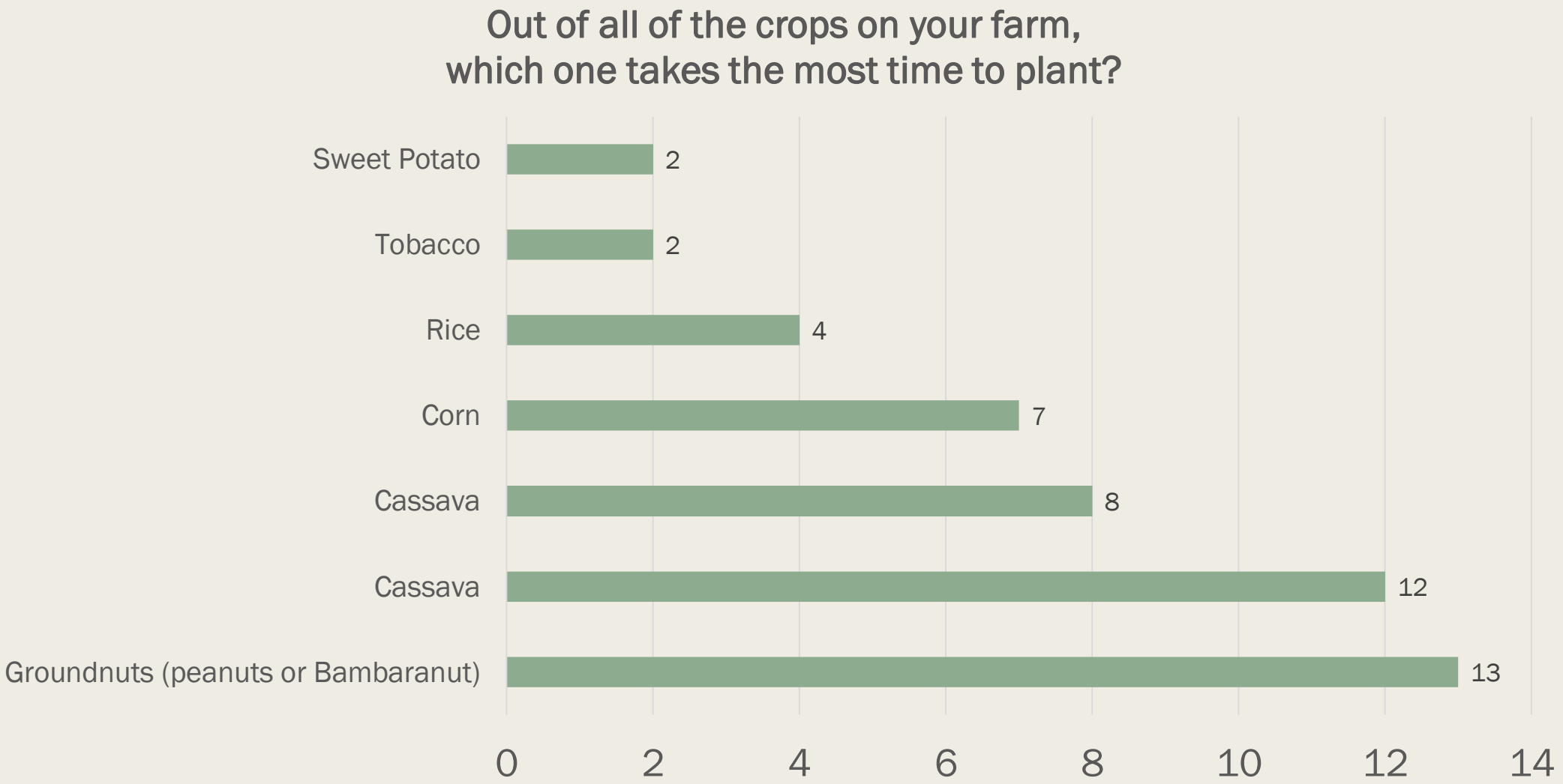
Substitution Effects?



Substitution Effects?



