Deconstructing the 'Development Equals Empowerment' Trap: A Case Study of Women Small-Scale Sunflower Farmers in Tanzania

Key Terms: Development, Empowerment, Gender Equality, Agency, Autonomy, Microeconomic Variable, Economic Advancement, Economic Empowerment, Technology

S. Peyton Ellis

Trinity College Dublin

speytonellis@gmail.com

+1 (336) 287 2450

Abstract

Starting in the 1980s, development institutions and researchers have increasingly been focused on conceptualizing and measuring women's empowerment. This has predominately been done under the assumption that progress in development leads to proportional progress in empowerment. This paper aims to test this theory, referring to it as the 'development equals empowerment' trap. In order to do this, mainstream microeconomic development indicators are identified, and their catalytic effects on empowerment indicators are quantitatively measured through the use of probit regressions on data from a related case study. Key findings include that while the indicators were effective in reflecting gender disparities within male and female participants' experiences, 12 out of 14 (86%) of the indicators did not have significant catalytic effects on female participants' empowerment. This leads to the conclusion that 'development equals empowerment' theory is not always upheld in real-life situations, and that research on other, more influential indicators is needed in the assessment of women's empowerment.

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List of Acronyms

GBV	Gender-Based Violence
GEM	Gender Empowerment Measure
GII	Gender Inequality Index
ICRW	International Center for Research on Women
IFPRI	International Food Policy Research Institute
NGO	Nongovernmental Organization
SDG	Sustainable Development Goal
UN	United Nations
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WEAI	Women Empowerment in Agriculture Index

Key Term Definitions

Agency	self-efficacy; having the ability to change one's actions and the belief that one has the power to change their actions (Buvinic, 2017)
Autonomy	self-reliance and control over the decisions in one's life (Buvinic, 2017)
Economic Advancement	an increase in economic status through raised income and ability to earn income (Golla *et al.*, 2011)
Economic Empowerment	the ability to make economic decisions without external dependence or pressure (Golla *et al.*, 2011)
Gender Inequality	the occurrence of discrimination in the social or economic aspects of a person's life based on their gender identity (UNDP, 2013)
Microeconomic Variable	a factor or pattern that is assessed on the individual level; can be in relation to daily life or monetary contexts (Taylor, 2017)
Middleman	an individual or group that acts as a midpoint in the value chain between production and manufacturing (SNV, 2012)
Sunflower Cultivation	the process of growing, tending, harvesting, and processing sunflowers (National Sunflower Association, 2017)
Technology	an object or device developed from scientific knowledge that aids in the completion of a task or efficiency of a good (CED, 2018)

Executive Summary

Within the development sector, the mainstream approach in measuring women's empowerment is to assume that factors of development are catalysts of personal agency and autonomy. An example of this paradigm is the assumption that secondary education increases an individual's decision-making power. In light of contradicting literature on the subject, this paper challenges that underlying assumption, referring to its foundational logic as the 'development equals empowerment' trap. The research questions of this paper, therefore, are the following:

(1) What are the most commonly utilized microeconomic development indicators in mainstream women's empowerment indexes and frameworks, and
(2) Are women who ascribe to those indicators more likely to exhibit personal agency and autonomy?

After a thorough cross-referencing analysis, fourteen microeconomic development indicators were identified as the most common within mainstream indexes and frameworks, representing six main themes: education/training, technology access, time use, access to markets, work environment, and economic advancement.

Using data from a case study on small-scale sunflower farmers in Singida, Tanzania, probit models were used to measure the relationship between the fourteen mainstream microeconomic development indicators and measures of women's empowerment, introducing a novel quantitative approach to the subject. The main findings from this analysis were that while most indicators were effective in showing gender disparities between men and women's experiences within the sunflower sector, twelve (86%) of the indicators were not catalytic factors in female participants' empowerment. The two indicators that did have significant marginal effects were having enough time to complete all tasks and land ownership.

Subsequently, this paper concludes with two main points: (1) the lack of catalytic effects from mainstream microeconomic development indicators on women's empowerment within the sample contradicts the core logic of 'development equals empowerment' theory, and (2) given that the indicators were effective in depicting gender disparities they should not be completely thrown away in women's empowerment assessments, but instead be included in new measurement models that allocate them less weight and include other more influential indicators, such as ones associated to social constraints and systemic patriarchy.

1: Introduction

In 1970, Ester Boserup forever transformed development interventions with her work, *Woman's Role in Economic Development*, in which she details how women[1] are disproportionately affected by development issues and how the purposeful inclusion of women in development initiatives can catalyse positive impacts (Boserup, 1970; Beneria & Sen, 1981; Turner & Fischer-Kowalski, 2010). Feminist development literature of the 1980s added to the discussion by arguing that simply showing disparities between men and women's experiences was not sufficient in reflecting women's development, introducing the novel, more encompassing idea of women's empowerment. This concept brought to light social constraints women face beyond tangible factors, such as the effects of gender roles and power over resources that influence a woman's sense of well-being and growth (Oxaal & Baden, 1997; Calves, 2009; Mehra, 1997).

Academia and development organizations alike have taken to measuring these factors of women's empowerment by analysing women's level of development. The logic behind this line of thought is that development itself is the driver of empowerment, reasoning that is saturated with ideals of western capitalism and modern political economy (Sen, 1999; Keating *et al.*, 2010). This has led women's empowerment indexes and frameworks to take an economic approach to the subject, identifying and measuring microeconomic indicators in order to assess an individual's level of empowerment, in turn treating these microeconomic indicators as a proxy for women's empowerment.

While this has been the mainstream approach, scholars such as Naila Kabeer (1999) and Esther Duflo (2012) point out that development does not always equal empowerment. Accordingly, this paper refers to the microeconomic development assumption as the 'development equals empowerment' trap, where achievements in development are assumed to equate to proportional achievements in individual empowerment.

[1] The terminology of women and men throughout this report will refer to the mainstream cisgender viewpoint of 'women's empowerment' literature and the publicly identified cisgender participants of the case study used in this paper. References to the tern 'gender' are therefore used lightly throughout the paper and only used within the confines of existing labels that are commonplace in existing literature.

In contrast to existing literature, this paper deconstructs the 'development equals empowerment' trap and tests its logical foundation by showing the probability that a woman whose microeconomic status is considered developed simultaneously possesses personal agency and autonomy within her home and workplace. Such deconstruction is thoroughly explored in this paper by focusing on two research questions: (1) What are the most commonly utilized microeconomic development indicators in mainstream women's empowerment indexes and frameworks, and (2) Are women who ascribe to those indicators more likely to exhibit personal agency and autonomy?

To answer these questions, mainstream indicators were derived from six existing indexes and frameworks, then integrated into a survey that was used to collect data from small-scale sunflower farmers in Singida, Tanzania. This data was then analysed to show any present relationship between participants' responses to development indicators and their respective level of personal agency and empowerment.

Section 2 of this paper outlines the women's empowerment indexes and frameworks that are most used in the development sector and the reasoning behind choosing the sunflower sector in Singida, Tanzania for data collection. Section 3 presents the setting, methodology, and main findings of the study, and Section 4 contains an in-depth discussion of these findings as well as concluding remarks on how the results of this work can influence future research and development initiatives concerning women's empowerment.

2. Related Literature and Background

2.1 Mainstream Measurements of Women's Empowerment

The following six indexes and frameworks are the most recognized and influential mechanisms for measuring women's empowerment within the development sector, representing ideas from the UN, research institutions, aid agencies, and NGOs. Together, they provide insight into the mainstream methods of measuring women's empowerment, all of which are heavily dependent on 'development equals empowerment' theory. As these indexes and frameworks are meant to provide guidelines for the design of development interventions and programmes worldwide, it is imperative to understand them along with the criticisms made against them.

Table 1: Mainstream Women's Empowerment Indexes and Framework

Index/Framework	Year	Background	Main Focus	Main Critiques
Gender Empowerment Measure (GEM)	1995	Created by UNDP; first index mearusreing women's empowerment within development (UNDP, 1995)	Female leadership, number of female professional and technical workers, and ratio of female to male income (UNDP, 2015)	Indicators are too broad and lack necessary depth (Moghadam, & Senftova, 2005; Ismail *et al.*, 2011; UNDP, 2015)
International Center for Research on Women (ICRW)	2011	Framework publiched by ICRW	Women's participatin in labor market, control of assests, agency/decision-making power, mobility, self-confidence, income, consumption patterns, and work environment (Gola, et al).	Too much focus on labor makret participation outside of the household (Elson, 1999; Kabeer, 2012)
Women's Empowerment in Agriculture Index (WEAI)	2012	Created through collaboration between USAID, IFPRI, and OPHI.	Decicion-making power in agriculutural production, access to and decision-making on productive resources, control and use of income, leadership in community, and time use (Peterman *et al.*, 2012; Ahmed, 2013; IFPRI, 2015).	IFPRI's pilot studies all exclude indicators addressing attitudes towards women (IFPRI, 2015).

Gender Inequality Index (GII)	2015	Created by UNDP to update and replace GEM	Maternal mortality rate, adolescent birth rate, female leadership, proportion of female population with secondary education, proportion of female in labor force (UNDP, 2015).	Too reliant on link between reproductive health and women's empowerment; leadership statistics can be misleading (Mumtaz et al , 2009; Pratley, 2016).
Sustainable Development Goal 5	2015	Part of the 2015 Sustainable Development Goals	Violence against women, value of unpaid care and domestic work, leadership, sexual and reproductive rights, access to economic resources, technolgy use, and presence of sound legislation that enforces gender equality (UNGA, 2015).	Narrowness in operating definitions; lack of intersectional indicators and indicators directly related to empowerment (Rasmusssen, 2017; Hepp *et al.*, 2019; Struckmann, 2018).
OXFAM	2017	Published report *A 'How to' Guide to Measuring Women's Empowerment*	Self-confidence, education, gender roles, gender-based violence, autonomy, control of resources, income, access to basic services and resources, and ability to influence political conditions (Lombardini *et al.*, 2017).	Gives equal weight to development and empowerment indicators; in practice, issues related to gender-based violence are often left out (OFAM, 019).

2.1.7 Index and Framework Analysis

Based on each of the above indexes and frameworks, the most common microeconomic development indicators used in measuring women's empowerment fall under the following six themes: education/training level, technology access and training, time spent doing various daily activities, access to markets, work environment, and economic advancement. For the purpose of this paper fourteen microeconomic development indicators were carefully derived from each theme through extensive cross-referencing of each index and framework. The quantitative methods of this paper will therefore focus on these fourteen microeconomic development indicators, explained further in Section 3.

2.2 Women's Empowerment in the Sunflower Sector of Tanzania

2.2.1 A Growing Consumer Base

Sunflowers are currently growing in popularity within the global market, and as a result so is sunflower production in Tanzania. In 2016, the country produced approximately 900,000 tonnes of sunflower seeds (FAO, 2016). These seeds were grown by small-scale farmers in rural Tanzania, approximately 90% of which were women. For Tanzanian small-scale farmers, this increase in demand opens channels for economic growth and has increased profit for farmers that can access the proper market avenues. Throughout the country, some women small-scale sunflower farmers have been able to gain this level of access while other women remain unable to tap into the increasing potential of the sector (SNV, 2012), allowing for this paper to compare the agency and autonomy of women who have experienced economic development to those who have not.

2.2.2 Similar Studies

Despite the fact that women small-scale farmers are the largest producers of sunflowers in Tanzania, research on the industry leaves them out of the discussion on the economics and future of sunflower cultivation. Emmanuel Mroto's (2015) gender analysis of the sunflower value chain in the Mvomero District of Tanzania is the closest such inclusion has come, where significant drawbacks for women in the sunflower industry were found. While the data collected through this analysis is relevant to the proposed research topic, it does not provide direct information regarding women's empowerment as small-scale farmers. In order to further examine such variables, the study in this paper used similar instruments along with additional variables that indicate the level to which this inequality has directly influenced women's empowerment in terms of personal agency and autonomy.

3. Case Study and Data Analysis

3.1 Setting

3.1.1 The Singida District, Tanzania

The participants in this case study are individuals involved in sunflower cultivation in the Singida District of the Republic of Tanzania. This district is commonly known for its sunflower production and has one of the highest concentrations of small-scale sunflower farmers in the country (ITC, 2016). Located in Central Tanzania, the Singida District offers conducive climate conditions for sunflower growth, with the growing season typically being between February and May and the harvesting season being between June and July. This study took place in June while many of the participants were harvesting their sunflower crops and sending the seeds to be processed into oil.

3.2 Methodology

3.2.1 Formulation of Survey

In order to fully assess the microeconomic aspects of each participant's livelihood, a 72 question survey was created that addressed the six themes present in the mainstream indexes and frameworks along with the demographics of each participant (see Appendix F). The survey was originally written in English and was translated into Swahili by a two-person team at the District Council of Singida. Before the pilot interviews, the translated survey was circulated around to different officers at the District Council to ensure the translation was correct and made logical sense. Once the translated version of the survey was approved, two participants from the Mtinko Village were interviewed as part of the pilot process. Changes to the survey were made after the pilot as certain questions were not thoroughly understood by participants due to vagueness, inapplicability, or issues with translation. These questions were either adjusted or removed from the survey.

3.2.2 Data Collection

For each ward included in the study, there were two individual interviews (one male and one female); the rest of the participants were divided into two groups, one group consisting of female participants and the other of male participants. All males, including those in the individual and group interviews, were interviewed by a male interviewer, while all females were interviewed by a female interviewer.

In the individual and group interviews, translators went through the survey and recorded the independent answers of all participants. The reasoning for doing both individual and group interviews was based on 1) maintaining respect for the participants' time, especially since the survey was conducted during harvesting season, 2) to allow comradeship for those uncomfortable answering questions in a one-on-one setting, and 3) to facilitate discussion on the topics brought up by the questions. Elaboration and further discussion by the participants was encouraged in both the individual and group interviews. By the end of the study, there were a total of 117 participants, 53 males and 64 females.

3.2.3 Statistical Analysis

The survey used in this study consisted mainly of binary, closed-ended questions, with participants answering either 'yes' or 'no' to the majority of questions. After research on potential statistical tools, a probit regression was found to be the best method in measuring the relationship between these binary variables.[2] This type of regression allows for the calculation of the maximum likelihood of an outcome between an independent and dependent variable, meaning it shows the probability that a participant who said 'no' to one question will say 'yes' to another (see Appendix G for example of Probit results).[3]

[2] In order to perform the probit regressions, data from the case study was uploaded into Stata; then the command 'probit' was used for the dependent and independent variables, followed by the 'margins' command in order to estimate the marginal effects of the independent variable on the dependent variable.

