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Food and Enterprise Development (FED) Project Impact Survey

February 14, 2017

This publication was produced at the request of the United States Agency for International Development. It was prepared independently by International Development Group LLC.

FOOD AND ENTERPRISE DEVELOPMENT (FED) PROJECT IMPACT SURVEY

LEARNING EVALUATION AND ANALYSIS PROJECT-II (LEAP-II)

ACTIVITY ORDER #25:

Contract Number:
AID-OAA-I-12-00042/AID-OAA-TO-I4-00046

DISCLAIMER

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

Photo credits: Richard Rousseau. Clockwise from upper left: Lowland rice beneficiary group, goat shelter, cassava field, newly planted vegetable field.

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International Development Group LLC (IDG) worked in collaboration with African Development Associates (ADEAS) – a Liberian organization to manage and implement the Impact Survey.

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ACRONYMS

ATE	Average Treatment Effect
CAHW	Community Animal Health Worker
CDP	Country Data Plan
CI	Confidence Interval
DAI	Development Alternatives, Inc.
ECOWAS	Economic Community of West African States
FED	Food and Enterprise Development
FGD	Focus Group Discussion
FTF	Feed the Future
FY	Fiscal Year
HA	Hectare
IC	Input Costs
IR	Intermediate Result
KG	Kilogram
KII	Key Informant Interview
LNGO	Local Non-Government Organizations
LOP	Life of Project
M&E	Monitoring and Evaluation
MOU	Memorandum of Understanding
MT	Metric Tons
NERICA	New Rice for Africa
NGO	Non-Government Organizations
PBS	Population-Based Survey
PMP	Performance Management Plan
PSM	Propensity Score Matching
QS	Quantity of Sales
SOW	Scope of Work
TP	Total Production
UP	Units of Production
USAID	U.S. Agency for International Development
USG	United States Government
VS	Value of Sales
VSLA	Village Savings and Loans Associations
WASH	Water, Sanitation, and Health
ZOI	Zone of Influence

EXECUTIVE SUMMARY

EVALUATION PURPOSE AND QUESTIONS

As stated in USAID's scope of work for the Food and Enterprise Development (FED) Impact Survey, the "objective of the impact study is to capture the magnitude of the impact of USAID/Liberia's value-chain investments in FED on agricultural productivity and profitability, investment and earnings, and quality of life". The evaluation has three primary goals: 1) to measure the difference in key indicators between FED beneficiaries and a comparison group of farmers, making use of standardized Feed the Future (FTF) performance indicators to the maximum extent possible; 2) to disaggregate this impact across four value chain commodities; and 3) to estimate to the extent practicable the impact of FED programming by year of initial program intervention.

The FED Impact Survey focused on five evaluation questions:

1. Have beneficiary farmers applied new practices, and technologies to selected value chains?
2. How much have beneficiary farmers invested (cash or equivalent in-kind) compared to the comparison group?
3. What are the gross profits and productivity of beneficiary farmers compared to the comparison group?
4. What are the household incomes of beneficiary farmers compared to the comparison group?
5. What is the quality of life of beneficiary farmers and their families compared to the comparison group?

PROJECT BACKGROUND

In 2011, USAID launched the implementation of FED, a five-year, \$75 million¹ cost plus fixed fee completion type contract under a consortium led by Development Alternatives, Inc. (DAI). The objectives of the program, as stated in the contract, were to:

1. Increase agricultural productivity and profitability and improve human nutrition;
2. Stimulate private enterprise growth and investment; and
3. Build local technical and managerial human resources to sustain and expand accomplishments achieved under objectives one and two.

The project was implemented in six counties that collectively include 75% of Liberia's households, more than two-thirds of all farming households; and nearly 70 percent of the country's population living below the poverty line²; these six counties, which include Grand Bassa, Bong, Margibi, rural Montserrado, Lofa, and Nimba, make up the Liberia Feed the Future Zone of Influence (ZOI).

FED worked in four product value chains (rice, cassava, vegetables, and goats) in partnership with farmers, agribusinesses, non-government organizations (NGOs) and the Government of Liberia. The FED Fiscal Year (FY) 2015 Annual Report estimated that the project had directly benefited at least

¹ USAID Foreign Aid Explorer, which lists the total amount of funding disbursed to USAID projects states that from 2011 – 2016, a total of \$68,357,503 was disbursed to DAI for the FED project.

² Liberia FY 2011-2015 Feed the Future Multi-Year Strategy, June 2011.

102,679 rural households of which approximately 60% participated in the cultivation of rice, 30% in cassava, 5% in goats, and 5% in vegetables.

In 2015, performance monitoring results reported by FED were questioned when an Independent Data Quality Review (DQR) “revealed serious deficiencies throughout the data management process, i.e., instrumentation, collection, collation, monitoring and quality checks, and how information was calculated and selected for reporting purposes.”³ It concluded that much of the data reported by FED, particularly on the most critical outcome/impact indicators, was of “poor quality and cannot be used for reporting or decision-making purposes.”³ As a result of the DQR, this impact survey was commissioned by the USAID mission in Liberia, and implemented by International Development Group LLC, to estimate the impacts of FED on beneficiary outcomes in light of unusable performance monitoring information.

EVALUATION DESIGN AND METHODS

The evaluation employs both quantitative and qualitative methods. The quantitative utilizes a household survey, and the qualitative involves key informant interviews (KIIs) and focus group discussions (FGDs). A total of 1,440 surveys were conducted in three of the six counties covering all four value chains. The three counties were chosen because “FED investments have been concentrated in the three “breadbasket” counties of Bong, Lofa and Nimba”.⁴ 597 surveys were conducted with FED beneficiaries and 843 with comparison farmers. The study team also conducted 21 FGDs and 69 KIIs with FED beneficiaries and other project stakeholders.

The quantitative approach uses a population-based matching design as the primary strategy to estimate impact. In each survey location (i.e. village or town), randomly-selected beneficiaries are compared to another group of randomly-selected farmers who did not participate in the FED program. A screener questionnaire ensures that these comparison farmers did not learn new farming methods or receive inputs directly from FED, or from other similar agriculture projects. An average treatment effect (ATE) and P-Value (a measure of significance) are calculated for each question and group, and propensity score matching (PSM) is used as a robustness test.

LIMITATIONS

The design of the Impact Survey is as rigorous as possible, given three major limitations: 1) the non-random selection of villages by the FED team; 2) lack of coordination between the baseline survey and FED implementation; and 3) the non-random selection of beneficiaries by FED. A difference-in-differences design, which would compare baseline and endline indicators for individual beneficiaries and comparison farmers, could not be used because baseline data were not collected for beneficiaries and the baseline did not have a defined comparison group. The evaluation overcomes these challenges, to some extent, by matching FED beneficiaries with similar farmers in the same villages, using propensity score matching as a robustness test. Locating the randomly selected FED beneficiaries was the greatest implementation challenge. The team managed to locate 71% of the names on the survey sample lists with a response rate of 100%. Among the comparison group, the survey achieved a response rate of 95%.

FINDINGS & CONCLUSIONS

³ FED Quarterly Report, March 3, 2016.

⁴ Scope of Work, USAID/Liberia, Food and Enterprise Development (FED) Impact Survey, April 2016.

5.1 Estimated Number of Direct Beneficiaries

It is estimated that a total of 50,353 farmers participated in FED programs in Bong, Lofa, and Nimba in Fiscal Years (FY) 13, 14, or 15. This represents 67.8% of the 74,280 beneficiaries reported by the FED Project over the same period in those three counties. The largest number of beneficiaries is located in Nimba County (45% of total); the largest value chain is rice farming (69% of total).

5.2 Findings and Conclusions related to the Five Evaluation Questions

Table I below summarizes the survey results for the five evaluation questions. For each question, it provides results by value chain and gender for beneficiary and comparison groups, the Average Treatment Effect (ATE), the P-Value, which is a measure of significance of the ATE, and the number of households surveyed (N). Results that are significant, i.e. those with a P-Value of 0.5 or less, are highlighted in green. While all four value chains show significantly higher application of new practices and technologies by beneficiary groups in contrast to comparison groups, only the goat value chain beneficiary group records a significantly higher gross margin. There are no significant differences between the two groups in household income, although beneficiary groups do exhibit significantly higher results on five of nine several quality-of-life measures.

1. Have beneficiary farmers applied new practices, technologies, and/or crops?

Surveys show that FED farmers are significantly more likely to utilize improved practices compared to non-FED farmers in their same villages for all value chains. In all cases, except for the deep placement of urea fertilizer, the use of improved practices was dramatically higher for FED farmers. More specifically, FED-trained goat farmers are 74.7% more likely to use goat shelters than other goat farmers in the same villages, while FED-trained cassava growers are 41.9% more likely to plant their cassava on mounds and ridges, rather than flat ground. However, 15 of the 25 improved practices were employed by fewer than half of the FED farmers.

FGDs and KIs indicated that the application of most practices depended on the willingness of farmers to increase labor effort and/or costs, and the ability of lead farmers to share knowledge with group members. Female and male beneficiaries are equally likely to apply the new practices, technologies, and/or crops.

2. How much have beneficiary farmers invested (cash or equivalent in-kind) compared to the comparison group?

The survey results on capital equipment expenditures reveal no significant differences between the beneficiaries and the comparison farmers, or between female and male beneficiaries. The estimates vary widely due to the relatively small number of farmers who reported spending money on capital equipment. Among the FED beneficiaries, rice farmers make the largest investments. Ownership of capital equipment is another indicator of investment, and the survey showed that FED farmers do own significantly more hand tools than the comparison farmers.

FGDs and KIs provided anecdotal evidence that farmer groups have invested in new production technologies and practices that were introduced by FED. Much of the reported investment occurred in the form of contributions of labor to physical infrastructure, such as improved lowland rice fields, goat pens and shelters, and rain shelters for vegetables, for which FED provided material and technical support.