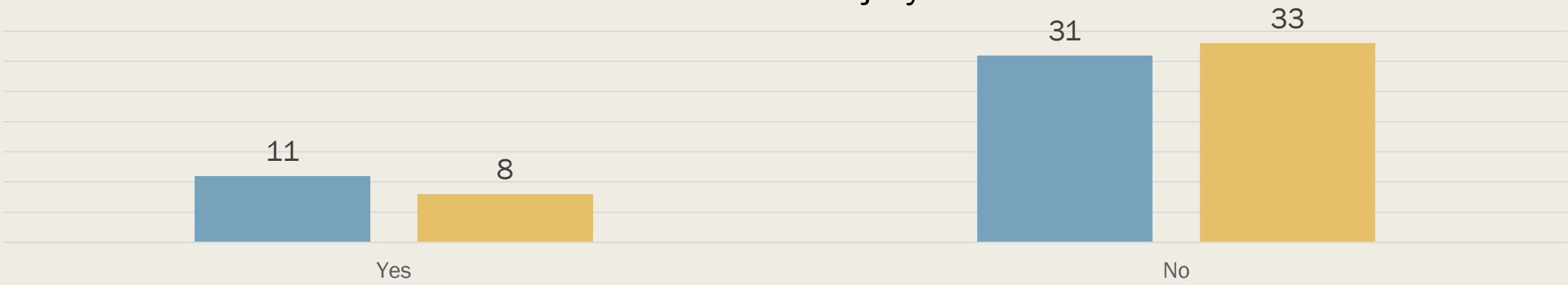
Time Allocation Example



Prices (1 USD = 2,300 TSH)

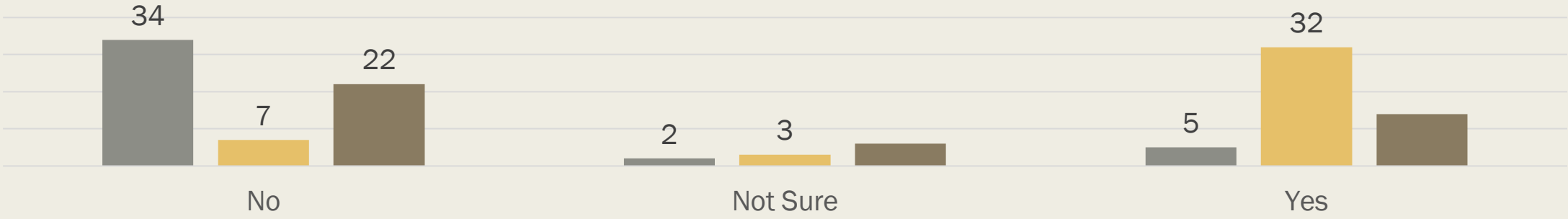
	Yes, Tabora Town	Yes, Local Market	Yes, Outside Tabora Region	If yes, how much does your household usually sell 1 kilo for?
Pigeon Pea	1	1	0	2000 TSH
Cassava	10	9	0	25-17,000 TSH
Corn	5	6	0	250-42,000 TSH
Rice	1	1	0	1,100 TSH
Yams	6	5	1	500-15,000 TSH

Illness and Injury



- Have any household members experienced illness or injury during the last agricultural season that impacted their ability to work on the farm?
- Have any household members experienced long-term illness or injury spanning several agricultural seasons that have impacted their ability to work on farm?

Health Access



- Have any household members experienced illness or injury that has impacted their ability to work off-farm? (taxi driver, sell goods to market, work in a store)
- Does your household have access to a health clinic when household members are sick?
- Does your household make use of homemade or local medicines?

The Adoption Prediction Model: Probit
U > 0 = Adopt!

$$U = \beta_0 + \beta_1 * \text{Ha_FarmedCarlo} + \beta_2 * \text{Hours_MarketCarlo} + \beta_3 * \text{Hours_FarmingCarlo} + \beta_4 * \text{ICRAFDumCarlo} + \beta_5 * \text{long_term_illnessCarlo} + \beta_6 * \text{Age_Carlo} + \boldsymbol{\beta_7} * \textbf{Innovations} + e$$

Coefficient

$\beta_7 < 0$

1 = Innovator

2 = Early Adopter

3 = Early Majority

4 = Late Majority

5 = Laggard

Pseudo R-Squared = .5302	Coefficient	Standard Error
Hectares Farmed	0.12 ***	0.03
Hours to Market	-0.04 ***	0.01
Hours spent Farming	0.09 ***	0.01
Heard of ICRAF?	0.25	0.20
Suffer from Long Term Illness	-0.50 ***	0.24
Age of Participant	0.02 ***	0.00
Self-Reported Innovator Category (Diffusion of Innovations Theory)	-0.16 ***	0.06

$$U = \beta_0 + \beta_1 * \text{Ha_FarmedCarlo} + \beta_2 * \text{Hours_MarketCarlo} + \beta_3 * \text{Hours_FarmingCarlo} + \beta_4 * \text{long_term_illnessCarlo} + \beta_5 * \text{Age_Carlo} + \boldsymbol{\beta_6} \textbf{ * ExtensionInteractions} + \boldsymbol{\beta_7} \textbf{ * Innovations} + e$$