[3] A good way to think about probit regressions is that the marginal effects calculated through probit are essentially the estimated impact that an independent variable has on the likelihood of the dependent variable occurring, for example, the impact adding a new coat of paint on a house has on the likelihood of the house being sold. If the new paint coat increases the likelihood, there will be a positive marginal effect of significant magnitude. If it decreases the likelihood, there will be a negative marginal effect of significant magnitude, and if the new coat of paint has no effect on the likelihood of the house being sold, the marginal effect will be similar to that of not adding the paint. In

For this study, probit regressions were calculated using three demographic variables and 14 microeconomic development indicators as the independent variables and eight empowerment indicators as the dependent variables, shown below in Table 2. The fourteen microeconomic indicators represent the six themes present within the mainstream indexes and frameworks.

Table 2: Independent and Dependent Variables Used in Probit Regressions

Independent Variables		Dependent Variables		
Demographic Variables		Empowerment Variables		
Age		Freedom to Spend Income	Agency	
Geography		Involved in Household Decision Making	Agency	
Religion		Ability to Comment on Household Decisions	Agency	
Microeconomic Development Indicators		Confident in Making Business Decisions	Autonomy	
Formal Training		Confident in Making Household Decisions	Autonomy	
Informal Training		Confident in making Financial Household Decisions	Autonomy	
Continuous Access to Technology		Confident in Purchasing Household Possessions	Autonomy	
Technology Training		Confident in Buying Personal Possessions	Autonomy	
Technology Use				
Time Use				
Having Enough Time				
Impact of Location				
Safe to Travel				
Labor Division				
Benefits Equal to Work				
Land Ownership				
Ability to Save				
Ability to Pay for Children's Schooling				

When coding the data, answers to both microeconomic development-related and empowerment questions were coded on a binary nominal basis, with ‘0’ indicating the participant responded ‘no’ and ‘1’ indicating ‘yes.’ Probit regressions were also used for age, religion, location, and time expenditure, the coding of which is explained in each respective section of this paper.

3.2.4 Empowerment Indicators

In order to assess a participant's level of empowerment, questions were asked addressing the eight empowerment indicators located on the right side of Table 2.These indicators were

the context of this paper, a female participant adhering to a development indicator is the coat of paint and the empowerment indicators are the likelihood of selling.

carefully derived from the women's empowerment indexes and frameworks mentioned in Section 2 in order to show the relationship between mainstream development indicators and women's empowerment. Each question targets a participant's agency and autonomy within the business and household aspects of their daily life. A 'yes' to one of these questions indicates empowerment within that respective topic, with a participant who answers 'yes' to all empowerment questions being considered highly empowered.

If the logic of 'development equals empowerment' theory holds, then there will be a positive marginal effect of significant magnitude on empowerment indicators when a female participant ascribes to a development indicator. If these marginal effects are of low magnitude or similar to the marginal effects of not adhering to the development indicator, then the logic of 'development equals empowerment' theory will not be upheld.[4] For the purpose of this research, a significant magnitude was set at the threshold of .25. This threshold was chosen based on the nature of the variables at hand and the standard errors of the probit regression results.

In the end, it was not possible to compare these results to that of male participants as almost all male participants (98%) answered 'yes' to all eight empowerment questions, a matter that is further discussed in Section 4 of this paper.[5]

3.2.5 *Limitations*

There were various challenges throughout the study that limited its reach and content. Location was one of these challenges; the villages that were visited were far away from the District Council's office, creating time and monetary constraints. The added language barrier between the researcher (native English speaker) and the participants (native Swahili speakers) was a challenge as some English terminology does not exist in Swahili. This resulted in some questions not translating appropriately, needing to be either heavily revised or thrown out.

[4] For thorough statistical analysis, tests for heteroskedascity as well as tests concerning the inverse relationship between the empowerment indicators and microeconomic indicators were performed, of which no statistically significant findings were produced.

[5] The 2% of male participants that did not answer 'yes' to all empowerment questions constitutes 2 male participants, both of which answered 'yes' to seven out of the eight empowerment questions.

One limitation within the statistical analysis of this paper is the constraints of using only one independent variable in the probit regressions. By doing this, there is a risk of missing an influential variable that is tied to the initial independent variable. While this is a recognized limitation, these patterns were carefully combed for using statistical software and by individual examination of each participant's responses, preventing any misleading results.

3.3 Data Analysis and Findings

3.3.1 Demographics

Sample Size and Geography of Participants

The participants of this study represented five wards, shown in Table 3 in the order of which they were visited, and fourteen villages[6] of the Singida District.

Table 3: Geographical Location of Participants

Ward	Participants (Female)	Participants (Male)	
Mudida	8	8	
Mtinko	13	15	
Makuro	18	15	
Mwasauya	5	12	**Total**
Msange	20	3	**Participants**
Total	64 (55%)	53 (45%)	117

[6] The fourteen villages represented are (in alphabetical order): Kibaoni, Malolo, Matumbo, Migugu, Minyenye, Mpambaa, Mpipiti, Mpoku, Msange, Mtinko, Mudida, Mwakichenchi, Ngamu, and Ng'ongoampoku.

Based on results from probit regressions, it was found that location had little to no influence on the probability that a female participant answered 'yes' to any of the empowerment questions.[7] Even in villages that were technologically more advanced and easier to access, female participants predominately did not associate themselves with the empowerment indicators. This alludes to barriers of women's empowerment going beyond that of geographic constraints.

Age

Table 4: Average Ages of Participants

	Men's Avg. Age	Women's Avg. Age
Group 1	48.7	47.4
Group 2	Ranges Given	44.9
Group 3	Ranges Given	36.4
Group 4	41	32.3
Group 5	46.9	36.5
Group 6	42	43.3
Individual Interviews	39.5	40.3
Average	43.6[8]	40.2

As can be seen in Table 4, most of the participants were middle aged (54% of those who gave ranges instead of an exact age were above the age of 35 years old), averaging between 10-16 years of experience in sunflower cultivation.[9] While there were some younger participants, classified as under 25 years old, their presence was rare in this study.

[7] This probit regression was performed using the following categorical variables: Mudida as '0,' Mtinko as '1,' Makuro as '2,' Mwasauya as '3,' and Msange as '5.'

[8] This number was calculated using the responses of the 29 male participants who were able to give a specific number for their age (55% of male participants). The ranges given by the other participants puts them in the following age categories: 18-35 years old (11 participants), 36-50 years old (8 participants), 51 & up years old (5 participants). As not knowing your age can be a sensitive subject for many rural Tanzanians, they were not pushed to give an exact age nor were they pressured to place themselves in a smaller range than the ones given.

[9] This average was calculated using the participants responses when asked: How many years have you worked with sunflowers?

A probit regression with age as the independent variable and the empowerment indicators as the dependent variables was run to measure any potential relationship between age and a female participant's empowerment.[10] The result of this regression showed there were no significant differences in the likelihood of a female participant answering 'yes' to any of the empowerment questions whether they were below or above the median age range. This indicates that age did not have a substantial impact on a female participant's empowerment.

Religion

Table 5: Religion of Male Participants

	Christian	Muslim
Group 1	3	4
Group 2	3	7
Group 3	3	11
Group 4	1	2
Group 5	5	6
Group 6	2	0
Individual Interviews	3	3
Total	20 (38%)	33 (62%)

Table 6: Religion of Female Participants

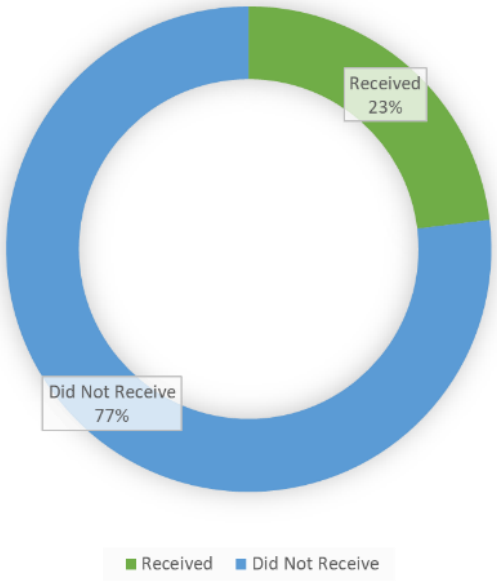
	Christian	Muslim
Group 1	3	4
Group 2	0	8
Group 3	3	14
Group 4	3	0
Group 5	3	1
Group 6	9	10
Individual Interviews	4	2
Total	25 (39%)	39 (61%)

Table 5 and Table 6 show the religious representation of the sample used in this study. Probit regressions were run using religion as the independent variable (Christianity coded as '0' and Islam as '1') and empowerment indicators as dependent variables. The regression results were that a Christian female participant was more likely to answer 'yes' to three out of the eight empowerment questions by an average increase of .1, while a Muslim female participant was more likely to answer 'yes' to the remaining five questions by an average increase of .17. The similarity in these magnitudes indicates that a female participant's answers to empowerment questions were not significantly different depending on their religion.

[10] This probit regression was performed using the following nominal variables: a female participant being below the age of 40.2 years as '0' and a female participant being at or above to age of 40.2 years as '1.'

3.3.2 Education/Training

Figure 1: Formal Training of Participants



In Fig. 1 the percentages of participants that did and did not receive formal training are shown. Formal training in this context was defined as participating in a training program that was held by the government or another organization in which lessons were held by an expert of agriculture or by someone who specialized specifically in sunflower cultivation. Within the sample, 25 female participants (39% of female participants) received formal training.

Table 7: Marginal Effects of Formal Training on Empowerment using Probit Model (Female Participants)

	Freedom to Spend Income	Involved in Household Decision Making	Ability to Comment on Household Decisions	Confident in Making Business Decisions	Confident in Making Household Decisions	Confident in making Financial Household Decisions	Confident in Purchasing Household Possessions	Confident in Buying Personal Possessions
Did Not Receive Formal Training	.10 (0.05)	.44 (0.08)	.49 (0.08)	.44 (.08)	.41 (0.08)	.38 (0.08)	.41 (0.08)	.33 (0.08)
Received Formal Training	0.28 (0.09)	.36 (0.09)	.64 (0.1)	.36 (0.1)	.2 (0.08)	.2 (0.08)	.36 (0.1)	.36 (0.1)

N = 64

Note: Robust Standard Errors in Parenthesis.

Table 7 presents the probit regression results when a female participant's receipt of formal education is the independent variable and their responses to empowerment indicators are the dependent variables (see Appendix H for response distribution). Here it is seen that a female participant who received formal education was more likely to answer 'yes' to three of the empowerment questions with an average probability increase of .12.[11] Female participants who did not receive formal training were more likely to answer 'yes' for the other five empowerment indicators by an average increase of .12. These regression results imply that there was no significant difference in the empowerment level of female participants who did and did not receive formal training, suggesting that formal training was not a catalyst for women's empowerment within the sample.

Figure 2: Informal Training of Participants

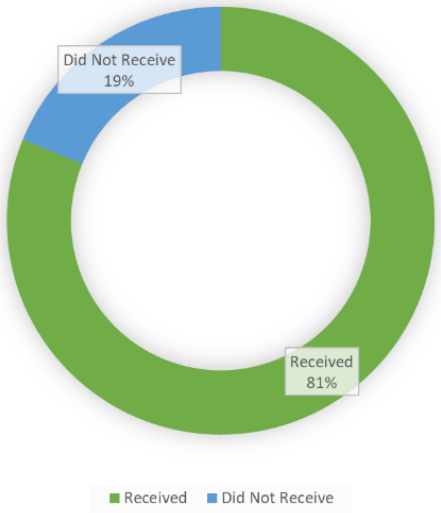


Fig. 2 presents the percentage of participants that did or did not receive informal training. For the sake of this study, informal training was defined as involving lessons from a local farmer or

[11] Average probability increase was calculated by averaging the differences between marginal effects of each binary variable. These differences were averaged for both '0' and '1' input variables, where average probability increase refers to the average increase in likelihood that a variable had on the outcome variables. Using the results in Table 6, an example is the .18 difference in 'freedom to spend' averaged with the .15 difference in 'confident in making business decisions' and the .03 difference in 'confident in buy personal possessions,' the average being .12. This .12, therefore, shows the average effect on how receiving formal education increases a female participant's overall level of empowerment.

family member who had experience in sunflower cultivation. Those who did not receive informal training were predominantely women, with 30% of female participants and 6% of male participants not receiving informal training.

Table 8: Marginal Effects of Informal Training on Empowerment using Probit Model (Female Participants)

	Freedom to Spend Income	Involved in Household Decision Making	Ability to Comment on Household Decisions	Confident in Making Business Decisions	Confident in Making Household Decisions	Confident in making Financial Household Decisions	Confident in Purchasing Household Possessions		Confident in Buying Personal Possessions
Did Not Receive Informal Education	.21 (0.09)	.84 (0.08)	.89 (.07)	.84 (.08)	.89 (0.07)	.84 (0.08)	.84 (0.08)	.68	(0.11)
Received Informal Education	0.16 (0.05)	.22 (0.06)	.4 (0.07)	.22 (0.06)	.09 (0.04)	.09 (0.04)	.02 (0.06)	.02	(0.06)

N = 64

Note: Robust Standard Errors in Parenthesis.

Table 8 presents the probit regression results showing the relationship between a female participant's receipt of informal education and the empowerment indicators (see Appendix I for response distribution). As can be seen, female participants were more likely to answer 'yes' to all eight empowerment questions if they had not received informal education, with an average probability increase of .56. These results do not align with current women's empowerment frameworks and literature, all of which emphasize the importance of both formal and informal education. One potential explanation for this is that female participants who did not receive training were likely self-taught, meaning they might already have the motivation and sense of independence that is linked to personal agency and autonomy.

3.3.3 Technology Access

Figure 3: Participants' Continuous Access to Technology

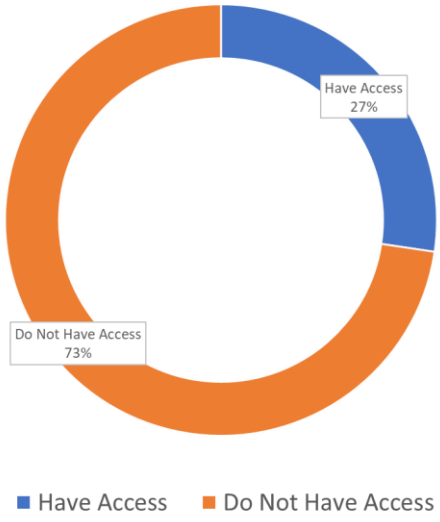


Fig. 3 shows the percentage of participants who did or did not have continuous access to technology. Technology was described to the participants as high-quality seeds, tractors, new plows, and fertilizer. Continuous access in this context is defined as being able to continually use this technology throughout the planting and harvesting seasons. Of the participants, 27% had this level of access while 73% did not. Among both male and female participants, this level of access was highly unavailable with 68% of male participants and 77% of female participants not being able to continuously access any form of technology. These high percentages for both men and women show continuous access to technology is a prominent obstacle in sunflower cultivation, with women still being less likely to have this access by approximately 11%.