Table 1: Summary of Survey Results

(significant differences shaded in green)

#	Question / Value Chain or Quality of Life Indicator	Beneficiary	Comparison	ATE	P-Value	N
1	Have beneficiary farmers applied new practices, and technologies on selected value chains?					
	Total	82.30%	51.50%	29.60%	<0.01	1,293
	Rice	79.60%	48.00%	12.80%	<0.01	629
	Cassava	87.40%	50.40%	10.70%	<0.01	377
	Goat	97.40%	72.70%	3.70%	<0.01	167
	Vegetable	87.70%	70.40%	2.40%	<0.01	120
	Female	82.00%	48.40%	NA	NA	726
	Male	82.60%	58.00%	NA	NA	522
2	How much have beneficiary farmers invested (cash or equivalent in-kind) compared to the comparison group? (US\$ last 12 months)					
	Total	\$12.48	\$21.09	(\$3.03)	0.44	1,293
	Rice	\$13.19	\$14.47	\$0.21	0.64	629
	Cassava	\$11.12	\$42.08	(\$3.42)	0.38	377
	Goat	\$7.73	\$8.36	\$0.03	0.87	167
	Vegetable	\$12.43	\$8.53	\$0.15	0.37	120
	Female	\$11.76	\$24.28	NA	NA	726
	Male	\$13.17	\$14.42	NA	NA	522
3	What are the gross profits and productivity of beneficiary farmers compared to the comparison group? (Gross margin per unit of production (hectares or heads) US\$, last 12 months)					
	Rice	\$134.92	\$63.45	\$16.67	0.09	629
	Cassava	\$80.74	\$79.99	(\$11.18)	0.67	377
	Goat	\$55.00	\$26.70	\$5.35	<0.01	167
	Vegetable	\$381.27	\$453.92	(\$7.71)	0.42	120
4	What are the household incomes of beneficiary farmers compared to the comparison group? (per capita daily)					
	Total	\$0.31	\$0.31	(\$0.02)	0.57	1,293
	Rice	\$0.31	\$0.32	(\$0.01)	0.61	629
	Cassava	\$0.32	\$0.29	\$0.00	0.98	377
	Goat	\$0.23	\$0.30	(\$0.01)	0.17	167
	Vegetable	\$0.37	\$0.25	\$0.00	0.61	120
	Female	\$0.24	\$0.27	NA	NA	726
	Male	\$0.37	\$0.39	NA	NA	522
5	What is the quality of life of beneficiary farmers and their families compared to the comparison group?					
	Mod-Severe Hunger (last 12 months)	17.60%	20.70%	1.30%	0.58	1,293
	Satisfied with Health	74.70%	72.90%	3.00%	0.23	1,293
	Satisfied with Financial situation	36.50%	28.60%	6.30%	0.02	1,293
	Satisfied with House	63.50%	64.20%	1.10%	0.67	1,293
	Satisfied with Job / Source of income	51.40%	39.70%	7.60%	0.01	1,293
	Satisfied with Life as a whole	69.40%	59.70%	10.00%	<0.01	1,293
	Current situation is "comfortable"	7.10%	4.80%	2.60%	0.03	1,293
	Situation 3 years ago was "comfortable"	10.40%	6.70%	0.80%	0.6	1,293
	Expect in 3 years to be "comfortable"	65.30%	54.40%	10.70%	<0.01	1,293

3. How profitable and productive are beneficiary farmers compared to the comparison group?

FED-supported goat farmers have significantly higher gross margins per unit of production than the comparison farmers. Rice, cassava and vegetable farmers did not exhibit significantly higher gross margins. When using the propensity score matching, the magnitude of the FED impact is reduced for all value chains, but remains significant for the goat value chain.

There are also indications that the long-term effects of FED participation exceed the short-term benefits: the FY13-14 cohorts have gross margins that are 53% higher than the FY15 cohort.

4. What are the household incomes of beneficiary farmers compared to the comparison group?

None of the methods used to measure household incomes showed significant differences between the beneficiary and the comparison groups. The household income method revealed no significant differences between beneficiaries and comparison farmers in household incomes, either overall or among any of the counties or value chains. Among FED beneficiaries, male farmers reported higher incomes than female farmers. Although beneficiary goat farmers revealed higher gross margins than comparison farmers, these gains do not appear to translate into higher household income. Per-capita daily expenditures show similar trends: there is no difference between the FED-supported farmers and the comparison farmers, and male FED beneficiaries exhibit higher expenditures than female beneficiaries. As before, earlier cohorts have higher expenditures than the FY15 cohort, which may suggest that the benefits of the FED program increase after the first year of participation.

5. What is the quality of life of beneficiary farmers and their families compared to the comparison group?

Subjective indicators of happiness reveal major differences between the FED beneficiaries and the comparison farmers. FED beneficiaries are significantly more likely to be satisfied with their current financial situation, their job, and their life as a whole. Similar trends are observed in the subjective wealth indicators. FED-supported households are 54% more likely to describe their current situation as “comfortable”, and 20% more likely to expect their situation in three years to be comfortable.

FGDs and KIs provided a significant amount of positive anecdotal evidence concerning the quality of life of beneficiary farmers. Participants spoke about improvements in nutrition, improved housing, increased savings, and better educational opportunities. Negative perceptions of the impact of FED were expressed in only three of the 31 villages and towns where FGDs and KIs were conducted.

RECOMENDATIONS

Recommendations for future programs and activities are grouped into four areas: 1) Selection and Support of Value Chains and Commodities; 2) Targeted Value Chains; 3) Supporting Institutions; 4) Performance Monitoring and Evaluation.

I. Carefully Select and Support Value Chains and Commodities

1.1 Select Value Chains that Demonstrate Comparative Advantage and for Which Anticipated Assistance Benefits are Worth the Associated Costs: Future interventions should be based on timely analysis prior to the selection of specific value chains within targeted regions. Analysis needs to identify value chains that

might offer comparative advantage, either at present or in the future with the removal of trade impediments and other market distortions.

1.2 Remove Trade and Other Barriers and Market Distortions: In addition to directly assisting production of value chains that demonstrate economic comparative advantage, it is important to work with local government, businesses, and consumers on removing any barriers or distortions that impede purchase of supplies or selling of goods to markets.

2. Capitalize on Promising Areas in the Four Targeted Value Chains

2.1 Rice: In future activities that promote lowland rice cultivation program implementers should ensure that farmers are aware of the additional labor costs involved, tools and equipment are readily available to assist in the process of reclaiming wetlands for productive use, financing is available to cover higher costs, and farm-to-market linkages are strengthened.

2.2 Cassava: Future interventions should continue the dissemination of improved cultivation practices, the distribution of improved varieties through private market channels, and the continued encouragement of value-added activities that increase marketability.

2.3 Goats: Programs should continue to emphasize the importance of herd health management, through the use of low cost shelters as well as continued support for Community Animal Health Workers (CAHWs). The transition to lower costs materials for goat shelters should be expedited.

2.4 Vegetables: Expanded use of low cost rain shelters will allow households to grow and harvest short-cycle vegetables in the rainy season, while low cost irrigation will facilitate cultivation in the dry season.

3. Strengthen Local Support Institutions;

3.1 Increase Use of Local Non-Government Organizations as Implementing Partners

The role of local non-government organizations, which have greater flexibility and sometimes more expertise than government extension services, should be continued and strengthened from the outset of a project to its conclusion.

3.2 Build on Project Successes with Private Input and Service Suppliers

Future interventions should build on the success of FED in expanding the availability of private support services by encouraging the expansion of private input suppliers of seeds, fertilizer, pesticides, herbicides, and fungicides, farm tools, and farm machinery.

3.3 Maximize the Use of Existing Local Organizations

Future interventions need to take maximum advantage of existing associations that have already been formed by local residents and/or farmers to address common interests and concerns.

3.4 Ensure the Availability of Credit for New Methods and Technologies

USAID should continue to strengthen local financial institutions both as depositories for savings as well as a source for short term production credit and longer term credit for equipment needed to finance the application of new methods and technologies.

3.5 Improve Coordination with Government of Liberia Institutions

Future projects like FED should coordinate more closely with local government officials and keep them better informed, even if they are not directly involved in project implementation.

4. Enhance Performance Monitoring and Evaluation

4.1 Establish a Clear Performance Management Plan at the Outset

Performance monitoring and evaluation systems need to be established at the outset of each program, given high priority by program leadership, and managed by dedicated staff who possess the appropriate knowledge and motivation. Of particular importance is the collection of credible baseline information for beneficiary and comparison groups that is subsequently compared to results achieved following program interventions. Managers should decide at the outset of a new program if they want an impact evaluation or not, and if so, plan for it with a rigorous baseline.

4.2 Consider Possible Trade-offs between Program Measurement and Program Impact

This Impact Study of the FED Project highlights the trade-offs that may arise between the objectives of accurately assessing impact on the one hand, and maximizing program impact on the other hand. Managers of future USAID interventions, whether related to Feed the Future or other areas, need to be cognizant of these trade-offs and decide what is most important for achieving the development and foreign policy objectives of foreign assistance programs.

I. EVALUATION PURPOSE AND QUESTIONS

EVALUATION PURPOSE

As stated in USAID's scope of work (SOW) for the Food Enterprise Development (FED) Impact Survey, the "objective of the impact study is to capture the...impact of USAID/Liberia's value-chain investments in FED on agricultural productivity and profitability, investment and earnings, and quality of life" (see Annex I: Evaluation Statement of Work for the full evaluation SOW). The evaluation has three primary purposes:

1. To measure the difference in key indicators between FED beneficiaries and a comparison group of farmers, making use of standardized Feed the Future performance indicators to the maximum extent possible;
2. To disaggregate this impact across four value chain commodities; and
3. To estimate to the extent practicable the impact of FED programming by year of initial program intervention.

It is expected that the results of this evaluation will inform the implementation of recently inaugurated USAID agriculture programs as well as the design of new agriculture programs. The main audiences of the report are USAID/Liberia and the USAID Bureau for Food Security.

EVALUATION QUESTIONS⁵

The FED Impact Survey focused on the following five evaluation questions and corresponding project performance indicators (USAID's Feed the Future (FTF) indicators for FED are noted in italics)⁶:

1. Have beneficiary farmers applied new practices, technologies, and/or crops?

- *Number of hectares under new technologies or management practices as a result of USG assistance [FTF 4.5.2-02]*
- *Hectares under new or improved/rehabilitated irrigation or drainage services as a result of USG assistance [FTF 4.5.2-28]*
- *Number of farmers and others who have applied new technologies and management practices as a result of USG assistance [FTF 4.5.2-05]*

2. How much have beneficiary farmers invested (cash or equivalent in-kind) compared to the comparison group?

- Value of on-farm investment leveraged by FTF implementation (USD)⁷

⁵ The five specific evaluation questions listed here were formulated in the Country Data Plan (CDP) that was approved by USAID.

⁶ FTF indicators are calculated according to the guidance provided in the 'Feed the Future Indicator Handbook' dated October 2014.

⁷ FTF Indicator 4.3.2-38 defines investment as "any use of private sector resources intended to increase future production output or income, to improve the sustainable use of agriculture-related natural resources (soil, water,

3. What are the gross profits and productivity of beneficiary farmers compared to the comparison group⁸?

- *Gross margin per unit of land or animal of selected product [FTF 4.5.0-04]*

*Gross margin is calculated from five data points, reported as totals across all direct beneficiaries:

1. Total Production by direct beneficiaries during reporting period (TP)
2. Total Value of Sales (USD) by direct beneficiaries during reporting period (VS)
3. Total Quantity (volume) of Sales by direct beneficiaries during reporting period (QS)
4. Total Recurrent Cash Input Costs (USD) of direct beneficiaries during reporting period (IC)
5. Total Units of Production: Hectares planted (for crops); Number of Animals in herd/flock/etc. (for milk, eggs, meat, live animals) for direct beneficiaries during the production period (UP)

4. What are the household incomes of beneficiary farmers compared to the comparison group⁹?

- Household income
- *Per capita expenditures as a proxy for household income [FTF 4.5-9]*

5. What is the quality of life of beneficiary farmers and their families compared to the comparison group?

- Prevalence of households investing in children's education
- *Prevalence of households with moderate or severe hunger [FTF 3.1.9.1(3) and FTF 4.7(4)]*
- Prevalence of households satisfied with life circumstances
- Prevalence of households that experienced recent shocks to household welfare

etc.), to improve water or land management, etc.". The definition includes upstream and downstream activities, but does not specifically exclude on-farm investment by private farmers. For the purpose of this survey, only private farmers' investment in equipment is reported. Other investment in off-farm activities, while important for on-farm productivity, was not measured by this survey.