Pseudo R-Squared = .79	Coefficient	Standard Error
Hectares Farmed	0.35 ***	0.09
Hours to Market	-0.13 ***	0.04
Hours spent Farming	0.16 ***	0.03
Suffer from Long Term Illness	1.66 ***	0.58
Age of Participant	0.03 ***	0.01
Self-Reported Innovator Category (Diffusion of Innovations Theory)	-0.15	0.17
Extension Interactions	0.68 ***	0.24

Eager to Innovate and Extension Interactions

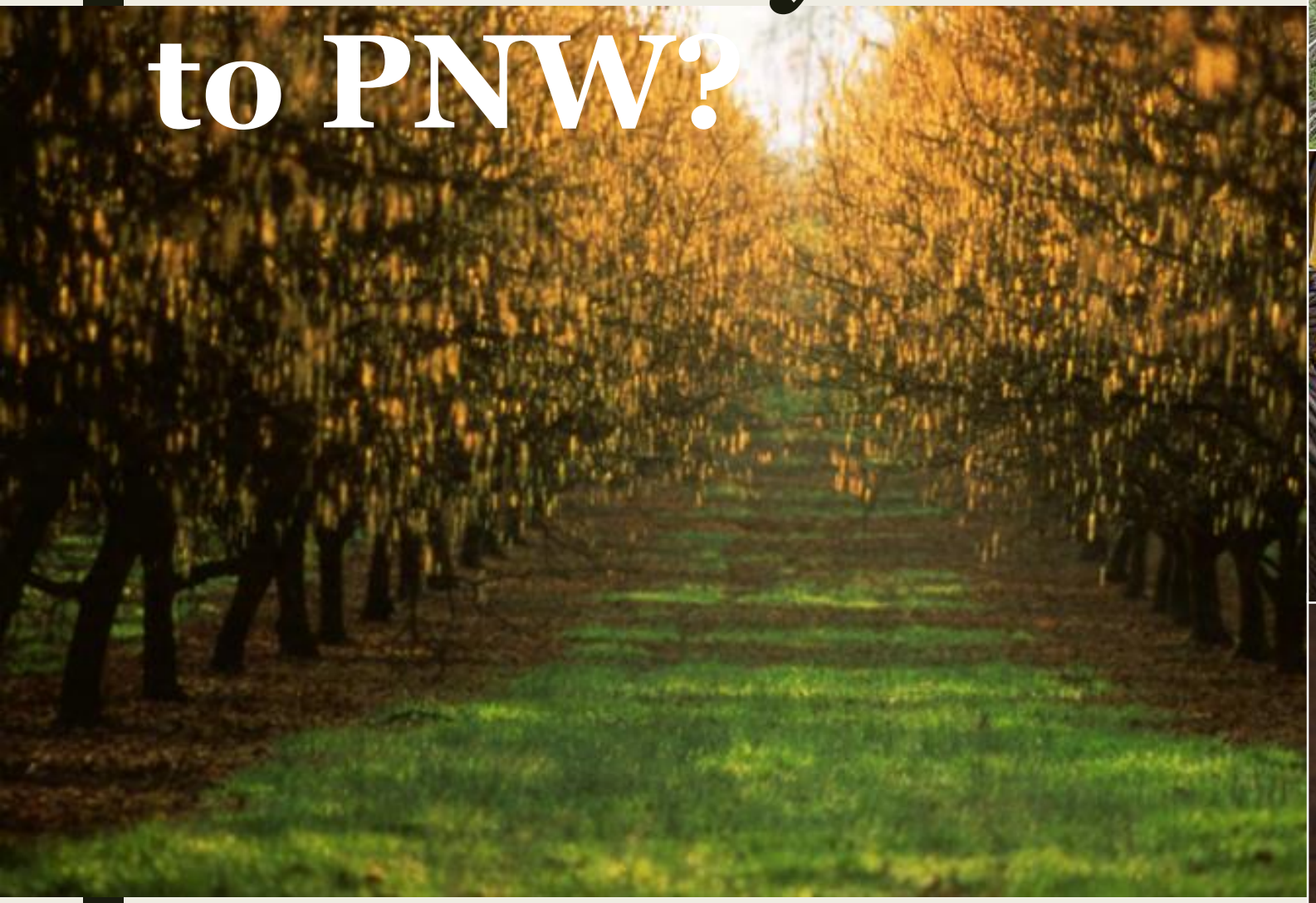
$Chi^2 = 28.6$

Fishers Exact= .001

Future Testable Hypotheses

- Exploring Tradeoffs & Substitution Effects
- Welfare Effects (Food Security)
- Previous Adoption Experiences

Relevancy to PNW?



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Cowpea (Left)
Mr. Nasibu – Local Guide (Down)