Through a probit regression, it was found that female participants who had continuous access to technology were more likely to answer 'yes' to five of the empowerment questions by .06, with those who did not have access being .23 more likely to answer 'yes' to the other three empowerment questions. These probabilities indicate that having continuous access to technology did not make a substantial impact on a female participant's responses to the empowerment indicators.

Table 9: Marginal Effects of Technology Training on Empowerment using Probit Model (Female Participants)

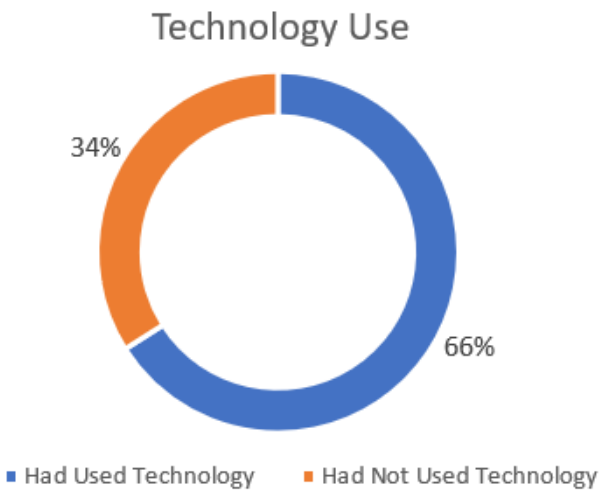
	Freedom to Spend Income	Involved in Household Decision Making	Ability to Comment on Household Decisions	Confident in Making Business Decisions	Confident in Making Household Decisions	Confident in making Financial Household Decisions	Confident in Purchasing Household Possessions	Confident in Buying Personal Possessions
Did Not Receive Technology Training	.17 (0.06)	.43 (0.08)	.48 (.08)	.45 (.08)	.43 (0.08)	.4 (0.08)	.45 (0.08)	.38 (0.07)
Received Technology Training	0.18 (0.08)	.36 (0.1)	.68 (0.1)	.32 (0.1)	.14 (0.07)	.14 (0.07)	.27 (0.09)	.27 (0.09)

N = 64

Note: Robust Standard Errors in Parenthesis.

Participants were also asked if they had received training for technology, with the training being either formal or informal. 22 female participants (34% of female participants) received this type of training. Table 9 shows the probit regression results reflecting how this receiving of technology training influenced the probability of a female participant answering 'yes' to the empowerment indicators (see Appendix J for response distribution). As can be seen, female participants who had received technology training were more likely to answer yes to two of the empowerment questions, with an average increase of .11. Female participants who had not received training were more likely to answer 'yes' to the remaining six questions by an average increase of .17. These probability estimates indicate technology training was not a catalytic factor in a female participant's overall empowerment.

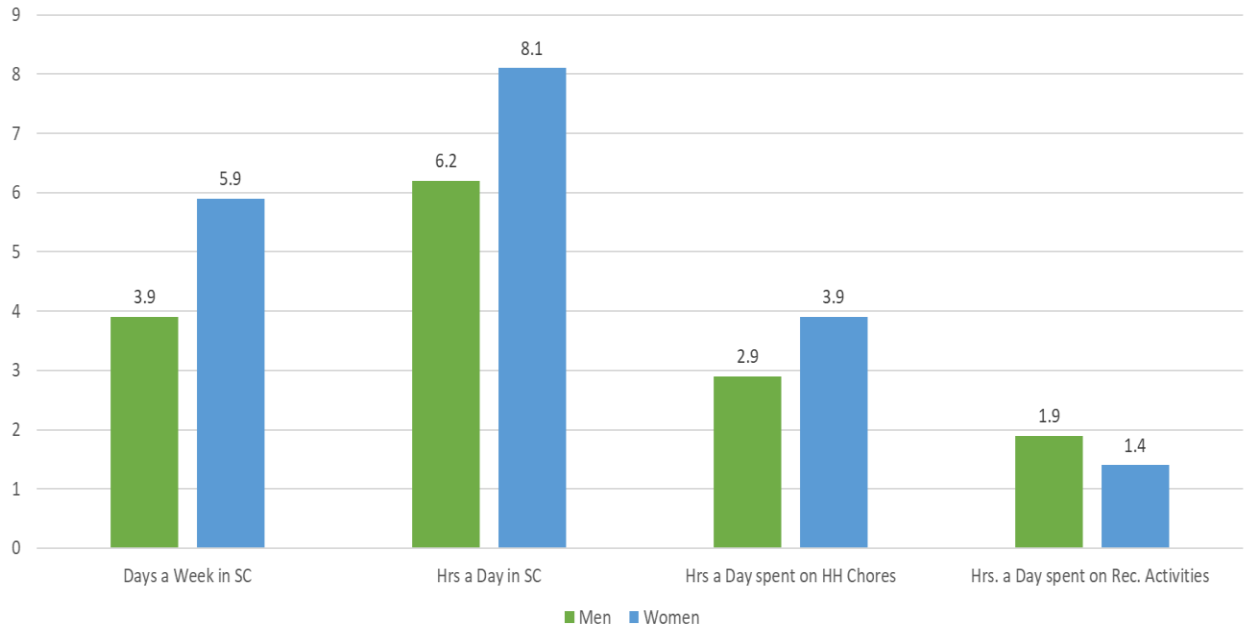
Figure 4: Participants' Usage and Views of Technology



The graph in Fig. 4 shows the percentages for how many participants had experience using technology. Of the 34% who did not have experience using technology, all of them were women. This 34% represents 40 female participants, making up 63% of all female participants. A probit regression was performed that examined whether being part of the 37% of female participants who had experience using technology increased chances of being empowered (see Appendix K for response distribution). The results of this regression were that female participants who had experience using technology were more likely to answer 'yes' to four of the empowerment questions by an average increase of .12, with the remaining female participants being more likely to answer 'yes' to the other four questions by an average increase of .23. This suggests that having experience using technology was not a significant determinant of a female participant's level of empowerment. The lack of catalytic effects from technology related indicators on female participants' empowerment implies that technology related indicators were not proper measures of female participants' empowerment.

3.3.4 Time

Figure 5: Time Differences between Men and Women within Daily Activities



In Fig. 5, the average responses to questions regarding how participants spend their time are presented. Each participant was informed that in this context sunflower cultivation included any work done in regard to sunflowers, household chores meant any routine activities that were done within their household such as cleaning or tending to repairs, and recreational activities could be reading, watching television, playing sports or similar pastimes. A probit regression was performed using time as the independent variable and the empowerment indicators as the dependent variables. The results indicated there was no substantial difference in the likelihood of a female answering 'yes' to an empowerment question based on whether she worked in sunflower cultivation under or above the mean of 8.1 hours a day.[12] This was also true

[12] This probit regression was performed using the following nominal variables: a female participant who worked in sunflower cultivation less than 8.1 hours a day as '0,' and a female participant who worked in sunflower cultivation exactly or more than 8.1 hours a day as '1.'

concerning whether the female participant worked on household chores under or below the mean of 3.9 hours a day.[13]

Table 10: Marginal Effects of Time Constraints on Empowerment using Probit Model (Female Participants)

	Freedom to Spend Income	Involved in Household Decision Making	Ability to Comment on Household Decisions	Confident in Making Business Decisions	Confident in Making Household Decisions	Confident in making Financial Household Decisions	Confident in Purchasing Household Possessions	Confident in Buying Personal Possessions
Did Not Have Enough Time	.1 (0.09)	.4 (0.15)	.49 (.08)	.4 (.15)	.1 (0.09)	.1 (0.9)	.3 (0.14)	.3 (0.14)
Had Enough Time	0.19 (0.05)	.41 (0.7)	.67 (0.1)	.41 (0.07)	.37 (0.07)	.35 (0.06)	.41 (0.07)	.35 (0.06)

N = 64

Note: Robust Standard Errors in parenthesis.

Table 10 presents the results of a probit regression that used whether female participants felt they had enough time to complete their tasks as the independent variable and the empowerment indicators as the dependent variables (see Appendix L for response distribution). Female participants who felt they had enough time to complete their tasks were more likely to answer 'yes' to all of the empowerment indicators with an average increase of .12. This shows that while the amount of time spent on sunflower cultivation and household chores did not have a significant impact on a female participant's empowerment, a female participant's perception of the adequacy of that time did increase their likelihood of answering 'yes' to the empowerment questions, though this increase was of a low magnitude.

[13] This probit regression was performed using the following nominal variables: a female participant who worked on household chores less than 3.9 hours a day as '0,' and a female participant who worked exactly or more than 3.9 hours a day as '1.'

3.3.5. Access to Markets

Table 11: Marginal Effects of Location Impact on Empowerment using Probit Model (Female Participants)

	Freedom to Spend Income	Involved in Household Decision Making	Ability to Comment on Household Decisions	Confident in Making Business Decisions	Confident in Making Household Decisions	Confident in making Financial Household Decisions	Confident in Purchasing Household Possessions	Confident in Buying Personal Possessions
Felt Location Did Not Affect Business	.17 (0.06)	.43 (0.07)	.43 (.07)	.43 (.07)	.38 (0.07)	.37 (0.07)	.43 (0.07)	.37 (0.07)
Felt Location Affected Business	0.18 (0.09)	.35 (0.12)	.82 (0.09)	.35 (0.12)	.18 (0.09)	.18 (0.09)	.29 (0.11)	.29 (0.11)

N = 64

Note: Robust Standard Errors in Parenthesis.

As shown through the probit regression results in Table 11, female participants who felt their location affected their business were more likely to answer 'yes' to two of the empowerment questions, with an average increase of .2 (see Appendix M for response distribution). Female participants who felt their location did not affect their business were more likely to answer 'yes' to the remaining six questions with an average percent increase of .13. The average increases are of relatively low magnitude, indicating that the perception of location impact on business was not a catalytic factor in the female participants' empowerment.

Table 12: Marginal Effects of Safe Travel on Empowerment using Probit Model (Female Participants)

	Freedom to Spend Income	Involved in Household Decision Making	Ability to Comment on Household Decisions	Confident in Making Business Decisions	Confident in Making Household Decisions	Confident in making Financial Household Decisions	Confident in Purchasing Household Possessions	Confident in Buying Personal Possessions
Did Not Feel Travel was Safe	.28 (0.08)	.06 (0.04)	.49 (.08)	.09 (.05)	.44 (0.08)	.42 (0.08)	.06 (0.04)	.06 (0.04)
Felt Travel was Safe	0.5 (0.09)	.75 (0.8)	.67 (0.1)	.72 (0.08)	.1 (0.06)	.1 (0.06)	.72 (0.08)	.63 (0.09)

N = 64

Note: Robust Standard Errors in Parenthesis.

Table 12 shows the results of a probit regression using whether a female participant felt that it was safe to travel for business as the independent variable and the empowerment indicators as the dependent variables (see Appendix N for response distribution). Here it seen that female participants who felt it was safe to travel for business were more likely to answer 'yes' to six of the empowerment questions, with an average percent increase of .7. While this high magnitude percentage shows a positive correlation between a female participant feeling it is safe to travel and empowerment, the 100% of male participants said it was not safe to travel, making this statistic potentially misleading. As many female participants did not travel themselves, this correlation is primarily indicative of travel related indicators not being reliable measures of the female participant's empowerment. This is likely because of the extremely rural location of the villages, implying that travel related indicators may be less effective in rural areas.

3.3.6 Work Environment

Figure 6: Views on Labor Division

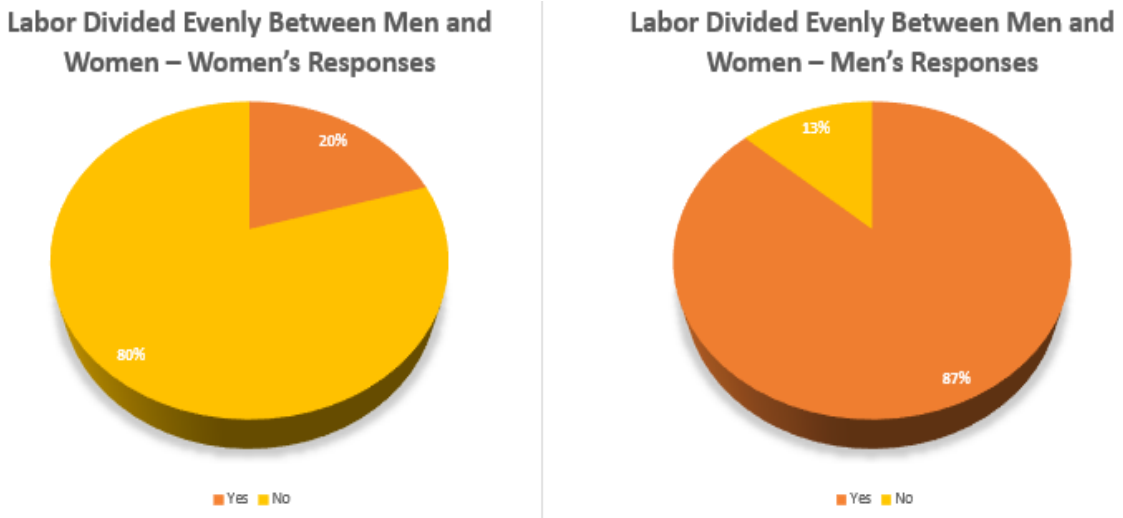


Fig. 8 illustrates the different responses that were given by female and male participants when asked if they felt labor was divided evenly between men and women. While 80% of the female participants said labor was not equally distributed, 87% of the male participants said it was

equally distributed. Reasoning behind this vast difference in the responses reflects a misunderstanding concerning the difficulties both male and female participants experienced as they each played their role in the sunflower sector.

Table 13: Marginal Effects of Labor Distribution on Empowerment using Probit Model (Female Participants)

	Freedom to Spend Income	Involved in Household Decision Making	Ability to Comment on Household Decisions	Confident in Making Business Decisions	Confident in Making Household Decisions	Confident in making Financial Household Decisions	Confident in Purchasing Household Possessions	Confident in Buying Personal Possessions
Felt Labor was Not Evenly Distributed	.18 (0.05)	.47 (0.07)	.65 (.07)	.49 (.07)	.36 (0.07)	.37 (0.07)	.45 (0.07)	.39 (0.07)
Felt Labor was Evenly Distributed	0.15 (0.1)	.15 (0.1)	.15 (0.1)	.08 (0.07)	.08 (0.07)	.08 (0.07)	.15 (0.1)	.15 (0.1)

N = 64

Note: Robust Standard Errors in Parenthesis.

Table 13 presents the probit regression results when a female participant's perception of whether labor is divided evenly among men and women is the independent variable and the empowerment indicators are the dependent variable (see Appendix O for response distribution). Female participants who felt that the labor was not divided evenly were more likely to answer 'yes' to all empowerment indicators, with an average probability increase of .3. The main takeaway from these results is that women who felt labor was divided evenly were less likely to answer 'yes' to the empowerment indicators, meaning equal labor distribution was not a catalytic factor in the female participants level of empowerment.