⁸ FTF Indicator 4.5.2(23) 'Value of incremental sales (collected at farm-level) attributed to Feed the Future implementation (RiA)' cannot be calculated as a part of this FED Impact Survey because the 'Baseline Survey USAID Food and Enterprise Development Program Liberia', prepared by DAI and dated April 30, 2012, did not include information on the sales of surveyed farmer households.

⁹ Household income includes gross income from farming as well as income from other sources. As explained in detail in the Section 3, Methodology, it is estimated through two different approaches, a survey of income and expenses, and a household expenditures survey.

2. PROJECT BACKGROUND

PROJECT OVERVIEW

On September 12, 2011, under the USAID Feed the Future Initiative, USAID/Liberia launched FED, a five year, \$75 million¹⁰ cost plus fixed fee completion type contract implemented under a consortium led by Development Alternatives, Inc. (DAI). FED intended to support equitable agricultural sector growth and improve food utilization to contribute to Feed the Future's overall objective of sustainably reducing global poverty and hunger. The objectives of the FED program, as stated in the contract, were to:

1. Increase agricultural productivity and profitability and improve human nutrition;
2. Stimulate private enterprise growth and investment; and
3. Build local technical and managerial human resources to sustain and expand accomplishments achieved under objectives one and two.

These three objectives are virtually identical to the three intermediate results included in the Results Framework from USAID's Project Approval Document, and the Results Framework in FED's April 2015 Performance Management Plan (PMP) (see **Figure 2.1** on the following page).

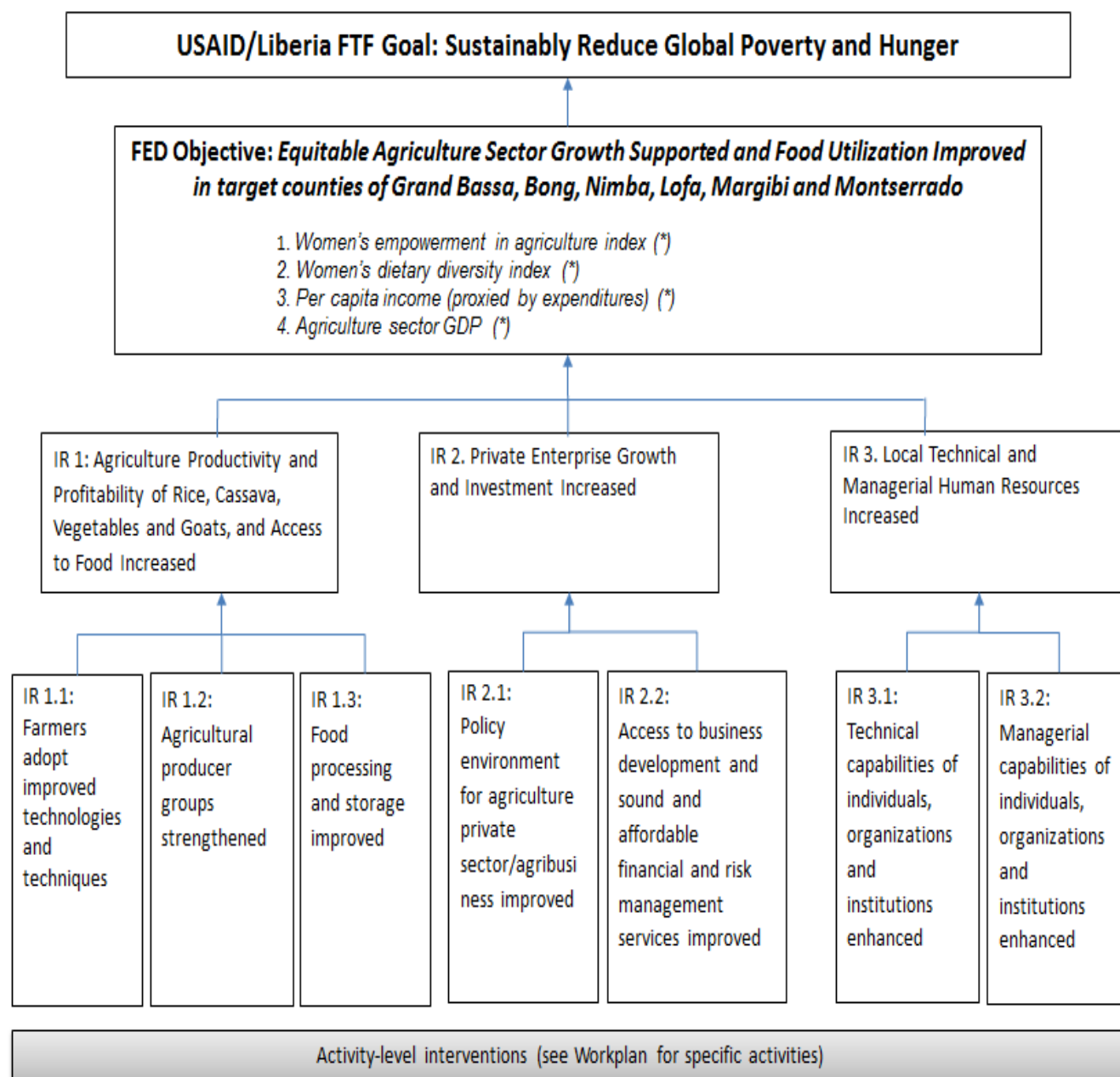
The project was implemented in six counties that collectively include 75% of Liberia's households, more than two-thirds of all farming households; and nearly 70 percent of the country's population living below the poverty line¹¹; these six counties, which include Grand Bassa, Bong, Margibi, rural Montserrado, Lofa, and Nimba, make up the Liberia Feed the Future Zone of Influence (ZOI).

FED worked in four product value chains (rice, cassava, vegetables, and goats) in partnership with farmers, agribusinesses, non-government organizations (NGOs) and the Government of Liberia. The FED Fiscal Year (FY) 2015 Annual Report estimated that the project directly benefited at least 102,679 rural households of which approximately 60% participated in the cultivation of rice, 30% in cassava, 5% in goats, and 5% in vegetables.

¹⁰ USAID Foreign Aid Explorer, which lists the total amount of funding disbursed to USAID projects, states that from 2011 – 2016, a total of \$68,357,503 was disbursed to DAI for the FED project.

¹¹ Liberia FY 2011-2015 Feed the Future Multi-Year Strategy, June 2011.

Figure 2.1. Liberia FED Results Framework



PROJECT IMPLEMENTATION OVERVIEW

FED employed a common set of assistance delivery approaches in all four value chains:

- Selection criteria for farmers: Beneficiaries must meet four principal selection criteria: 1) already produce one of targeted commodities; 2) have access to land; 3) be a member of a farmer group; and 4) demonstrate motivation to adopt new practices.
- Annual enrollment of new beneficiaries: Beneficiaries were enrolled each year during the period from September to November. Beneficiary groups were designated by the U.S. fiscal year in which they were enrolled into the program.
- Demonstration farms: Following the training of lead farmers and other key group members, additional assistance to other group members was provided at local demonstration farms accessible to all beneficiary group members. In some instances, this farm belonged to one of the group members who made it available for the demonstration and provided access to other group members. In other instances, the farm land was community owned property that had been made available by local government authorities for use by the group. The demonstration farm could be worked collectively by group members, who shared the net income from the sales of crops and/or the crops themselves, or it could be operated primarily by the group member holding the rights to the land. In the latter case, the land holder provided all labor and retained the net income and surplus harvest for himself/herself.
- Types of assistance: FED provided tools, equipment, improved seeds and fertilizers, and technical assistance and training to farmer groups and other value chain actors, on an in-kind grant basis, although cost-sharing was required for major pieces of equipment, notably power tillers and tuk-tuks¹². Tools, equipment, seeds and fertilizers were delivered directly by DAI and only during the first year of beneficiary group participation. After the first year, only technical assistance and training were provided.
- Reliance on local non-government organizations (LNGOs): FED contracted with LNGOs to provide much of the project's technical assistance and training, although FED also directly employed its own extension agents who provide advice and training to farmer groups and farmers.
- Limited interventions per village: Most villages received one value chain intervention; 5-15% of villages receive more than one value chain intervention (e.g. rice and cassava).

In addition to FED's direct technical and material support to farmers, the project also supported other actors in the four value chains, who in turn provided goods and services to farmers. Among these interventions were:

- Establishment of rice business hubs that provide drying, threshing, milling, and other services to rice farmers;
- Promotion of increased business linkages among rice farmers, rice aggregators, wholesalers, and processors to provide improved marketing outlets for small farmers;

¹² Motorized three wheel vehicles that are used for transport of persons and merchandise.

- Support for private tillage services through a cost sharing arrangement for the purchase of power tillers;
- Support for youth operators of tuk-tuk motorbikes through a cost sharing arrangement to transport farm goods to markets.
- Technical assistance and training for Village Savings and Loan Associations to improve financial services to farmers;
- Assistance to four regional community colleges to establish a 'National Diploma in Agriculture'.
- Support for policy makers in conforming Liberian regulations for seeds, fertilizers, and other agricultural inputs to the standards established by Economic Community of West African States (ECOWAS).

FED PERFORMANCE MONITORING

FED's approved PMP and Results Framework included 29 performance indicators, which informed the baseline study conducted in April 2012. While the baseline study provided comprehensive data on the characteristics of villages within the targeted counties of FED, it did not provide specific baseline information for program beneficiaries as FED clients had not been identified at that time. In years following, the project collected performance monitoring data on an annual basis once FED beneficiaries had been selected and received interventions. However, as shown in later sections of the report, baseline information would have been needed to better estimate impacts of FED interventions.

A lack of baseline information was further compounded by the results of a Data Quality Review conducted by DAI that raised serious questions about the quality of the data collected and report by the FED Project. FED's Quarterly Report for the period ending March 31, 2016, included the following caveat based on its Data Quality Review: "The DQR revealed serious deficiencies throughout the data management process, i.e., instrumentation, collection, collation, monitoring and quality checks, and how information was calculated and selected for reporting purposes." It concluded that much of the data reported previously by FED, particularly on the most critical outcome/impact indicators, was "of poor quality and cannot be used for reporting or decision-making purposes."

The FED Quarterly Report continues: "DAI reported this situation to USAID immediately following the completion of the internal data quality review. Subsequent to a formal feedback session at USAID with FED's data quality consultant, a plan was developed under the Mission's leadership to re-capture information on the 18 FTF indicators in FED's performance management plan (PMP). The action plan is comprised of two main activities: (a) an impact assessment to be conducted under USAID's auspices that will address the eight most critical impact/outcome FTF indicators whose results FED's review determined to be of the poorest quality, as well as quality of life improvements such as asset accumulation, access to health care and education, etc.; and (b) a thorough review of existing FED project documentation to determine if reliable results can be extracted on the remaining 10 FTF indicators". This FED Impact Survey has been commissioned to address activity (a).

CONSTRAINTS TO AGRICULTURAL DEVELOPMENT IN TARGETED REGIONS

The following background information is based primarily on focus group discussions (FGDs) and key information interviews (KIs) conducted for this study. It presents constraints that are common to all four value chains supported by FED, as well as those that are more specific to individual value chains.

I. General Constraints

Markets: In more than one out of five FGDs and KIs, participants raised issues related to markets and/or marketing, citing a lack of buyers at prices that would cover costs and return a profit, a lack of information about markets, difficulties negotiating with middlemen (and women), and/or problems with physical access to markets over poor rural roads. As one District Agriculture Officer phrased it, there is "...no problem as severe as trying to market the produce".

Labor: A number of farmers cited the availability and costs of labor as important constraints to adopting the more labor-intensive farming practices being promoted by FED. Even when farmers band together under cooperative groups known as *kuus* to assist each other in either planting or harvesting a crop, there is a cost associated with the tradition of feeding unpaid laborers from neighboring farms.

Farm to Market Roads and Transport: While primary roads are generally in good condition in the three counties included in the survey, secondary and tertiary roads are often in poor condition, especially during the rainy season from April or May through October. Farmers frequently cite poor road conditions and the lack of transport as problems in getting their produce to market.

Tools and Inputs: In FGDs and KIs conducted for this study, the majority of farmers discussed the need for basic tools, inputs such as fertilizers and chemicals, and protective gear for use on their own individual plots of land. As noted elsewhere in this report, FED frequently provided such support on demonstration farms, but not on individual plots. Input suppliers, to the extent they exist, are located either in county capitals or Monrovia.

Access to Land: Several farmers mentioned the difficulties faced in accessing land. This constraint appears to be more prevalent among the cassava farmers interviewed as well as lowland rice farmers who often require special access rights to publicly owned swamp areas. However, the constraint was also cited by some vegetable farmers.

Farmer Attitudes and Traditions: One county agricultural official complained that farmers are used to receiving handouts and that old and outdated farming methods are deeply rooted. Some confirmation of this comes from the responses of farmers when asked what they needed most from FED. Many seemed to view the provision of free tools and other inputs as one of the most important functions that a project like FED should undertake. Such free provision of goods and services can seriously undermine the development of private input and service providers. In addition, during certain cultural practices, notably those related to the *sande* cults for women and *poro* cults for men, outsiders are not permitted in the villages and some farmers stop work.

2. Sector Specific Constraints

Rice: Cultivation of rice in lowlands (also referred to as swamp land) offers excellent opportunities for increases in yields, but it also entails additional labor, initially to clear the land of plants, trees, and stumps, and then to maintain the land and ensure proper drainage. Laborers must be compensated and also require additional protection when working in the swamps. Although they welcome the increased production in both lowlands and uplands made possible with improved methods, almost all rice farmers expressed concern about the ability to market rice at prices that would allow them to compete with imports and provide a fair return.

Cassava: Among the four value chains reviewed for this study, cassava appears to face the most serious marketing constraints, partly due to the perishability of fresh cassava root. Cassava farmers complain about the lack of processing equipment that would allow them to conserve their harvest, add value, and make it easier to market.

Goats: Goat raisers face special constraints. Outside pens, goats often destroy crops. Inside pens, goats require supplemental feeding at an additional cost to the owner. In addition, trained health workers and veterinary medicines are often in short supply or too costly for farmers to afford.

Vegetables: Vegetable farmers mentioned problems in accessing land, competition with livestock, availability and cost of inputs, and difficulties in marketing produce.

TARGETED VALUE CHAINS: ASSISTANCE

Rice: FED promoted: increased planting in lowland areas, where water is more abundant and predictable, in addition to upland cultivation; planting higher yielding seed varieties, notably NERICA¹³; deep placement of urea fertilizer; improved water management practices; transplanting rice seedlings grown in seed beds rather than broadcast seeding; and planting seedlings at standard intervals.

Cassava: FED promoted: the use of mounds and ridges to improve soil drainage; planting at standard intervals; use of improved varieties; and the planting of only one cutting per hole.

Vegetables: FED supported the cultivation of new varieties, including African eggplant, bitter ball, cabbage, carrots, chili pepper, coriander, cucumber, eggplant, lady-finger, okra, lettuce, native okra, radish, spring onion, string beans, sweet pepper, tomato, water melon. It has also promoted: the construction of rain shelters¹⁴ that allow production to take place during the rainy season; and the introduction of water pumps and drip irrigation kits to help farmers expand vegetable production during the dry season.

Goats: FED has promoted improved goat herd management practices among goat raisers. In particular, FED has provided plans, construction materials, and technical support for the construction of goat pens and shelters that protect goats from the weather and from theft, while at the same time preventing goats from destroying other farmers' crops. FED has also trained CAHWs (who are often farmers and members of the assisted beneficiary groups) in vaccination, nutrition, and care of sick animals.

TARGETED REGIONS

The three counties (Bong, Lofa, and Nimba) that are the subject of this study make up the North Central Region of Liberia. With a total population of over 1.2 million people, roughly 26% of Liberia's population, it is the second largest region in the country after the capital region of Montserrado. While the FED project also covers the regions of rural Montserrado and South Central (Margibi and Grand Bassa Counties), the latter two regions are not included in the scope of work for this study.

¹³ NERICA (New Rice for Africa) is a hybrid rice developed by the Africa Rice Center to improve yields.

¹⁴ Rain shelters are constructed with wood and plastic sheets. In order to reduce costs FED has increased the use of local materials to the extent possible.¹⁵ Surveys took place in villages or towns adjacent to agricultural areas. These locations are referred to in this report as villages or towns.

Figure 2.2. Map of Liberia



Figure 2.3 Counties Supported by FED



3. EVALUATION METHODS

The evaluation employs a mixed-methods approach, involving both quantitative and qualitative methods. The quantitative component utilizes a household survey, and the qualitative component involves key informant interviews (KIs) and focus group discussions (FGDs).

I. QUANTITATIVE RESEARCH

Impact Estimation

The quantitative evaluation employs two methodological strategies to estimate the impact of the FED program. The primary strategy uses a population-based matching design, tailored to the unique challenges of this impact study. The primary characteristics of the matching design are a screener questionnaire and an average treatment effect (ATE) estimator. The following paragraphs provide a description of each of these elements, and the appendix provides the ATE equation.

In each survey location¹⁵ (i.e. village or town), randomly-selected beneficiaries are compared to another group of randomly-selected farmers who did not participate in the FED program. A screener questionnaire ensures that these comparison farmers did not learn new farming methods or receive inputs directly from FED, or from other similar agriculture projects. The screener questionnaire also ensures that the comparison farmers satisfy the same eligibility requirements used by FED to vet the beneficiaries (for example, they must have experience growing the specific value chain commodity targeted by FED in that particular village). In this way, the comparison farmers are similar to the FED beneficiaries on a number of observable and unobservable/unmeasured characteristics¹⁶, and provide a counterfactual for identifying FED's impact. The screener questionnaire also provides a measure of FED's spillover effect, allowing for an estimate of the total number of farmers who benefited from the program, both directly and indirectly.

Farmers are excluded from the comparison group if they: 1) directly benefited from FED (i.e. members of a group that receives assistance from FED or personally received assistance from FED); 2) indirectly benefited from FED by learning one or more improved farming methods from a friend who learned the methods from FED; and/or 3) participated on a communal/demonstration farm supported by an outside organization for the specific value chain targeted by FED in that same village or town. Farmers who may have received other types of assistance from non-FED organizations were included in the comparison group. In practice, the survey found very few other agriculture projects in the FED areas, and thus few farmers were excluded based on this criterion.

Annex II: Evaluation Methods and Limitations, provides a formula for calculating the average treatment effect (ATE) for this research design, which is used to estimate the impact on each indicator. The ATE is the difference between the FED beneficiaries and comparison group that can be attributed to the FED project, given the assumptions of the research design. The ATE estimate for a particular indicator can be

¹⁵ Surveys took place in villages or towns adjacent to agricultural areas. These locations are referred to in this report as villages or towns.

¹⁶ Proxy indicators are often used as a rough control for unobservable characteristics, or characteristics for which data are not available. Geography is commonly used as such a proxy. For example, Tobler's first law of geography emphasizes how proximity correlates with similarity. In this case, geography captures a variety of unmeasured attributes, such as soil quality, market access, locality-specific farming practices, etc.

counter-intuitive because FED beneficiaries are compared to non-FED farmers in the same village, and then the village-level results are aggregated into the overall estimate.

This means that large differences between beneficiaries and comparison farmers in one village have less of an impact on the ATE—but could have a big impact on the population-level estimates for the beneficiary and comparison groups. For example, Table 5.3.4 estimates that comparison farmers (73.4%) are, on average, more likely to believe that accepting a loan was a good idea than the FED farmers (70.2%). Nevertheless, the study estimates a positive treatment effect—meaning that FED farmers are significantly more likely to believe that accepting a loan was a good idea. This is due to a high concentration of comparison farmers with those beliefs in a small number of locations, while FED beneficiaries share this belief in a large number of locations (albeit at a lower rate). These “mixed” findings result from the way the ATE equation aggregates responses at the village-level before computing the overall treatment effect.

Throughout the report, estimates are also presented for male and female beneficiaries, as well as upland and lowland rice farmers. These estimates do not include an ATE between the beneficiary and comparison groups, since the study was not designed to measure this level of variation. However, it is possible to measure the significance of differences between, for example, male and female FED beneficiaries. These significance tests are conducted using a weighted t-test. The results are discussed in the test, when relevant. The significance values are not reported in the tables to avoid confusion with the ATE.

A secondary strategy for detecting impact involves choosing comparison villages, which are villages that did not receive FED assistance but are similar to the villages and towns where FED operated. Suitable comparison villages were chosen through propensity score matching using four variables derived from the baseline survey data: (a) income from field crops; (b) distance to market; (c) expenditure on inputs; and (d) average acreage of farm land.¹⁷ The goal of propensity score matching is to compensate for the non-random selection of survey locations by identifying the locations that are as similar as possible as the FED villages and towns according to the outcomes of interest. Using these variables allows us to identify villages that, before the start of the FED project, produced roughly the same amount of the value chain commodities and had roughly the same market opportunities as the FED villages. This secondary strategy loosely follows the principles of what statisticians call a “difference-in-differences” approach, although it differs meaningfully from that approach due to limitations of the original baseline survey conducted at the beginning of the FED program.