Table 14: Marginal Effects of Benefits from Sunflower Sector on Empowerment using Probit Model (Female Participants)

	Freedom to Spend Income	Involved in Household Decision Making	Ability to Comment on Household Decisions	Confident in Making Business Decisions	Confident in Making Household Decisions	Confident in making Financial Household Decisions	Confident in Purchasing Household Possessions	Confident in Buying Personal Possessions
Felt Benefits were Not Equal to Input	.16 (0.06)	.3 (0.07)	.49 (0.08)	.4 (.07)	.28 (0.07)	.28 (0.07)	.3 (0.07)	.23 (0.06)
Felt Benefits were Equal to Input	0.21 (0.09)	.63 (0.11)	.63 (0.11)	.42 (0.11)	.42 (0.11)	.42 (0.11)	.58 (0.11)	.58 (0.11)

N = 64

Note: Robust Standard Errors in Parenthesis.

Table 14 presents the probit regression results when the independent variable is whether a female participant feels the benefits earned from sunflower cultivation are on average equal[14] to amount of work put in, while the dependent variables are the empowerment indicators (see Appendix P for response distribution). Female participants who believed these benefits were on average equal were more likely to answer 'yes' to all empowerment indicators by an average probability increase of .18. This is indicative of a slight positive correlation between a female participant's perception of the benefits received through sunflower cultivation and their empowerment, though the marginal effect is of low magnitude.

[14] The probit regression used for this variable did not include the 3% of female participants who felt the benefits were equal as the this only represented 2 female participants. Patterns within the responses of these two participants were closely examine, however, and it was also found that their perception of equal labor distribution had little to no effect on their respective levels of empowerment.

3.3.7 Economic Advancement

Table 15: Marginal Effects of Land Ownership on Empowerment using Probit Model (Female Participants)

	Freedom to Spend Income	Involved in Household Decision Making	Ability to Comment on Household Decisions	Confident in Making Business Decisions	Confident in Making Household Decisions	Confident in making Financial Household Decisions	Confident in Purchasing Household Possessions	Confident in Buying Personal Possessions
Did Not Own Land	.1 (0.06)	.19 (0.09)	.57 (.11)	.33 (.1)	.19 (0.09)	.19 (0.09)	.19 (0.09)	.05 (0.05)
Owned Land	0.21 (0.06)	.51 (0.08)	.53 (0.08)	.44 (0.08)	.39 (0.08)	.37 (0.07)	.49 (0.08)	.49 (0.08)

N = 64

Note: Robust Standard Errors in Parenthesis.

Table 15 shows probit regression results when using a female participant's land ownership as the independent variable and the empowerment indicators as dependent variables (see Appendix Q for response distribution). Female participants who stated they owned the land on which they cultivated sunflowers were more likely to answer 'yes' to seven of the empowerment indicators by an average probability increase of .24. This means the perception of land ownership was a possible catalyst in a female participant's likelihood of empowerment, with a relatively significant magnitude

Table 16: Marginal Effects of Ability to Save on Empowerment using Probit Model (Female Participants)

	Freedom to Spend Income	Involved in Household Decision Making	Ability to Comment on Household Decisions	Confident in Making Business Decisions	Confident in Making Household Decisions	Confident in making Financial Household Decisions	Confident in Purchasing Household Possessions	Confident in Buying Personal Possessions
Was Not Able to Save	.13 (0.05)	.54 (0.08)	.74 (.07)	.51 (.08)	.44 (0.08)	.44 (0.08)	.54 (0.08)	.46 (0.08)
Able to Save	0.24 (0.09)	.2 (0.08)	.24 (0.09)	.24 (0.09)	.13 (0.07)	.12 (0.06)	.16 (0.07)	.16 (0.07)

N = 64

Note: Robust Standard Errors in Parenthesis.

Participants were also asked if they had the ability to save income made through sunflower cultivation.39% of female participants and 77% of male participants said they had the ability to

save this income, showing a large gender disparity within the responses. In Table 16, the probit regression results of the relationship between whether a female participant was able to save income made from sunflower cultivation and the empowerment indicators are shown (see Appendix R for response distribution). For seven of the empowerment indicators, a female participant who was not able to save was more likely to answer 'yes' by an average probability increase of .35. The positive correlation and large magnitude imply that female participants who did not have the ability to save income were more likely to be empowered.

Table 17: Marginal Effects of Ability to Pay for Children's School on Empowerment using Probit Model (Female Participants)

	Freedom to Spend Income	Involved in Household Decision Making	Ability to Comment on Household Decisions	Confident in Making Business Decisions	Confident in Making Household Decisions	Confident in making Financial Household Decisions	Confident in Purchasing Household Possessions	Confident in Buying Personal Possessions
Not Able to Pay for Children's Schooling	.26 (0.1)	.89 (0.07)	.89 (.07)	.89 (.07)	.89 (.07)	.89 (0.07)	.89 (0.07)	.74 (0.1)
Able to Pay for Children's Schooling	0.13 (0.05)	.2 (0.06)	.4 (0.07)	.2 (0.06)	.07 (0.04)	.07 (0.04)	.18 (0.06)	.18 (0.06)

N = 64

Note: Robust Standard Errors in Parenthesis.

Table 17 presents the probit regression results concerning the relationship between a female participant being able pay for their children's schooling solely through sunflower cultivation income and the empowerment indicators (see Appendix S for response distribution). Female participants who were not able to pay for their children's schooling with income from sunflower cultivation were more likely to answer 'yes' to all eight empowerment indicators by an average probability increase of .61. As female participants being more likely to be empowered by lacking the ability to send their children to school does not follow logical reasoning, the results of this regression indicate that the ability to send children to school through sunflower income was not an effective indicator in measuring the of empowerment of female participants.

3.3.8 Women's Empowerment

Probit regressions were also run measuring the relationship between a female participant's answer to one empowerment indicator against the other seven (see results in Appendix T). The results of this regression show a participant was more likely to answer 'yes' to an empowerment question if they had answered 'yes' to any of the other empowerment indicators. The average probability increase of .65 for these relationships is higher than any other indicator examined in this paper, implying that within the sample the most reliable factor for a female participant answering 'yes' to an empowerment indicator was whether they also answered 'yes' to other empowerment indicators.

Chapter 4: Discussion and Conclusion

4.1 Discussion

The first research question of this paper was addressed through analyzing the six women's empowerment indexes and frameworks in Section 2. Here it was found that the most commonly utilized microeconomic development indicators in mainstream women's empowerment measurement fell under the specified six themes.

More significantly, the second research question of this paper yielded probit regression results that challenged the 'development equals empowerment' logic of these interventions. Within the probit regression results, only two out of the fourteen (86%) microeconomic development indicators had consistent positive marginal effects of significant magnitude. The other twelve indicators all had marginal effects on a female participant's empowerment that were of low magnitude or similar to the marginal effects of not ascribing to the corresponding development indicator. These findings merit further research on microeconomic development indicators and their relationship to women's empowerment.

As most male participants (98%) answered 'yes' to all of the empowerment questions, the only comparison that can be made in regard to gendered differences in empowerment is that even male participants who faced microeconomic challenges had considerably higher levels of empowerment. These results not only contradict 'development equals empowerment' logic, they also reveal that male participants' empowerment was based on something other than microeconomic factors. Additionally, the significant probability estimates seen between the empowerment indicators suggest that something beyond microeconomic factors was at play for female participants who answered 'yes' to multiple empowerment questions.

In the context of overall empowerment measures, these results suggest that most factors currently included in women's empowerment indexes and literature were useful in detecting gender inequalities but were rarely catalysts of women's empowerment within this study. These findings allude to overarching influences beyond that of microeconomic factors, ones likely related to intergenerational culture and systematic oppression based on sex.

To fully develop such indicators, further conversation would additionally be needed on the parameters and role of cultural relativism within women's empowerment initiatives. Consensus throughout the development sector on how to approach culturally sensitive topics where oppression is a key factor has yet to be reached, leaving the decision up to individual researchers and organizations. This is one cause of inconsistency within research and measurement of women's empowerment. Subsequently, the creation of industry-wide indexes and frameworks addressing specific issues of social inclusion would require a more uniform approach to the topic.

4.2 Conclusion

Overall, this paper suggests the need for employing indicators that are sensitive to the subtle factors at play – ones tied to ideas of social oppression and its psychosocial impacts. This style of research offers the possibility of not only better understanding empowerment with relation to sex, but also as a general concept. The development of psychosocial indicators could offer studies on empowerment an intersectional lens, revealing obstacles to empowerment that include relational, cognitive, and emotional constraints arising from the specific social construction of an individual's experience of race, sexual orientation, socioeconomic status, religion, gender identity, and overall social status. This, in turn, would lead to better empowerment indexes and frameworks for disenfranchised groups around the world.

Appendix (A): Survey used in study with English and Swahili translations. (Original survey by author, translations by Singida District Council members)

SEHEMU A. / Section A

1.Jina Mdau aliyeojiwa.....

1. Name……..

2.Kata anayotoka.....

2. Ward……

3 Kijiji anachotoka.....

3. Village…….

4.Jinsi.....1.mme(.....) 2 mke ( ) weka alama ya √ panapohusika

4. Sex……..

5.Umri .....(miaka)

5. Age……

6. Dini yako ni …….. a) Mkristo b) Muislamu c) Sina dini

6. Religion …….. a) Christian b) Muslim c) No religion

SEHEMU B / Section B

7. Mbali na kilimo cha zao la alizeti ,unalima mazao mengine? a)**ndio** b) **hapana**

7. In addition to sunflower cultivation, do you grow other crops? a) yes b) no

8. Je unajimudu katika zao la alizeti au unautegemezi?.....

8. Are you an independent sunflower farmer? a) yes b)no

9. Je unamiaka mingapi unajishughulisha na kilimo cha alizeti?.....

9. How many years have you worked with sunflowers?

10. Katika kilimo cha Alizeti wewe unajishughulisha na nini? (Kulima kawaida, kuchambua/kupeta, unatumia mashine)

10. Which sector of sunflower cultivation do you work in? (farming, winnowing/sorting, processing machinery)

11. Je umepata elimu/mafunzo rasmi ya kilimo cha zao la alizeti? **a) ndio b)hapana**

11. Have you received formal education / training for sunflower cultivation? a) yes b) no

12. Je umepata elimu/mafunzo yasiyo rasmi ya kilimo cha zao la alizeti? **a) ndio b)hapana**

12. Have you received informal education / training for sunflower cultivation? a) yes b) no

13. Ni kwa namna gani mafunzo uliyopata yameongeza ufanisi katika kazi yako" **a)Sio vizuri** b)**wastani** C)**vizuri**

13. How did the training you have gained increase your effectiveness in your work? A) Not good b) average C) well

14.Je mafunzo uliyoyapata yamekusaidia kupata ujuzi na maarifa katika kilimo cha alizeti? ?**a) ndio b)hapana**

14. Do you feel you have gained useful skills and knowledge through your training? a) yes b) no

15. Je ujuzi na maarifa uliyopata katika mafunzo ya kilimo cha alizeti yamekuwezesha kufanikiwa katika kilimo cha mazao mengine? **a) ndio b)hapana**

15. Have the skills and knowledge you have gained through sunflower farming helped you be successful in other sectors? a) yes b) no

16. Je unafikiri mafunzo uliyoyapata yatawezesha kuongeza mahitaji yako kwa ujumla? **a) ndio b)hapana**

16. Do you feel the training you received will enable you to access your overall needs (overall well-being)? a) yes b) no

17. Je umepata mafunzo ya tekinolojia zinazohitahika katika uzalishaji wa zao la alizeti? **a) ndio b)hapana**

17. Have you received training for technology used in the production of sunflowers? a) yes b) no

18. Je Umepata teknolojia za muhimu zinazotakiwa katika uzalishaji wa zao la alizeti? **a) ndio b)hapana**

18. Do you have access to technology that is necessary for sunflower production? a) yes b) no

19. Ni kwa ugumu gani unaoupata kufikia hizo teknolojia? **a) hakuna ugumu b) wastani c) Kuna ugumu**

19. How difficult do you feel it is to access those technologies? a) no difficulty b) average c) There is difficulty

20. Je unauwezo wa kupata pembejeo zilizo bora? mfano mbegu, mbolea na madawa. ? **a) ndio b)hapana**

20. Does the participant have access to quality seeds, fertilizer, and pesticides? a) yes b) no

21. Ni kwa mara ngapi unatumia tekinolojia hii **a) Sio mara nyingi b) mara nyingi c)mara nyingi zaidi**

21. How often do you use this technology? A) Not often b) often c) very often

22. Je unamiliki tekinolojia uliyoipata ? **a) ndio b)hapana**

22. Do you own this technology? a) yes b) no

23. Ni zana zipi zinatumika katika kilimo cha alizeti.....,.....,.....

23. What tools do you use in sunflower cultivation?

24. Je ni kwa namna gani ufanisi wa tekinolojia unaitajika katika kilimo cha alizeti? **a)sio kwa ufanisi. b) kwa ufanisi c)kwa ufanisi wa hali ya juu.**

24. How effective does the participant feel technology is in sunflower cultivation? a) is not effective. b) efficiently c) to the highest efficiency.

25. Je Unahisi tekinolojia inayotumika ni muhimu katika kilimo cha alizeti? **a)ndio b)hapana**

25. Do you feel using technology is important in sunflower cultivation? a) yes b) no

26.Ni kiwango gani unafikiri matumizi ya tekinolojia yameathiri kipato chako?

a) haikuathiri, b)imeathiri c)imeathiri sana

26. How much do you feel using technology affects your income? a) yes b) no

27. Je unafikiri mafunzo ya tekinolojia uliyopata yameboresha faida? **a)ndio b)hapana**

27. Do you think technology training has improved profits? a) yes b)no

28. Ni masaa mangapi unayatumia kwa siku unaposhiriki katika kilimo cha alizeti?.....

28. How many hours a day do you spend participating in sunflower cultivation?

29. Ni masaa mangapi unayotumia kwa siku katika kufanya kazi za nyumbani?.....

29. How many hours a day do you spend doing housework (household chores)?

30. Ni masaa mangapi unayotumia katika shamba la alizeti kwa wiki ?.....

30. How many days a week do you participate in sunflower cultivation?

31. Ni masaa mangapi unayotumia kwa shughuli za burudani kwa siku?.....

31. How many hours per day do you spend participating in recreational activities?

32. Je unafikiri huna muda wa kutosha katika kukamilisha kukamilisha majukumu yako yote? **a) ndio b)hapana**

32. Do you feel that you do not have enough time to complete all of your tasks?

33. Je vikwazo vya muda vinakusababishia mawazo? **a) ndio b)hapana**

33. Do time constraints cause you to worry? a) yes b) no

34. Je unauza mazao yako kwa wafanya biashara wa kati? **a) ndio b)hapana**

34. Do you sell your products to middleman? a) yes b) no

35. Je unauza mazao yako kwa wafanya biashara wa jumla? **a) ndio b)hapana**

35. Do you sell your products to wholesale merchants? a) yes b) no

36. Je unasafiri kwenda kuuza mazao yako? **a) ndio b)hapana**

36. Do you travel to sell your products? a) yes b) no

37. Kama jibu la swali la 36 ni ndio unasafiri kilomita ngapi .....

37. If you answered yes to questions 36, how many miles do you travel?

38. Je ni kwa namna gani unafikiri eneo ulilopo linakuathiri katika biashara ya mazao yako? **a)hakuna athari b) athari kidogo c)athari kubwa**

38. How do you feel your location (area/province) affects your business? a) no effect b) slight effect c) significant effect

39. Je unafikiri ni salama katika usafirishaji wa biashara yako? **a) ndio b)hapana**

39. Do you think it is safe to travel for your business? a) yes b)no

40.Je unafikiri ni urahisi kuwafikia wauzaji wa jumla? **a) ndio b)hapana**

40. Do you think it is easy to access wholesalers? a) yes b) no

41. Je unauwezo wa kutosha wa kupata vifaa vya usindikaji? **a) ndio b)hapana**

41. Do you have enough access to processing equipment? a) yes b) no

42.Je, unaona mazingira ya kazi katika kilimo cha Alizeti ni salama? **a) ndio b)hapana**

42. Do you feel the working environment in sunflower farming is safe? a) yes b) no

43. Je, unafikiri faida anayoipata inalingana na kiasi cha kazi unayoifanya katika kilimo cha alizeti? **a) sio sawa b) wastani c) sawa**

43. Do you think the benefits it gets are equal to the amount of work you do in the sunflower farming? a) not equal b) average c) equal

44. Je, kuna mgawanyo wa kazi kati ya mwanaume na mwanamke katika kilimo cha Alizeti? **a) ndio b)hapana**

44. Is the labor evenly distributed between men and women in sunflower farming? a) yes b) no

45. Je, una uhuru wa matumizi ya kipato kitokanacho na kilimo cha alizeti? a)ndio b)hapana

45. Do you have freedom to spend the income from sunflower cultivation? a) yes b) no

46. Kilimo cha alizeti kimeweza kuinua kipato cha familia yako? **a) ndio b)hapana**

kama ni ndio eleza kwa namna gani.....

46. Ha sunflower cultivation raised your family's income? a) yes b) no

If yes, explain how ....

47. Je, Katika eneo lenu mkulima anaweza kupata mkopo toka kwa watu binafsi **a) ndio b) hapana**

47. In your area, do farmers have access to loans from individuals? a) yes b) no

48. Je, Eneo unalolima Alizeti unalimiliki? **a) ndio b)hapana**

48. Do you own the land on which you cultivate sunflowers? a) yes b) no

49. Unasehemu salama ya kuhifadhi fedha zitokanazo na mauzo ya zao la Alizeti? **a) ndio b)hapana**

49. Do you feel it is safe to store (save) money made from the sales of sunflower products? a) yes b) no

50. Unauwezo wa kuhifadhi fedha zinazotokana na mauzo ya zao la Alizeti? **a) ndio b)hapana**

50. Are you able to save money made from the sales of sunflower products? a) yes b) no

51.Kipato cha kaya yao ni Ths. Ngapi?Kwa mwezi?.....

51. What is your household income? How much per month?

52. Je unachangia kikamilifu kwenye pato la Kaya yako? **a) ndio b)hapana**

52. Do you fully contribute to the income of your household? a) yes b) no

53. Je unatumia kipato unachokipata mwenyewe? **a) ndio b)hapana**

53. Do you spend the income that you earn? a) yes b) no

54. Asilimia ngapiya kipato unachopata kinatumiwa na familia/? .....

54. What percentage of your income is spent on your family?

55. Unaweza kununua mahitaji ya lazima ya familia yako? **a) ndio b)hapana**

55. Are you able to provide (buy) the needs (necessities) of your family? a) yes b) no

56. Unaweza kupeleka watoto shule kutokana na kipato cha kilimo cha alizeti? **a) ndio b)hapana**

56. Can you pay for your children to go to school through the income earned from sunflower cultivation? a) yes b) no

57.Je Unaweza kununua bidhaa za kifahari kwa mfano……,……? **a) ndio b)hapana**

57. Are you able to buy luxury products? For example? a) yes b) no

58. Je Kilimo cha Alizeti kinakuwezesha kupata mahitaji yako ya lazima? **a) ndio b)hapana**

58. Does sunflower cultivation provide enough (allow) for you to buy (get) your necessities? a) yes b) no

59.Je kilimo cha alizeti kinakuwezesha kupata mahitaji ya familia? **a) ndio b)hapana**

59. Does sunflower cultivation provide enough (allow) for you to buy (get) your family's necessities? a) yes b) no

60. Kwa namna gani unafikiri kipato kitokanacho na kilimo cha alizeti kupelekea kuwepo mabadiliko katika afya yako? a) **Kidogo** ,b) **Wastani**, c) **Sana**.

60. How much do you think income from sunflower cultivation has affected your health? a) small b) average c) very

61.Je kipato kitokanacho na kilimo cha alizeti kimeweza kuleta mabadiliko katika afya yako na familia yako? **a) Kidogo** ,b) **Wastani**, **c) Sana**.

61. How much do you think income from sunflower cultivation has affected your family's health? a) small b) average c) very

62. Je unahusika katika utoaji wa maamuzi katika kaya yenu? a) ndio b)hapana

62. Are you involved in decision making in your household? a) yes b) no

63. Je unaweza kuyasemea maamuzi yanayotolewa katika kaya yenu? a) ndio b)hapana

63. Are you able to comment on the decision made in your household? a) yes b) no

64. Je unaweza kusafiri wakati ukihitajika? a) ndio b)hapana

64. Are you able to travel when needed? a) yes b) no

65. Unaweza kutumia simu ya mkononi inapohitajika? **a) ndio b)hapana**

65. Are you able to use a cell phone when needed? a) yes b) no

66. Unaweza kupata huduma ya mtandao wa intaneti pale unapohitajika? **a) ndio b)hapana**

66. Are you able to access internet when it is needed? a) yes b) no

67.Je unaweza kupata habari kupitia vyombo vya habari? **a) ndio b)hapana**

67. Are you able to access information via media (news)? a) yes b) no

68.Je unaoujasiri wa kufanya maamuzi katika biashara yako? **a) ndio b)hapana**

68. Do you feel confident in making decisions in your business? a) yes b) no

69. Je unaujasiri wa kufanya maamuzi yeyote katika kaya ? **a) ndio b)hapana**

69. Do you feel confident in making decisions in your household? a) yes b) no

70.Je unaujasiri wa kufanya maamuzi ya matumizi ya fedha katika kaya? **a) ndio b)hapana**

70. Do you feel confident about making decisions about money in the household? a) yes b) no

71.Je unaujasiri wa kununua mali zingine katika kaya? **a)ndio b)hapana**

71. Do you feel confident in buying possession/property for the household? a) yes b) no

72.Je unamiliki mali zako binafsi? **a) ndio b)hapana**

72. Are you confident in buying personal property/possessions? a) yes b) no

Appendix (B): Example of 'probit' and 'margins' results when using Stata. Here a female participant's receipt of formal training (feduc) is the independent variable and freedom to spend income (freespend) is the dependent variable.

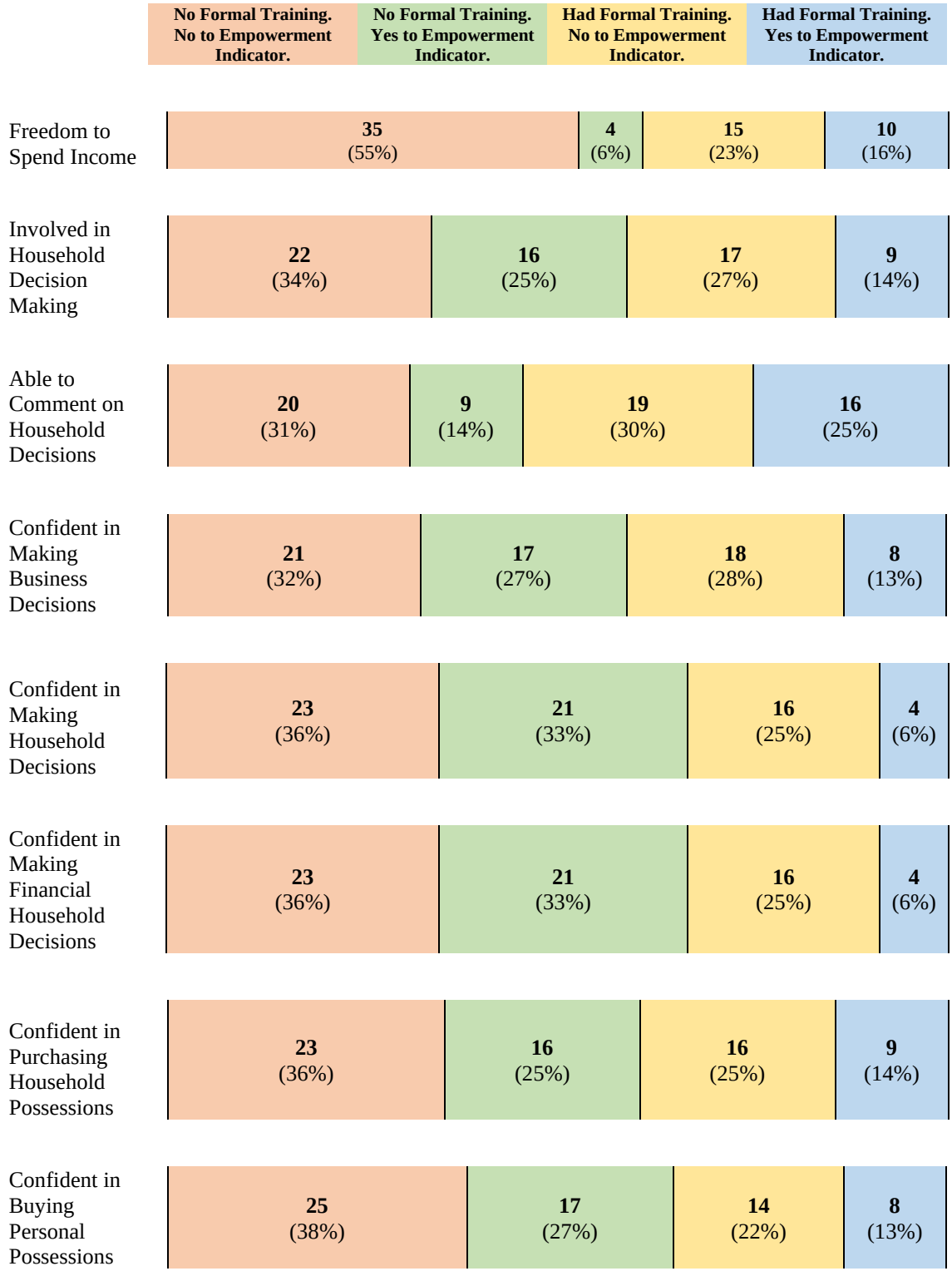
```
. probit freespend feduc

Iteration 0:   log likelihood = -29.366198
Iteration 1:   log likelihood = -27.730337
Iteration 2:   log likelihood = -27.720378
Iteration 3:   log likelihood = -27.720378

Probit regression                                 Number of obs     =         64
                                                  LR chi2(1)        =       3.29
                                                  Prob > chi2       =     0.0696
Log likelihood = -27.720378                       Pseudo R2         =     0.0560
```

freespend	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
feduc	.6842342	.3808108	1.80	0.072	-.0621412	1.43061
_cons	-1.267076	.2717583	-4.66	0.000	-1.799712	-.7344393

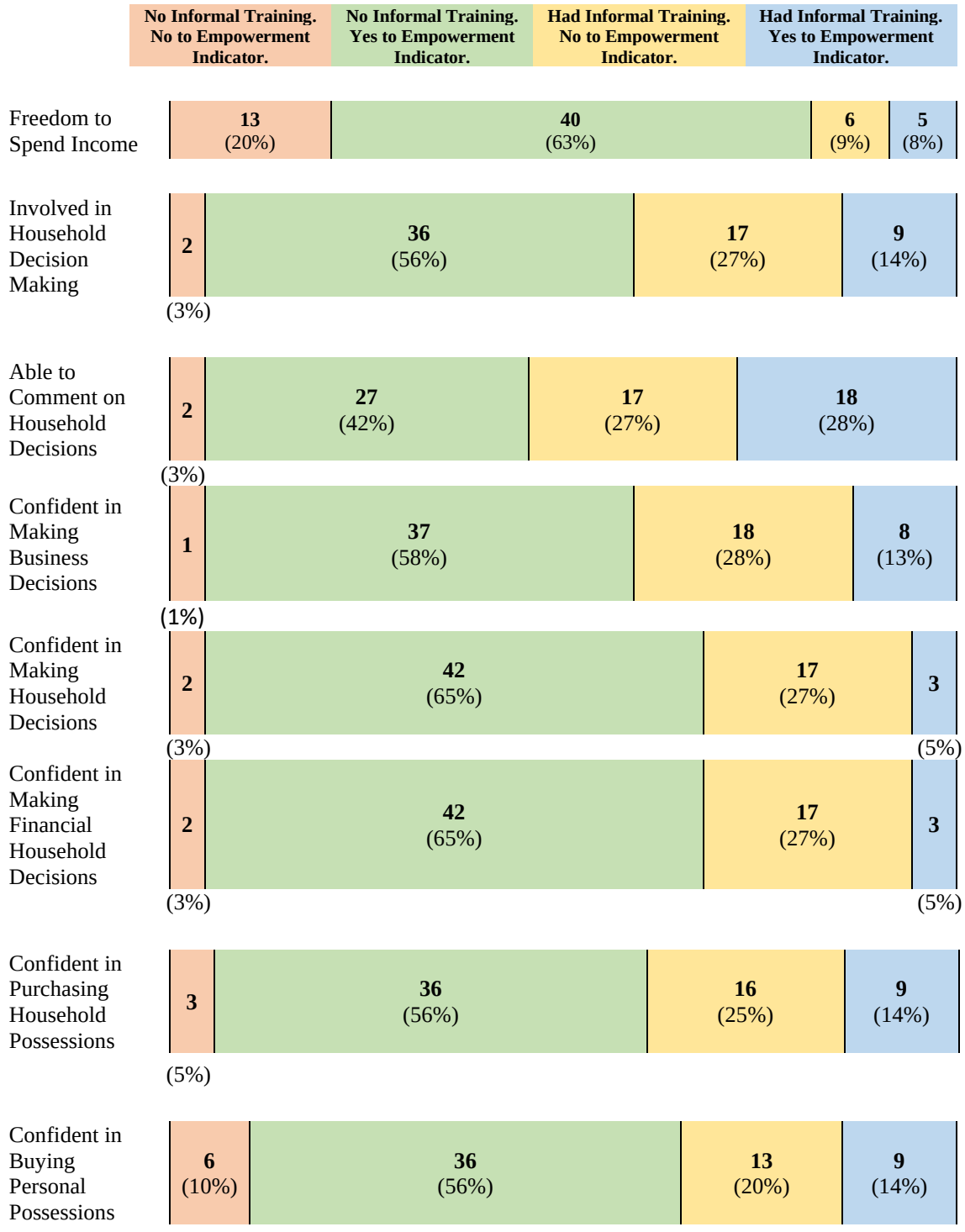
```
. margins feduc, atmeans

Adjusted predictions                              Number of obs     =         64
Model VCE    : OIM

Expression   : Pr(freespend), predict()
at           : 0.feduc         =     .609375 (mean)
               1.feduc         =     .390625 (mean)
```