Stratification

The population-based matching strategy stratifies the survey across locations and value chains to increase the precision of the results. Stratifying the 30 survey locations across different dimensions allows us to provide evidence of impact within each county and value-chain, and to take advantage of the baseline survey data. Furthermore, stratifying the surveys by the year when the beneficiaries first received assistance allows us to measure both short-term and long-term impact. Below is a description of each stratum, and a summary is presented in Table 3.1.1. Annex II: Evaluation Methods and Limitations: Evaluation Methods and Limitations provides equations for calculating the sampling weights associated with this stratification design.

Value-Chain Results

¹⁷ The propensity score was estimated using logistic regression and nearest neighbors.

The FED project targeted four different value chain commodities: rice, cassava, vegetables, and goats. It is likely that the FED intervention was more successful with some value chain commodities than others. To measure this variation, the sample is stratified across the value chains, with 50% of the surveys focused on rice (5 locations per county), 30% on cassava (3 locations per county), 10% on vegetables (1 location per county), and 10% on goats (1 location per county). This represents an over-sampling of vegetable and goat beneficiaries, which each represent approximately 5% of beneficiaries, and a slight under-sampling of rice producers (approximately 60% of beneficiaries). This sampling strategy, however, allows for impact estimates of the vegetable and goat value chains without significantly compromising the impact estimates for rice producers.

Incorporating the Baseline Survey Data

In each county, two rice locations and one cassava location were randomly selected from among the villages and towns that were surveyed during the baseline. The Impact Survey conducted surveys in these villages, while the same households who participated in the baseline survey were not necessarily tracked down. This allows for some comparison of change over time at a village level between the areas where FED operated and a set of similar comparison villages that did not receive FED assistance, loosely approximating a difference-in-differences research design.¹⁸ Only 9 locations (23% of survey locations) were chosen to overlap with the baseline survey due to concerns about selection bias, since only 5% of beneficiaries are located in villages surveyed by the baseline. These surveys did not attempt to locate the same households that participated in the baseline survey. Rather, the goal is to create village-level estimates of changes over time.

Short-Term and Long-Term Impact

During the first year of participation in the FED project, demonstration farms receive inputs such as improved seeds and/or farming tools, as well as technical advice. After this first year, demonstration farms may continue to receive technical advice, but receive no additional inputs. To measure both short-term and long-term impact, the beneficiary surveys are split among the FY15 cohort of farmers (a target of 300 surveys), the FY14 cohort (a target of 150 surveys), and the FY13 cohort (a target of 150 farmers). This stratification is mirrored within each survey location (10 surveys of FY15 farmers, 5 surveys of FY14 farmers, and 5 surveys with FY13 farmers in each location), when possible. The FY15 cohort is the most recent cohort that has completed a harvest under the FED program. Dividing the surveys in this way allows us to estimate both the short-term impact of providing farm inputs, as well as the long-term persistence of new farming techniques and changes in income. Some of the randomly selected locations received FED assistance in FY15 only, so the actual number of surveys with the FY13-14 cohorts is lower than the target. In these areas, all 20 beneficiary surveys were conducted with randomly selected members of the FY15 cohort.

Table 3.1.1 Stratification of Surveys: Target Number of Surveys (Number of Locations in parenthesis)

	Lofa	Bong	Nimba	Total
Total Surveys	400 (10)	400 (10)	400 (10)	1,200 (30)
Beneficiary surveys	200 (10)	200 (10)	200 (10)	600 (30)
Comparison surveys	200 (10)	200 (10)	200 (10)	600 (30)
<i>Rice Value Chain</i>	200 (5)	200 (5)	200 (5)	600 (15)

¹⁸ A rigorous, fully compliant difference-in-differences design is not possible due to the lack of baseline data on FED beneficiaries and comparison farmers. Only 5% of FED beneficiaries are located in villages that were surveyed during baseline, and very few beneficiaries were surveyed during the baseline.

	Lofa	Bong	Nimba	Total
Beneficiary surveys	100 (5)	100 (5)	100 (5)	300 (15)
Comparison surveys	100 (5)	100 (5)	100 (5)	300 (15)
<i>Cassava Value Chain</i>	120 (3)	120 (3)	120 (3)	360 (9)
Beneficiary surveys	60 (3)	60 (3)	60 (3)	60 (3)
Comparison surveys	60 (3)	60 (3)	60 (3)	60 (3)
<i>Vegetables Value Chain</i>	40 (1)	40 (1)	40 (1)	120 (3)
Beneficiary surveys	20 (1)	20 (1)	20 (1)	60 (3)
Comparison surveys	20 (1)	20 (1)	20 (1)	60 (3)
<i>Goats Value Chain</i>	40 (1)	40 (1)	40 (1)	120 (3)
Beneficiary surveys	20 (1)	20 (1)	20 (1)	60 (3)
Comparison surveys	20 (1)	20 (1)	20 (1)	60 (3)
<i>Baseline Data Overlap¹⁹</i>	120 (3)	120 (3)	120 (3)	360 (9)
<i>Short-term and Long-term Impact</i>				
FY 13 beneficiaries	50 (5)	50 (5)	50 (5)	150 (15)
FY 14 beneficiaries	50 (5)	50 (5)	50 (5)	150 (15)

Limited Difference-in-Differences Strategy

In addition to the above survey design, the evaluation seeks to further triangulate its findings by conducting surveys in a small group of comparison *villages*. These villages were selected to meet two criteria: (a) they were surveyed during the baseline, to allow for estimates of change-over-time; and (b) they are as similar as possible to the FED project sites based on baseline indicators, to minimize (but not eliminate) the selection bias caused by the non-random selection of FED sites. These additional comparison villages allow for an entirely different impact evaluation design, conducted in parallel with, and leveraging the data collected for, the design described above. Propensity score matching was used to ensure that these comparison villages were as similar as possible to the FED villages at the time of the baseline survey. The matching process used four variables derived from the baseline survey data and aggregated at the village or town level: (a) income from field crops; (b) distance to market; (c) expenditure on inputs; and (d) average acreage of farm land.

Rather than comparing treatment and comparison farmers within each village, this add-on analysis treats all surveys in the FED areas as beneficiary surveys.²⁰ Village-level estimates of each indicator²¹ are compared between the treatment and comparison villages. The challenge of this design is conducting enough surveys in comparison villages to have a hope of detecting a statistically significant impact. Three comparison villages were chosen in each county, with a target of 20 surveys in each location. The result is 180 additional surveys. Screener questionnaires were used to select survey respondents, as it is possible that these comparison villages have benefited from non-FED agriculture projects.

¹⁹ “Overlap” is defined as surveys conducted in locations where the baseline survey was also conducted; it does not imply the same individuals will be interviewed.

²⁰ Due to the non-random selection of FED beneficiaries, it is not appropriate to compare only FED beneficiaries to the community-level statistics in these non-FED villages. To construct an appropriate comparison for the beneficiaries, the survey would have had to recruit a lead farmer who then introduced the survey teams to the top farmers in the community, for inclusion in the survey. In any case, running the analyses with FED beneficiaries does not substantively change the results.

²¹ The village-level estimates weight the surveys to account for the relative population size of the beneficiaries and non-beneficiary farmers in each location.

Because of the complexity of the survey design, it is worth emphasizing that the propensity score matching used to select these villages is entirely different from the primary analyses that focus on FED beneficiaries and comparison farmers living in the same village or town. The goal of PSM is to compensate, to some extent, for non-random selection in the project implementation. The FED project involved two levels of non-random selection. At the first level, FED selected villages (non-randomly) to receive the project, based on their access to markets and experience producing the value chain commodities. We use PSM at this level to select suitable comparison villages for a limited analysis that appears in some sections of the quantitative results.

At the second level, FED selected farmers (non-randomly) to participate in the FED project based on recommendations from a lead farmer and the individuals' experience producing the value chain commodity. To control for this bias, we use a screener questionnaire to identify suitable comparison farmers. In some ways, this questionnaire can be considered a rough form of propensity score matching by setting thresholds on key indicators that define "similar" farmers. To test the robustness of the results we use a formal PSM analysis that excludes some of the comparison farmers based on a variety of indicators. This PSM analysis is completely different from the PSM model used to select the comparison villages.

Sample Size

The population-based matching evaluation targeted 600 beneficiaries and 600 matched comparison farmers. These surveys were clustered into 30 survey locations, stratified evenly among the three counties to allow for county-level comparisons. The survey locations were also stratified according to the value chain commodity and availability of baseline data. In each location, the enumeration teams targeted 20 beneficiaries and 20 comparison farmers. These clusters strike a balance between the logistical challenges of locating and interviewing respondents with the need for statistical precision.

The ideal sampling design is a simple random sample with replacement. This is essentially a cluster design where each cluster contains only one element. Under this scenario, we would select individual beneficiaries from the FED database, without reference to farmer group or location. Each of these selected beneficiaries would then be paired with a nearby comparison farmer who did not benefit from the FED program (or any other agriculture program). Logistical and budgetary constraints, however, make this design infeasible for large-scale studies such as this one.

Power Calculation

Surveying 600 beneficiaries and 600 comparison farmers in 30 clusters results in a detectable effect size of 0.226 and an estimated design effect of 1.95 (with a confidence level of 95% and 80% power) according to standard calculations. The appendix provides the equations used for the power calculations, given the clustered nature of the survey. A sample size of 1,200 allows us to detect changes across a wide range of indicators across the full program area, and will also be sufficient for measuring variation in program impact (although with less precision) among counties, between cohort years (FY13/14 v. FY15), and among the different value chain commodities.

Household Selection/Identification

The selection of **beneficiaries** proceeds in several stages. First, the FY15 farmer groups were chosen with a probability proportional to the number of members in the group.²² Each group represents one value chain commodity in one location. This selection involves several independent randomization processes, separating the farmer groups by county, value chain, and availability of baseline data, and then selecting the required number of groups from each category.²³ Once the FY15 groups were selected, FY13 and FY14 groups were randomly selected in each of the FY15 locations.

Second, within each selected farmer group, the order of the members' names was randomized. The enumeration teams received up to three lists for each location (FY 13 cohort, FY14 cohort, and FY15 cohort), and attempted to interview a specified number of farmers from each list (usually 10 farmers from the FY15 list and 5 each from the FY13 and FY14 lists). The teams also received the name of the group's lead farmer (when available) and any contact numbers for the group (when available).

Third, the teams traveled to the location and met with the town chief, who connected the team with the lead farmer. The team may have also phoned or contacted the lead farmer directly. Working with the lead farmer, the survey teams located and interviewed the beneficiaries in the order in which they appear on the lists, proceeding down the list until they hit the target number of completed surveys. The number of attempts required to locate and complete the specified number of interviews is analyzed in the report as part of the response rate.

The **comparison farmers** were selected from within, or nearby, the chosen survey locations, while also excluding farmers who have indirectly benefitted from the FED project or other agriculture projects. To accomplish this, the survey teams used a screener questionnaire to identify spill-over effects, as well as input from the town chief and the lead farmer to determine the survey area. For example, if the lead farmer indicated that half of the beneficiaries live in a neighboring village or town, the survey team would travel to that village or town for half of the comparison surveys.