	Margin	Delta-method Std. Err.	z	P>|z|	[95% Conf.	Interval]
feduc						
0	.1025641	.0485811	2.11	0.035	.007347	.1977813
1	.28	.0897998	3.12	0.002	.1039957	.4560043

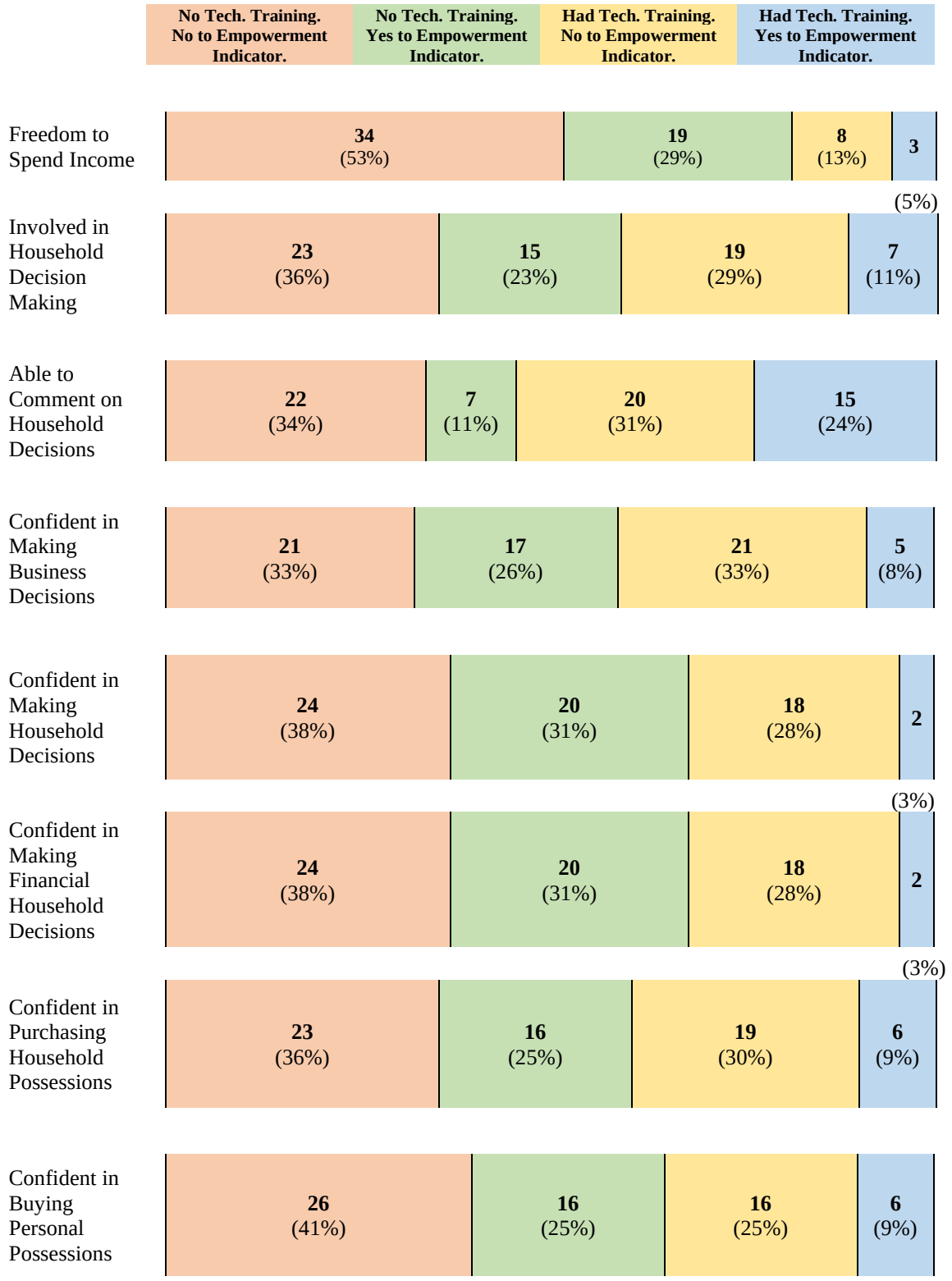
Appendix (C): Female participant response distribution charts when formal training is the independent variable and the empowerment indicators are the dependent variables. Number of participants in bold.



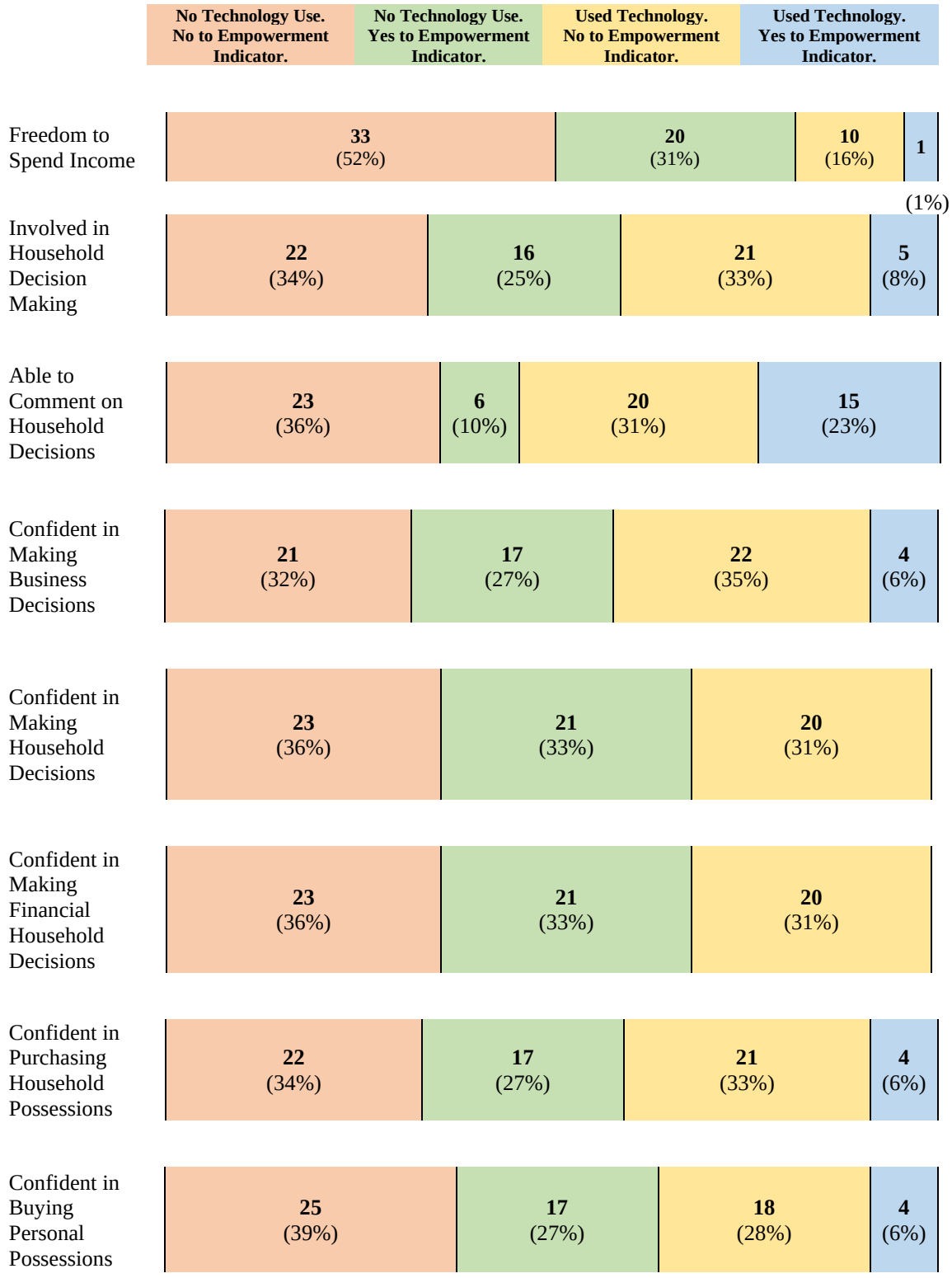
Appendix (D): Female participant response distribution charts when informal training is the independent variable and the empowerment indicators are the dependent variables. Number of participants in bold.



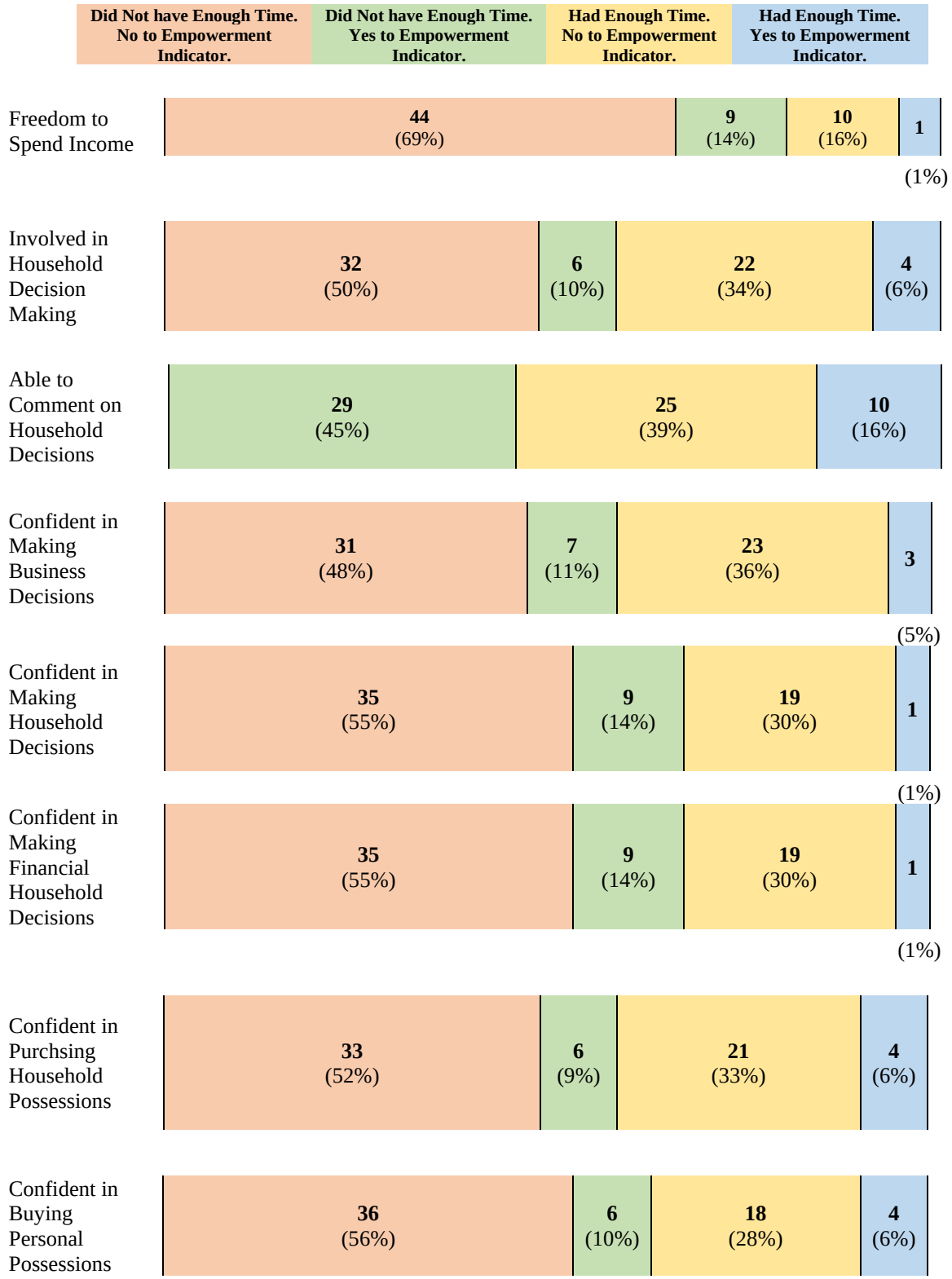
Appendix (E): Female participant response distribution charts when technology training is the independent variable and the empowerment indicators are the dependent variables. Number of participants in bold.