Once the survey area was identified, each enumerator randomly selected households according to a random start and sampling interval provided by the electronic tablets. The enumerator administered a screener questionnaire to determine whether or not the selected household was suitable for inclusion in the comparison group. The screener questionnaire required approximately 15 minutes and determined eligibility based on three categories of questions: 1) experience producing the specific value chain commodity, 2) membership in a farming group and whether this group has received assistance from FED or another NGO, and 3) exposure to the methods and inputs provided by FED. In this way, the screener questionnaire detected whether the selected household has the necessary farming experience and has benefited, directly or indirectly, from the FED program or another agriculture program.

If no spill-over was detected, the enumerator proceeded with the full questionnaire. In the case of spill-over, the tablet instructs the enumerator to end the survey and proceed to the house next door. The screener questionnaire serves an additional purpose by producing valuable data on the number of households that have indirectly benefitted from FED's program. Analyzing this information allows us to estimate FED's broader impact in the population.

²² For example, a farmer group with 100 members would be twice as likely to be selected as a group with 50 members.

²³ This selection process is complicated by the fact that FY15 groups are different from FY14 groups. The FY15 groups will be selected first, then a single FY14 group will be selected from each FY15 location, with a probability proportional to the number of members.

Survey Implementation, Response Rate, and Demographics

After training and piloting, the data collection began on July 11, 2016 in Bong, progressed to Lofa, and was completed on August 7, 2016 in Nimba. Data collection was conducted during Liberia's rainy season which also coincides with the lean season when household food stocks are at their annual low before the harvest. Data collection was conducted in collaboration with African Development Associates (ADEAS) – a Liberian organization – to manage and implement the Impact Survey. Data was collected on handheld tablets using Computer-Assisted Personal Interviewing (CAPI) to eliminate transcribing errors and enable live data monitoring.

The primary challenge of the survey implementation was locating the farmers in the FED assistance groups. Although this process went smoothly in general, some of the randomly selected groups did not receive FED assistance or possessed fewer members than listed. Two of the rice farming groups in Bong County reported that they did not receive FED assistance, so these groups were replaced with other randomly selected FED rice farming groups in the county. In Lofa County, the goat farming group was found to have fewer members than expected, so an additional goat producing group was added to the sample to achieve the desired sample size. Also in Lofa County, the selected vegetable farmer group did not receive FED assistance because they failed to meet the terms of the Memorandum of Understanding (MOU). This group was replaced with another randomly selected FED vegetable group in the county.

In total, the survey interviewed 1,440 farmers, including the 9 comparison villages.²⁴ Among the comparison groups, the survey achieved a response rate of 94.9%. Locating the beneficiaries proved more difficult, as teams were required to locate specific individuals on a randomly-ordered list – simply finding the targeted number of beneficiaries was not sufficient. The teams were able to locate 71.3% of the beneficiaries who could have been interviewed on the lists (e.g. those who had not permanently moved away or died). Among the beneficiaries located, the teams surveyed 100%. Table 3.1.2 describes the response rates.

Table 3.1.2 Response Rates and Sample Sizes

	Beneficiary Located	Beneficiary. Consent	Number of Beneficiary Completed	Comparison Consent	Number of Comparison Completed	N Total
Total	71.3%	100%	597	94.9%	843	1,440
Bong	73.8%	100%	192	92.7%	278	470
Lofa	66.3%	100%	185	96.3%	290	475
Nimba	73.8%	100%	220	95.8%	275	495
Rice	76.6%	100%	337	98.5%	510	847
Cassava	62.1%	100%	157	94.4%	185	342
Goat	81.1%	100%	60	77.8%	84	144
Vegetable	61.4%	100%	43	97.0%	64	107

²⁴ The impact study uses two different types of comparison groups. "Comparison farmers" are farmers located in villages that received FED assistance, but did not personally benefit from the programs. "Comparison villages" are farmers located in villages where no one received FED assistance, but where the village shares similar characteristics with the villages where FED operated. Unless specifically noted, the statistics do not include the comparison villages, as these are analyzed in a separate study design.

	Beneficiary Located	Beneficiary. Consent	Number of Beneficiary Completed	Comparison Consent	Number of Comparison Completed	N Total
FY15	72.4%	100%	423	NA	NA	423
FY13-14	68.8%	100%	174	NA	NA	174

NOTE: Includes comparison villages.

Impact studies depend on the assumption that the beneficiary and comparison villages or towns are similar in terms of relevant characteristics. Assessing the demographics of the beneficiary and comparison groups is a way of assessing the “balance” of the study groups and allows us to identify potential biases. Table 3.1.3 describes the demographics of the FED beneficiaries and the “comparison farmers”, the farmers located in villages that received FED assistance but did not personally participate in the program.

Table 3.1.3 reveals some significant imbalances. On average, the beneficiary sample is older, has more household members, has more children, and is more literate than the comparison farmer sample. The beneficiary farmers are also more likely to have their children in school, although increased school attendance could be an impact of the FED project. Most significantly, the beneficiary surveys were nearly evenly divided between men and women, while the comparison farmers were 67% female. This over-representation of females likely resulted from the greater difficulty of finding male respondents: females are more likely to be present in the household during the day, when the survey was conducted.

Table 3.1.3 Demographics²⁵

	Beneficiary	Comparison	Matched Difference	P-Value
Age of respondent	41.9	38.5	2.7	0.07
Male respondent	51.2%	32.7%	17.6%	<0.01
Literacy	49.6%	37.5%	8.6%	<0.01
Household size	7.7	6.7	1.0	<0.01
Number of children	3.3	2.6	0.6	<0.01
Children in school	82.6%	76.3%	5.1%	0.02
Ethnic group				
Kpelle	23.9%	31.1%	-2.6%	0.03
Mano	29.1%	21.5%	1.3%	0.24
Lorma	5.6%	7.2%	1.2%	0.22
Mandingo	12.3%	25.1%	1.0%	0.23
Gio	9.3%	6.0%	-1.1%	0.30
Household type				

²⁵ The P value is a measure of statistical significance. High p-values mean that the differences there are no meaningful difference between the estimates.

	Beneficiary	Comparison	Matched Difference	P-Value
Male and Female	97.4%	95.5%	1.1%	0.21
Female Adult Only [^]	NS	NS	NS	NS
Male Adult Only [^]	NS	NS	NS	NS

[^] n < 30. Not statistically reliable (NS)

NOTE: Matched difference is computed in the same way as ATE. This terminology is used when not all of the indicators could plausibly be affected by the FED intervention. In these cases, the differences cannot be called a treatment effect.

These imbalances are a concern, but it is not clear *a priori* how they could bias the results. If men (or literate people or larger households) are more productive farmers, then the results will be biased upwards, towards showing a greater impact from the FED project than the reality. To correct for these imbalances, the evaluation uses propensity score matching (PSM) as a robustness test for key indicators. PSM matches beneficiary farmers with comparison farmers who are similar on key indicators, such as sex, literacy, age, and family size, thereby adjusting for the imbalances. Due to the non-random selection of FED beneficiaries on unobservable characteristics (such as personal connection to the lead farmer), these imbalances likely underestimate the bias in the sample. Unfortunately, without a baseline survey, we have limited options in how to correct for this bias. The results of the propensity score matching are discussed in the data analysis section in Table 5.4.7.

2. QUALITATIVE RESEARCH

The qualitative research provides contextual information that assists in the analysis of survey data. It helps to verify the causal pathways defined in the Program's Results Framework, and identify possible explanations for project participation, application or non-application of new practices, technologies, and/or crops being promoted by FED, and changes in productivity, gross farm income, and household income. Qualitative research was conducted under the direction of the Team Leader by two senior facilitators and two research assistants from the local survey firm and an independent agricultural economist. This qualitative research team coordinated the scheduling and location of its work with the quantitative research/survey teams, but was not involved in conducting individual household surveys. Overall the study team conducted 90 FGDs and KIIs with FED beneficiaries²⁶.

Focus Group Discussions (FGDs)

FGDs targeted the project beneficiary groups that were also selected for individual household surveys, although participants in FGDS were generally not the same persons as those who participated in individual household surveys. A total of 21 FGDs were conducted covering all three counties and all four value chains as shown in Table 3.2.1 below. The number of FGDs within each value chain reflects the relative importance of each of the four value chains in the FED program. FGDs explored experiences, beliefs, and knowledge about both project activities and outcomes, and were structured according to the protocol included as Annex VI.

²⁶ FGDs and KIIs were not conducted with comparison groups. Therefore, unlike the survey portion of this study qualitative reviews do not generally make comparisons between beneficiary groups and other groups.

Table 3.2.1 Focus Group Discussions with Beneficiary Farmer Groups

Value Chain/County	Bong	Lofa	Nimba	Total
Rice	3	3	5	11
Cassava	2	2	3	7
Goats	0	0	1	1
Vegetables	0	1	1	2
Total	5	6	10	21

Key Informant Interviews (KIs)

KIs involved a broad cross-section of project stakeholders in all three counties and all four value chains. A total of 69 interviews were conducted in the three beneficiary counties with local government officials, county and district extension staff, FED program field staff, farmers, nurseries, rice seed multipliers, other input suppliers, power tiller operators, tuk-tuk operators, buyers, millers, and processors. In Monrovia, the study team met with officials from the Ministry of Agriculture, USAID officers, and the FED implementation team. These key informants helped address questions for which survey respondents lack specialized knowledge or experience. The KI interview protocol is included as Annex V.

Table 3.2.2 Key Informant Interviews by Value Chain, County, and Role in Program

Value Chain/County/Role in Program	Bong	Lofa	Nimba	Total
Rice	3	9	4	16
Buyers/Millers	0	1	2	3
Farmers	2	3	0	5
Seed Multipliers	0	2	2	4
Local Implementing Partners	1	2	0	3
Power Tiller Operators	0	1	0	1
Cassava	6	3	3	12
Farmers	2	1	0	3
Local Implementing Partners	1	0	0	1
Nursery Operators	3	2	2	7
Processors	0	0	1	1
Goats	2	3	2	7
Community Animal Health Workers (CAHW)	2	2	2	6
Farmers	0	1	0	1
Vegetables	1	1	0	2
Government Extension Officials	0	1	0	1
Local Implementing Partners	1	0	0	1
Others (not identified with specific value chains)	14	11	7	32
Government Extension Officials	3	5	2	10
FED Staff	2	3	1	6

Value Chain/County/Role in Program	Bong	Lofa	Nimba	Total
Inputs Supplier	2	1	0	3
Local Government Officials	3	1	0	4
Local Implementing Partners	2	1	0	3
Tuk-tuk Operators	2	0	1	3
Village Savings and Loan Officials	0	0	3	3
Total	26	27	16	69

Table 3.2.3 Key Informant Interviews by Role in Program and County

Role in Program	Bong	Lofa	Nimba	Total
Buyers/Millers/Processors	0	1	3	4
Community Animal Health Workers (CAHW)	2	2	2	6
Farmers	4	5	0	9
FED Staff	2	3	1	6
Government Extension Officials	3	6	2	11
Inputs Suppliers	2	1	0	3
Local Government Officials	3	1	0	4
Local Implementing Partners	5	3	0	8
Nursery Operators	3	2	2	7
Power Tiller Operators	0	1	0	1
Rice Seeds Multipliers	0	2	2	4
Tuk-tuk Operators	2	0	1	3
Village Savings and Loan Officials	0	0	3	3
Total	26	27	16	69

4. LIMITATIONS

DESIGN LIMITATIONS

This research design derives from the need to meet three major challenges for impact evaluation. The **first challenge is the non-random selection of villages by the FED team**. The FED project locations were chosen based on the village's pre-existing capacity to produce the specific value chain commodity. Other villages in the county are likely different from these FED villages in some significant way, which prevented them from receiving FED assistance in the first place. As a result, other villages cannot form a suitable comparison group: comparing the FED beneficiaries with farmers in other villages would overstate the impact of the FED project.

The impact study overcomes this challenge by selecting comparison farmers from within the same villages or towns targeted by FED. This ensures that the study controls for village-level characteristics, such as distance to market, soil quality, and land tenure rights, that would influence farmer productivity. Choosing a comparison group from within the FED locations, however, creates a risk of contamination in the comparison group. Contamination occurs if the comparison farmers benefited indirectly from the FED program, perhaps by learning new farming methods through observing the beneficiaries. These indirect beneficiaries were identified through a screener questionnaire that allows for a measure of the FED program's reach, while also ensuring the impact estimate is not biased downwards.

The **second challenge is the lack of coordination between the baseline survey and the FED project implementation**. The best impact evaluation design would be a difference-in-differences design. This approach involves first conducting a baseline survey of all the eligible farmers in the project area. Then, the FED team would randomly select a group of beneficiaries from among the surveyed farmers. After program completion, the impact evaluation would survey all of the eligible farmers again (even those who were not selected for the project). The impact effect for an indicator would be the difference for each beneficiary at the endline versus baseline, compared to the difference for each comparison farmer at the endline versus baseline.²⁷ This approach would allow us to control for baseline differences among the beneficiary farmers. Without a baseline for a large percentage of the program beneficiaries, it is not possible to do a difference-in-differences evaluation.

The evaluation overcomes this challenge, to some extent, by using the baseline data to the degree that overlap exists. In each county, three locations that received the FED project were also covered by the baseline survey. By visiting as many of these locations as possible, the evaluation can examine the baseline distribution of farmer productivity and village-level changes over time. By comparing these aggregate trends to the outcomes observed among both the beneficiaries and comparison farmers, it will be possible to estimate, and control for, the selection bias.

The **third challenge is the non-random selection of beneficiaries** for the FED project. The FED team identified program beneficiaries through a "lead farmer", who was introduced to the team by the town elders. The lead farmer recruited other farmers to participate in the project. The FED team then verified that these farmers were eligible to participate based on each individual's experience producing the value chain commodity. These farmers are unlikely to be representative of the local farmers: at the

²⁷More formally, $TE = (T1 - T0) - (C1 - C0)$, where T1 represents the treatment group at endline, T0 represents the treatment group at baseline, C1 represents the comparison group at endline, and C0 represents the comparison group at baseline. The name "difference-in-differences" derives from this equation, as it computes the difference in two differences.

very least, they share social connections with village elites and may have access to opportunities, such as better land, that are unavailable to the typical farmer. Comparing these beneficiaries to a random sample of farmers—even farmers located in the same village or town—would likely bias the results upwards, towards greater estimated impact. In small rural villages, however, there is not likely to be large differences among the farmers and the magnitude of this bias is likely to be small.

This matching design relies on ex-post data collection to measure differences between beneficiaries and a group of comparison farmers. This is a widely accepted and rigorous research design, but it depends on several assumptions, which may or may not hold for this project. The first assumption is that the beneficiary and comparison farmers were similar before the start of the FED project. The farmers, on average, are assumed to have planted crops on similar sized plots of similar soil quality, using similar tools and similar methods, and earning similar amounts of income. The non-random selection of beneficiaries creates a risk that this assumption will not hold. The evaluation design addresses this risk, to some extent, through its use of eligibility criteria, screener surveys, and baseline data. But there is still a risk that the beneficiary farmers are too different from the general population to produce a reliable estimate of impact. The bias, in this case, would be towards estimating a higher impact from the FED project than the true level.

The second assumption is that spillover effects can be identified and do not affect too many farmers in the FED areas. This assumption is critical for the study's ability to locate and survey a comparison group of farmers in the same villages as the FED project—farmers who, by virtue of their close proximity to the beneficiaries, are similar to them in many ways. If the FED methods were widely shared among farmers, or if other NGOs provided services to large groups of farmers, the project will not be able to identify a suitable comparison group. The bias, in this case, would be towards estimating no impact. To compensate, we could have interviewed farmers from other villages or towns, but this would create a risk of selection bias due to the non-random selection of FED project locations. Nevertheless, conducting some surveys in other, similar villages or towns is still a good idea, as a strategy for triangulating the results. For this reason, the study identified several comparison villages through propensity score matching and conducted surveys in those locations. During implementation, the survey teams found that spillover effects were not a major concern.²⁸

IMPLEMENTATION LIMITATIONS

While there were several challenges faced during survey implementation, none of them prevented the survey teams from obtaining the requisite information needed for comparing the performance of beneficiary and comparison groups. First, survey teams experienced some problems in locating the beneficiaries who had been randomly selected from FED's list of beneficiaries. Second, on occasion it was difficult to locate a sufficient number of comparison farmers from within the same village as where the beneficiaries were located. The latter was the case in some very small villages. Third, the fact that the survey was being conducted during Liberia's rainy season also posed some problems, but not nearly as serious as anticipated prior to the start of the survey. In fact, in some cases it made it easier to locate farmers who were delayed in going out from their villages to the fields.

²⁸ "Spillover effects" and "indirect beneficiaries" can be considered interchangeable here. A spillover effect would be caused by non-FED farmers learning skills from FED beneficiaries. The indirect beneficiaries detected by the survey were found within the FED communities, not in these comparison villages. As such, spillover effects are not a concern when analyzing the comparison villages.

1) In the instances where beneficiaries could not be located, the survey teams obtained the requisite number of randomly selected beneficiaries through one of three strategies, all of which were approved by the Team Leader and Senior Analyst/Statistician:

a) Increase the sample size of other fiscal year groups in the same location: In two locations, where several different groups participated in the program in different fiscal years, it was possible to increase the sample size of the other groups that could be located to compensate for those that could not be found. For example, in Bong Mines, Fuameh District in Bong County, the leader of the FY15 sample group was located, but none of the names on the sample list corresponded with farmers in that group. To remedy this, the survey team increased the size of the FY14 and FY13 samples in order to obtain the requisite 20 surveys after consulting with the Team Leader and Team Statistician.

b) Select a replacement beneficiary village: In three cases (two rice villages in Bong and a vegetable village in Nimba), where only one fiscal year group was represented, it was necessary for the Team Statistician to select other beneficiary villages, and within these substitute villages to randomly select beneficiaries.

c) Select additional beneficiary villages: In the case of one beneficiary goat village in Lofa County, where there were an insufficient number of beneficiaries, an additional village was selected to arrive at the total requisite number of beneficiaries.

2) In instances where it was difficult to find comparison households within the beneficiary village (this was the case in very small villages), survey teams would interview as many comparison households within the village as possible, and then to move to the closest adjacent village to survey additional comparison farmers. This process was repeated until the requisite number of comparison households was surveyed.

Figures 4.1 and 4.2 show the spatial relationships of beneficiary and comparison households in two separate survey locations. In Figure 4.1, a survey location that contained few comparison households, most of the beneficiary households (represented by red dots) are highly concentrated and hidden by a few comparison households (represented by blue dots), while most of the comparison households are located in the upper right hand corner, at a distance from the beneficiaries. In Figure 4.2, the two types of households are closely interspersed in two areas of the survey location.

Figure 4.1. Survey Location with a Low Number of Comparison Households

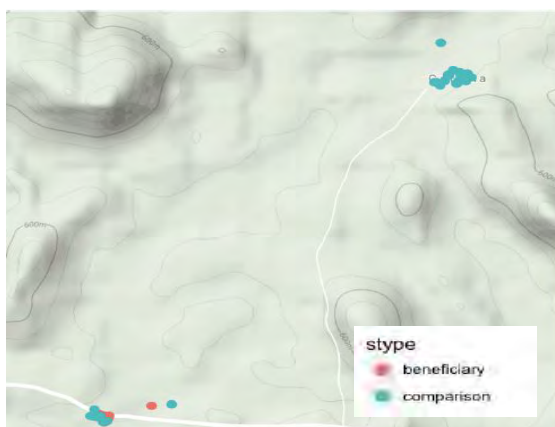
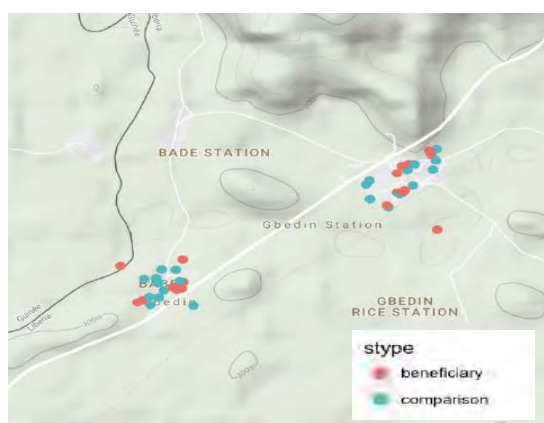


Figure 4.2. Survey Location with a High Number of Comparison Households



5. FINDINGS & CONCLUSIONS

1. ESTIMATED NUMBER OF BENEFICIARIES (DIRECT AND INDIRECT)

Quantitative Results

One of the goals of the study design is to obtain an independent estimate of the total number of FED beneficiaries, both direct and indirect, based on the randomly selected farm groups and the survey teams' efforts to locate randomly selected farmers in those groups. By speaking with members of the farm groups, including the lead farmer, the survey teams identified individuals who signed up as a member of the FED-assisted group but never participated in the project. In addition, there were several cases when listed beneficiaries could not be located. In some cases, this was due to the fact that the listed beneficiaries had moved. In other cases, the team was not able to ascertain the reasons why certain beneficiaries that appeared on FED lists could not be found in the locations described on the FED lists. Because the groups and the farmers interviewed in those groups were randomly selected, we can construct a representative estimate of the number of direct FED beneficiaries,²⁹ depicted in Table 5.1.1.

We estimate that a total of 50,353 farmers participated in FED programs in Bong, Lofa, and Nimba Counties in FY13, FY14, and FY15. This is 67.8% of the total number of farmers (i.e. 74,280) on the beneficiary lists provided by FED. The largest differences between survey data and FED lists were observed in Lofa county and in the goat value chain (these differences cannot be explained based on the survey data). The largest number of beneficiaries are located in Nimba County (45% of total) and participate in rice farming (69% of total).