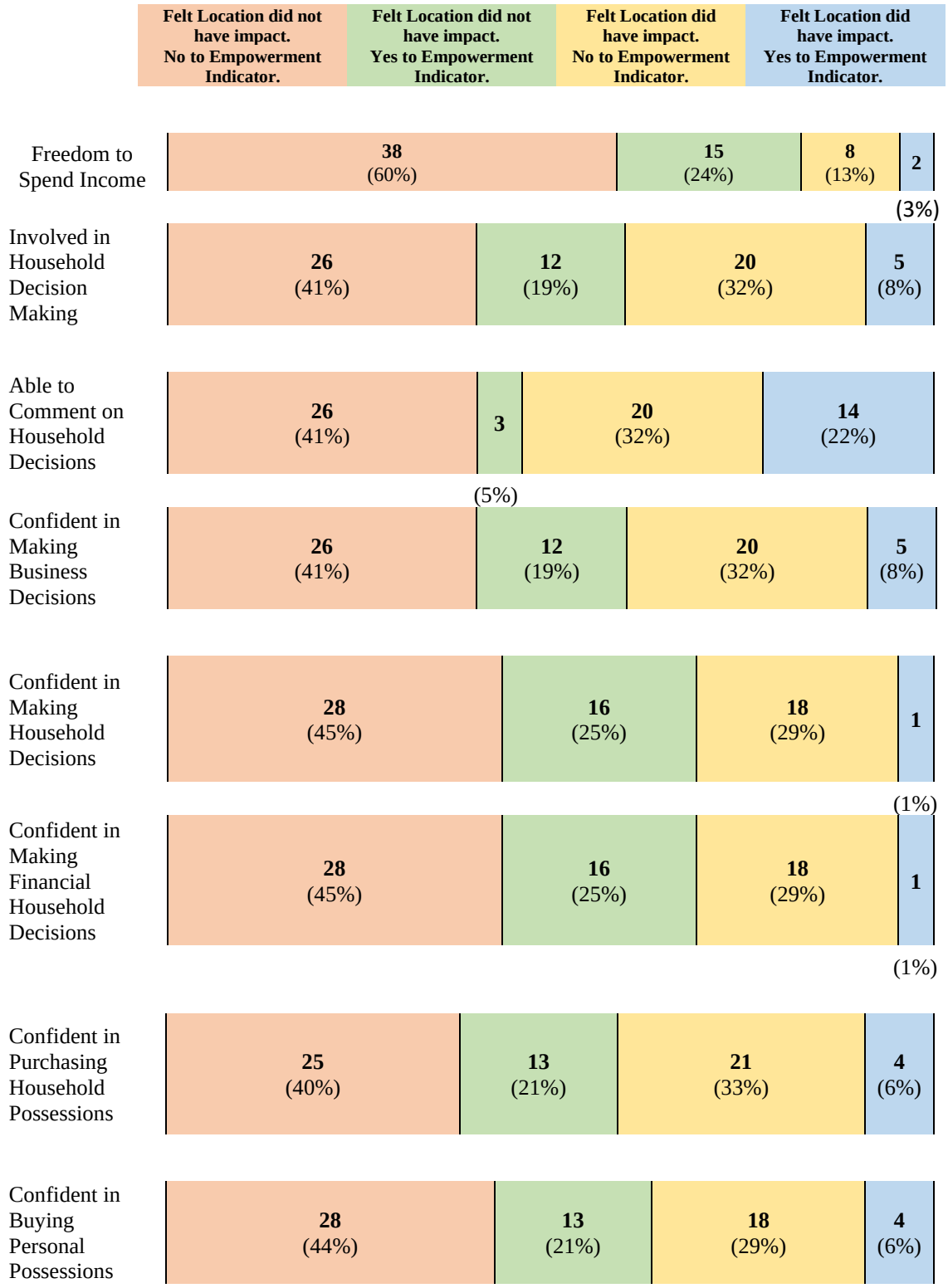
Appendix (F): Female participant response distribution charts when technology use is the independent variable and the empowerment indicators are the dependent variables. Number of participants in bold.



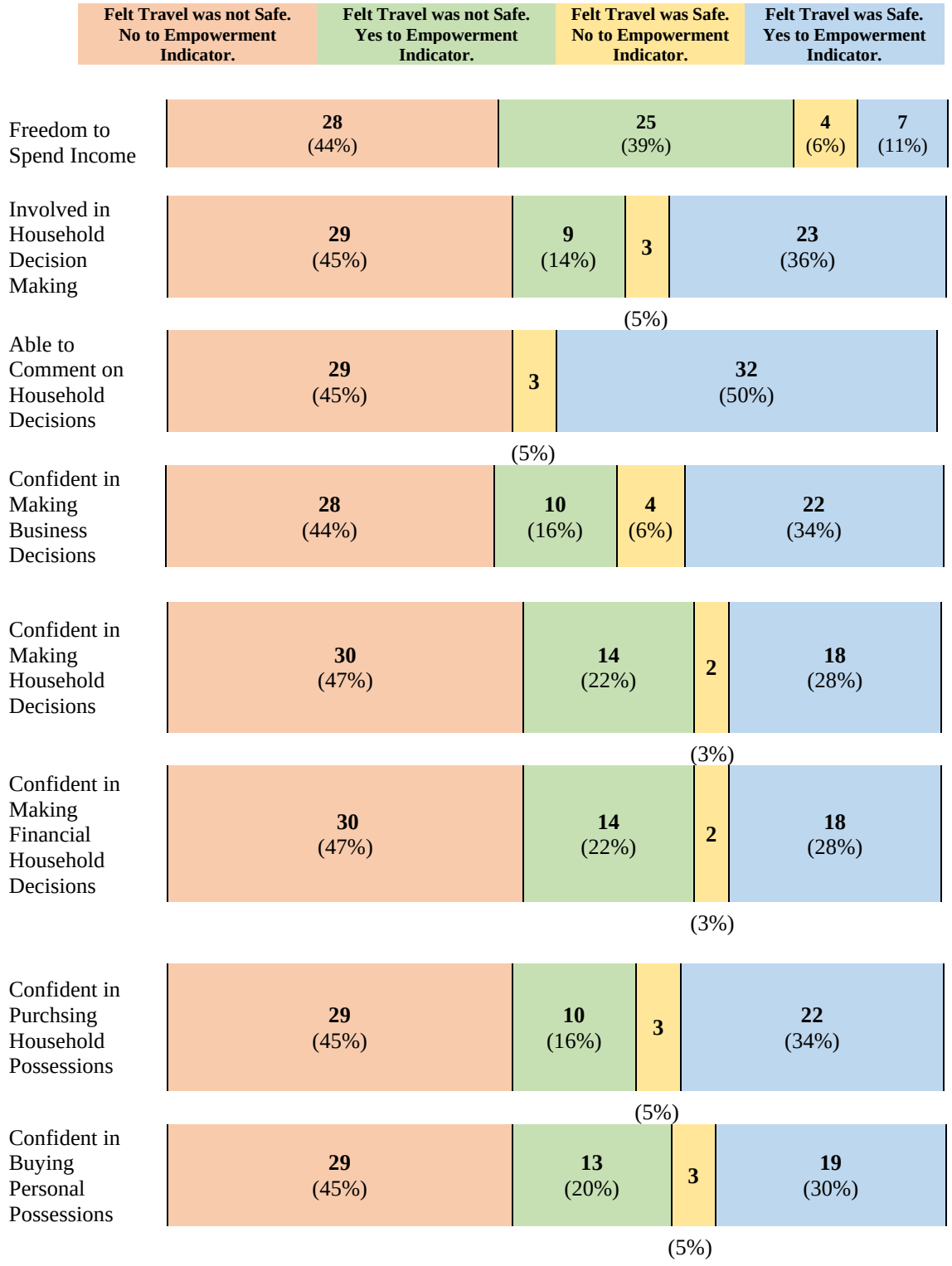
Appendix (G): Female participant response distribution charts when having enough time is the independent variable and the empowerment indicators are the dependent variables. Number of participants in bold.



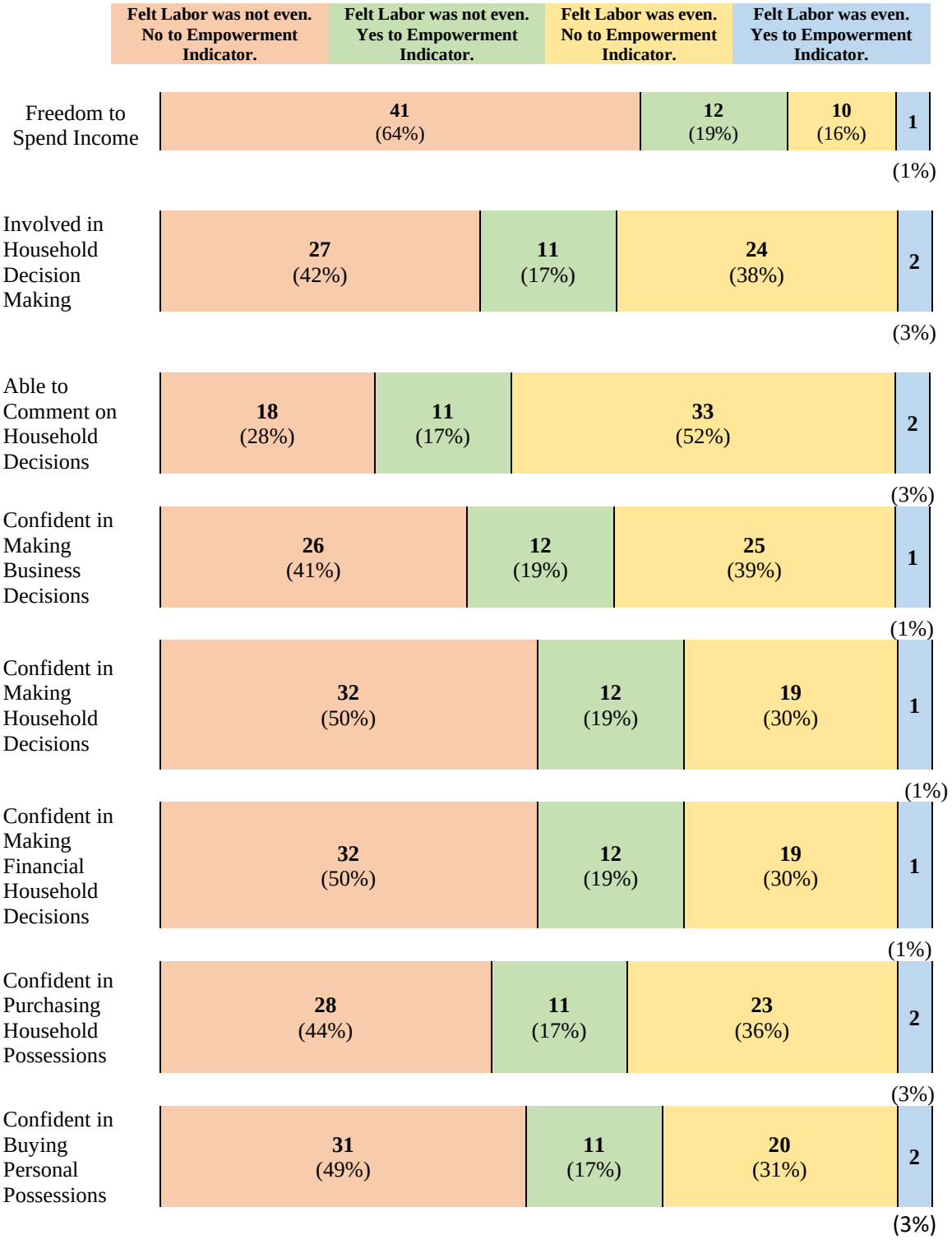
Appendix (H): Female participant response distribution charts when location impact is the independent variable and the empowerment indicators are the dependent variables. Number of participants in bold.



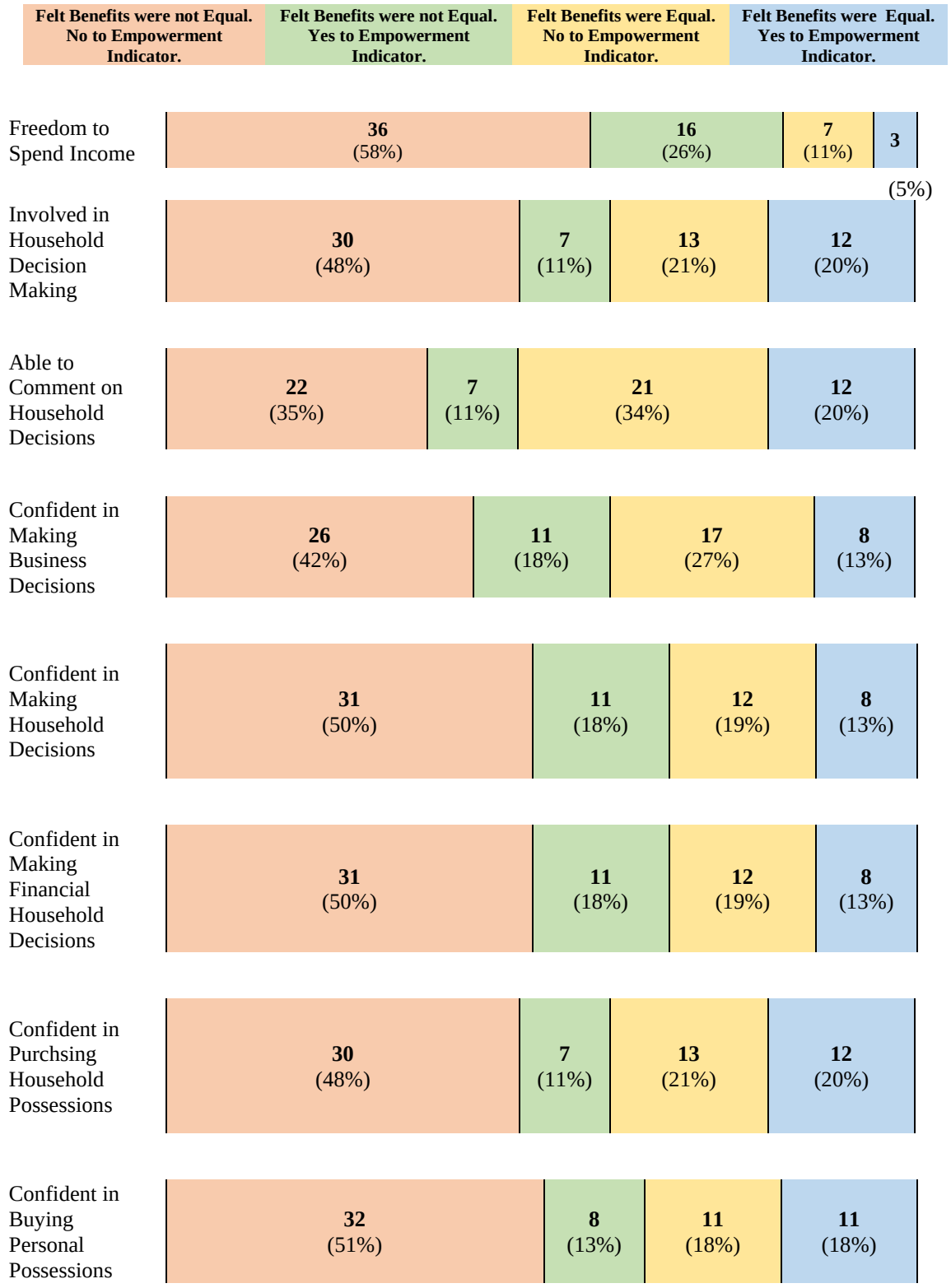
Appendix (I): Female participant response distribution charts when perception of safe travel is the independent variable and the empowerment indicators are the dependent variables. Number of participants in bold.



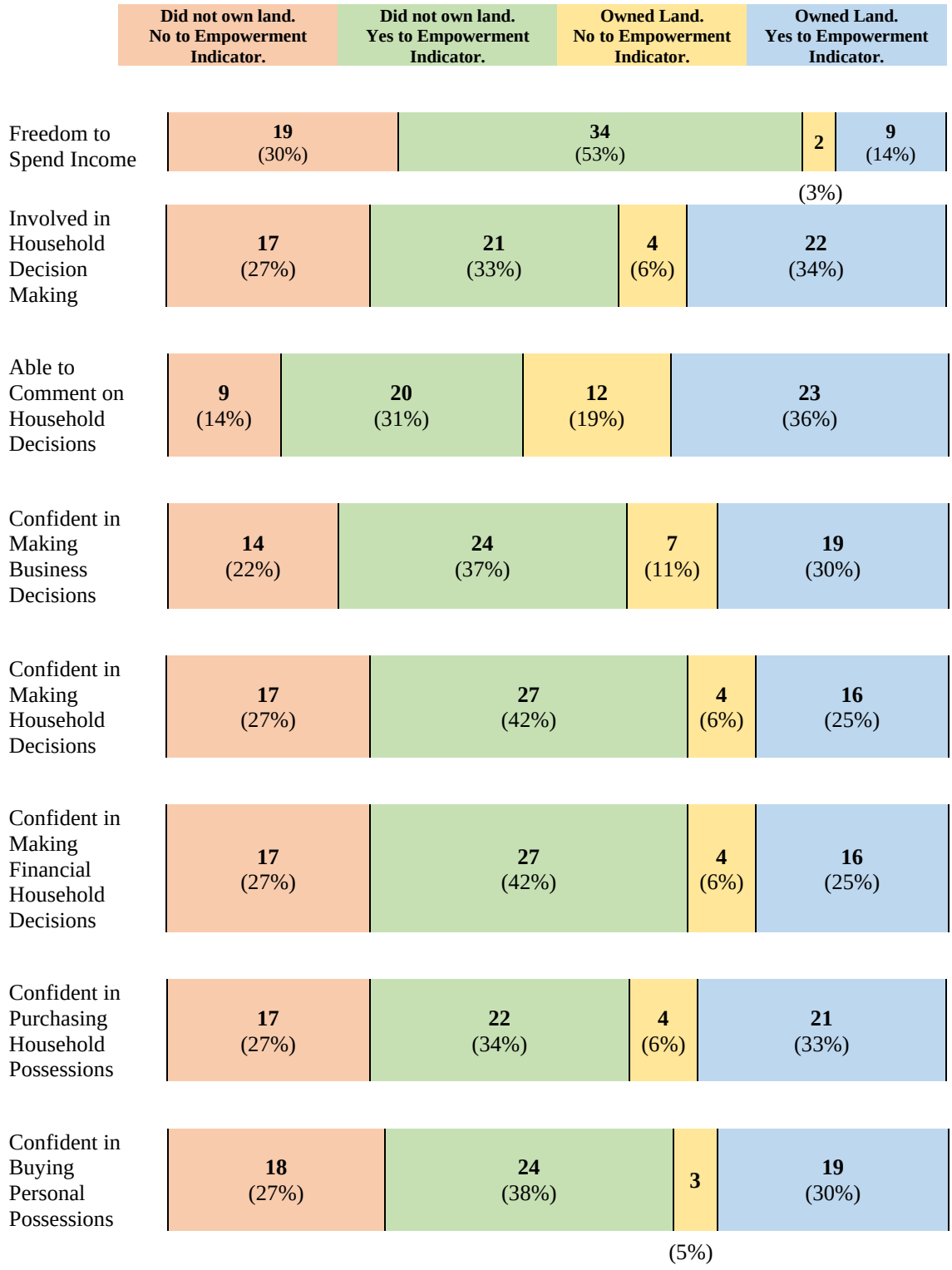
Appendix (J): Female participant response distribution charts when labor distribution is the independent variable and the empowerment indicators are the dependent variables. Number of participants in bold.



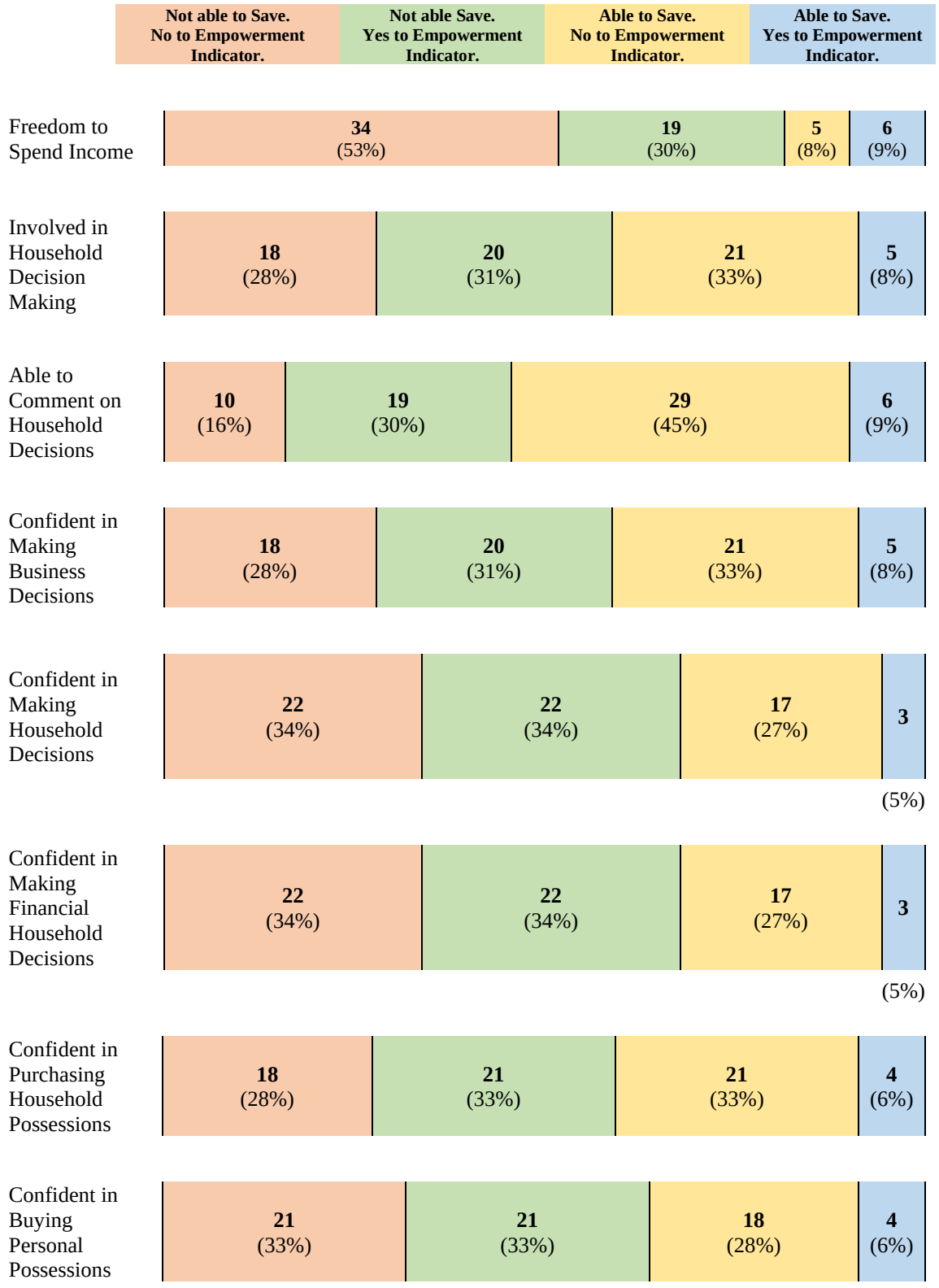
Appendix (K): Female participant response distribution charts when perception of benefits equal to work input is the independent variable and the empowerment indicators are the dependent variables. Number of participants in bold.



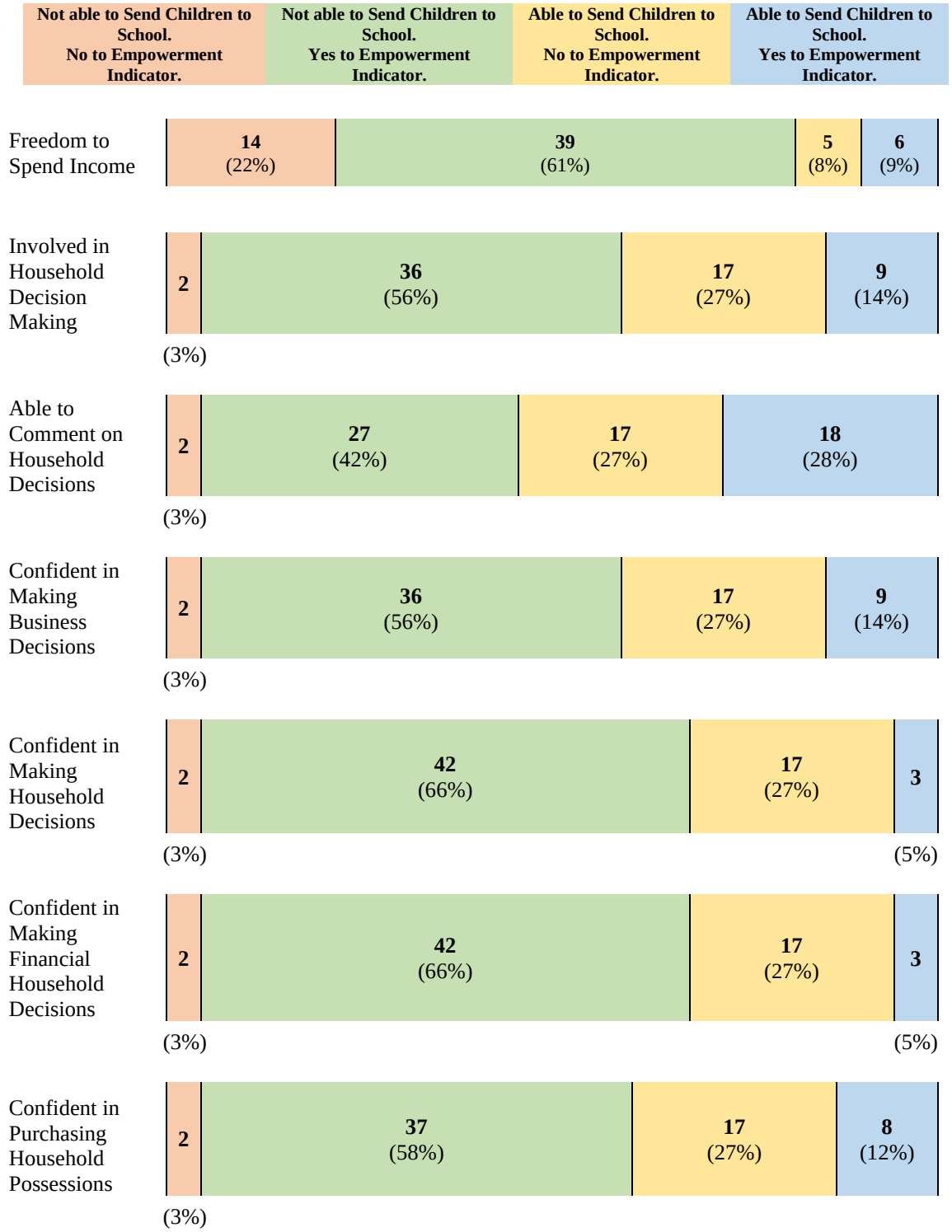
Appendix (L): Female participant response distribution charts when land ownership is the independent variable and the empowerment indicators are the dependent variables. Number of participants in bold.



Appendix (M): Female participant response distribution charts when ability to save is the independent variable and the empowerment indicators are the dependent variables. Number of participants in bold.



Appendix (N): Female participant response distribution charts when ability to send children to school through sunflower income is the independent variable and the empowerment indicators are the dependent variables. Number of participants in bold.



Appendix (O)**:** Probit regression results showing the marginal effects empowerment indicators have on other empowerment indicators within the responses of the sample.

	Freedom to Spend Income	Involved in Household Decision Making	Ability to Comment on Household Decisions	Confident in Making Business Decisions	Confident in Making Household Decisions	Confident in making Financial Household Decisions	Confident in Purchasing Household Possessions	Confident in Buying Personal Possessions
Did Not Have Freedom to Spend Income	-	.05 (0.04)	.07 (.05)	.03 (.03)	.07 (.04)	.07 (0.04)	.08 (0.04)	.1 (0.05)
Had freedom to Spend Income	-	.35 (0.09)	.26 (0.07)	.38 (0.1)	.4 (0.11)	.4 (0.11)	.32 (0.09)	.32** (0.1)
Not Involved in Household Decision Making	..32 (0.06)	-	0	0.11 (0.05)	0.14 (0.05)	0	0.05 (0.04)	0.12 (0.05)
Involved in Household Decision Making	0.82 (0.12)	-	0.69 (0.07)	0.85 (0.07)	1	1	0.96 (0.04)	0.95 (0.04)
Not Able to Comment on Household Decisions	0.49 (0.07)	0.24 (0.07)	-	0.26 (0.07)	0.34 (0.07)	0.34 (0.07)	0.28 (0.07)	0.33 (0.07)
Able to Comment on Household Decisions	0.82 (.12)	1	-	0.96 (0.04)	1	1	0.96 (0.04)	0.95 (0.04)
Not Confident in Making Business Decisions	0.3 (0.06)	0.11 (0.05)	0.03 (0.03)	-	0.14 (0.05)	0	0.15 (0.06)	0.21 (0.06)
Confident in Making Business Decisions	0.91 (0.09)	0.85 (0.07)	0.71 (0.08)	-	1	1	0.8 (0.08)	0.77 (0.09)
Not Confident in Making Household Decisions	0.23 (0.06)	0	0	0	-	0	0.03 (0.03)	0.1 (0.05)

Confident in Making Household Decisions	0.73 (0.13)	0.77 (0.08)	0.57 (0.08)	0.77 (0.08)	-	1	0.76 (0.09)	0.73 (0.09)
Not Confident in making Financial Household Decisions	0.23 (0.06)	0	0	0	0	-	0.03 (0.03)	0.1 (0.05)
Confident in making Financial Household Decisions	0.73 (0.13)	0.77 (0.08)	0.57 (0.08)	0.77 (0.08)	1	-	0.76 (0.09)	0.73 (0.09)
Not Confident in Purchasing Household Possessions	0.32 (0.06)	0.03 (0.03)	0.03 (0.03)	0.13 (0.05)	0.14 (0.05)	0.14 (0.05)	-	0.07 (0.04)
Confident in Purchasing Household Possessions	0.73 (0.13)	0.92 (0.05)	0.69 (0.08)	0.77 (0.08)	0.95 (0.05)	0.95 (0.05)	-	1
Not Confident in Buying Personal Possessions	0.28 (0.06)	0.03 (0.03)	0.03 (0.03)	0.13 (0.05)	0.14 (0.05)	0.14 (0.05)	0	-
Confident in Buying Personal Possessions	0.64 (0.15)	0.81 (0.08)	0.6 (0.08)	0.65 (0.09)	0.8 (0.09)	0.8 (0.09)	0.88 (0.06)	-

N = 64

Note: Standard Errors in Parenthesis.

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