Table 5.1.1 Estimated Direct Beneficiaries from Impact Survey and FED M&E Data

	Estimated Beneficiaries	Beneficiaries 95% Confidence Interval (CI)	FED Lists	Difference	% of Estimated Beneficiaries to FED Lists
Total	50,353	29,014 – 71,691	74,280	23,927	67.8%
Bong	18,160	5,335 – 30,985	22,392	4,232	81.1%

²⁹ Estimates of the number of beneficiaries are based on standard survey methods. Beneficiary groups were selected randomly from within each stratum based on the number of members listed in the FED database. This random selection process allows us to compute sampling weights. For example, we selected 1 group from a stratum that contained 10 possible farming groups and each group contained 10 members, then each member of the selected group would have a weight of 10. For each selected farming group, the survey teams attempted to contact a certain number of people beginning at the top of the randomly-ordered list. If the target was 10 people, they might actually have to find information on 20 or 30 people. Because the list was randomized, this provides a representative look at the group as a whole — so we can revise the estimate for that particular group. For example, say a group contained 50 members and the survey teams collected information on 25 members. They found that 5 members were not actually part of the group. This would imply an estimate for that particular group of 40 members total. That new estimate of 40 members is then extrapolated using the survey weights for that particular group.

	Estimated Beneficiaries	Beneficiaries 95% Confidence Interval (CI)	FED Lists	Difference	% of Estimated Beneficiaries to FED Lists
Lofa	9,449	4,623 – 14,275	19,161	9,712	49.3%
Nimba	22,744	6,387 – 39,100	32,727	9,983	69.5%
Rice	34,873	11,584 – 58,162	46,463	11,590	75.1%
Cassava	12,432	4,065 – 20,799	21,584	9,152	57.6%
Goat	1,592	60 – 3,310	3,910	2,318	40.7%
Vegetable	1,456	53 – 3,110	2,323	867	62.7%
FY15 ³⁰	27,088	18,783 – 35,393	36,405	9,317	74.4%
FY13-14	23,264	2,438 – 44,785	37,875	14,611	61.4%

The survey also estimates the number of indirect beneficiaries³¹ from the FED program. Indirect beneficiaries are farmers who received either inputs or instruction in improved farming methods from another farmer, who was a participant in the FED program. In the survey, a farmer would be coded as an indirect beneficiary if s/he (a) reported using at least one improved method or input; (b) learned this method or received this input from a “friend”; and (c) reported that the friend learned this method or received the input from FED. The survey recorded only 4 responses that satisfy these three conditions, resulting in an estimate of only **495 indirect beneficiaries** across the three counties.

However, if a farmer learned a new method from a friend, they are unlikely to know exactly where the friend learned it. And even if they were aware that the friend learned the method on a demonstration plot, they may not know that FED was responsible for organizing the demonstration. A broader interpretation could simply include any farmer who learned an improved farming method from a friend. This may be appropriate in this case, since the survey found little evidence of NGOs implementing similar projects, so there is little risk that the knowledge of improved methods originated from a source other than FED. According to this broader interpretation, there are an estimated 72,099 indirect beneficiaries, with a 95% confidence interval of 40,225 - 103,974 indirect beneficiaries. This estimate is based on the results shown in Table 5.1.2 below, which shows the reported source of improved practices among comparison farmers, who were included in the survey, and farmers who were screened out of the full survey by a screener survey due to direct or indirect contact with FED.

Table 5.1.2 Reported Source of Improved Practices among Comparison Farmers and Farmers Screened out due to Contact with FED

Source	Times Mentioned
Friends	324
FED	11

³⁰ As used throughout the report, fiscal year, or FY, refers to the U.S. Government fiscal year in which the beneficiaries entered the FED program. All 'results' in the table refer to the same time period of FY13-FY15.

³¹ An indirect beneficiary does not necessarily have direct contact with the activity but still benefits, such as the population that uses a new road constructed by the activity, neighbors who see the results of the improved technologies applied by direct beneficiaries and decide to apply the technology themselves (spill-over), or the individuals who hear a radio message but don't receive any other training or counseling from the activity. Indirect beneficiaries are not counted in the Feed the Future IM indicators. Activity spill-over and other multiplier effects can be assessed as a part of performance and impact evaluations". FTF Indicator Handbook, October 2014.

Source	Times Mentioned
NGO	7
Ministry of Agriculture	1
Business or Trader	42
Other	0
Total	385

NOTES: N=397. Only includes comparison farmers in FED-supported villages who report implementing at least one improved practice. Total is less than N because some farmers did not mention the source.

2. HAVE BENEFICIARY FARMERS APPLIED NEW PRACTICES, TECHNOLOGIES, AND/OR CROPS?

Quantitative Results

The FED project works with farmers on demonstration plots to teach them new farming methods and familiarize them with new technologies³². The most direct measure of FED implementation, therefore, is whether these skills are actually being practiced by the farmers who participated. Table 5.2.1 describes the rates of application for improved farming practices. For all value chain, FED farmers are significantly more likely to utilize one or more improved practices compared to non-FED farmers. For instance, FED-trained rice farmers are 12.8% more likely to use one or more improved practices than other rice farmers in the same villages. Looking more closely, FED farmers are significantly more likely to utilize all but one of the improved practices compared to non-FED farmers in their same villages.³³ In many cases, the difference is dramatic. For example, FED-trained goat farmers are 74.7% more likely to use goat shelters than other goat farmers in the same villages³⁴. FED-trained cassava growers are 41.9% more likely to plant their cassava on mounds and ridges, rather than flat ground. The only practice where FED farmers do not show improvement, i.e. practices for which the ATE is negative, is in the deep placement of urea fertilizer. Comparison farmers are more likely to implement this technique. Table 5.2.2 compares overall application rates by value chain and the fiscal year in which the group first received assistance from FED. Except for upland rice, all earlier groups outperformed later groups. However, the only significant difference was for the upland rice group.

³² See Annex VII for a complete list of the methods and technologies that were promoted by FED.

³³ The estimated average treatment effect is occasionally counter-intuitive. For example, the survey estimates that comparison farmers are *more likely* to practice the stale bed technique than the FED farmers. Nevertheless, the study estimates a positive treatment effect—meaning that FED created a statistically-significant improvement in the practice of this technique. These “mixed” findings result from the way the treatment effect is calculated: in each community, the average of the beneficiaries is compared to the average of the comparison farmers. So a high level of practice of a technique concentrated in a small number of locations has less effect on the average treatment effect than it does on the population estimate.

³⁴ The provision of building materials by FED certainly encouraged adoption, but the fact that beneficiary communities provided the labor for construction demonstrated commitment to the concept.

Table 5.2.I Improved Farming Practices (Percent of Population) ³⁵

	Beneficiary	Comparison	ATE	P-Value	N
<i>Applying one or more improved technologies or management practices</i>					
Total	82.3%	51.5%	29.6%	<0.01	1,293
Rice	79.6%	48.0%	12.8%	<0.01	629
Upland Rice	65.5%	51.8%	NA	NA	400
Lowland Rice	88.9%	32.2%	NA	NA	161
Cassava	87.4%	50.4%	10.7%	<0.01	377
Goat	97.4%	72.7%	3.7%	<0.01	167
Vegetable	87.7%	70.4%	2.4%	<0.01	120
Female	82.0%	48.4%	NA	NA	726
Male	82.6%	57.9%	NA	NA	522
<i>Rice</i>					
Experience with power tiller	24.6%	0.2%	8.3%	<0.01	209
Stale bed technique ³⁶	32.0%	3.9%	16.1%	<0.01	611
Transplanting	62.1%	20.9%	34.3%	<0.01	110
Water management	35.9%	5.9%	16.7%	<0.01	611
Urea deep placement	34.3%	50.0%	-5.2%	<0.01	40
Weed, pest, disease management	11.8%	2.3%	5.3%	<0.01	611
Intercropping	47.1%	44.7%	9.8%	<0.01	448
Improved rice seeds	45.5%	2.4%	29.8%	<0.01	611
<i>Cassava</i>					
Planting on mounds & ridges	56.7%	14.3%	41.9%	<0.01	360
Using only one stem	25.5%	2.4%	21.7%	<0.01	360
Planting density (1m x 1m)	59.8%	33.4%	25.3%	<0.01	360
Intercropping	33.3%	21.0%	17.6%	<0.01	134
Improved varieties	37.6%	3.6%	34.1%	<0.01	360
<i>Goat</i>					
Shelters	84.8%	6.6%	74.7%	<0.01	139
Vaccination	43.1%	8.1%	42.7%	<0.01	139
Deworming	32.5%	18.7%	31.8%	<0.01	139
Ear tagging	51.6%	35.1%	23.2%	<0.01	139
Salt/mineral lick	56.4%	3.7%	50.1%	<0.01	139
Improved fodder / forage	57.5%	28.5%	32.9%	<0.01	139
Fattening before sale	71.9%	52.0%	24.9%	<0.01	139

³⁵ ATE, or average treatment effect, essentially represents the difference between the average observation of the treatment group and the average observation of the comparison group. The exact formula for ATE is included in Annex II. The P-Value is a measure of significance. P-Values of less than 0.05 or less I are significant.

³⁶ A technique used to control weeds.

	Beneficiary	Comparison	ATE	P-Value	N
<i>Vegetable</i>					
Plant beds	49.0%	20.1%	27.0%	<0.01	117
Compost or fertilizer	68.0%	53.4%	27.0%	<0.01	117
Water management	53.5%	15.5%	45.4%	<0.01	117
Weed, pest, disease management	42.1%	30.3%	21.0%	<0.01	117
Improved varieties	40.7%	8.8%	33.2%	<0.01	117

Table 5.2.2 Improved Practices by FY Cohort and Value Chain

Improved Practices (Any)	FY13-14	FY15	P-Value
Total	82.10%	82.50%	0.9
Rice	81.40%	76.90%	0.35
Upland Rice	56.70%	72.90%	0.04
Lowland Rice	92.40%	81.00%	0.1
Cassava	87.10%	87.40%	0.96

NOTES: The P-Value column computes the statistical significance of the difference between the FY13/14 and FY15 estimates. P-values of <0.05 are traditionally considered to be statistically significant. FYs 13 and 14 are combined due to the lower number of surveys conducted for these two cohorts versus the FY 2015 cohort. Vegetable and goat value chains are excluded from the table due to small sample size per FY.

Also important is the amount of land devoted to these improved practices, depicted in Table 5.2.3. In total, an estimated 50,161 hectares of farm land across Bong, Lofa, and Nimba counties are under improved land practices due to FED.³⁷ Approximately 70% of the land under new management practices is devoted to rice farming. Because the survey did not select a representative sample from among the entire farming population in these counties, it is not possible to estimate the total land area under improved practices across the study area.

Table 5.2.3 Land area under new management/technology practices (FED Beneficiaries)

	Land Area (ha)	95% CI
Total	50,161	25,794 – 74,528
Rice	35,275	10,268 – 60,283
Cassava	13,881	3,845 – 23,918
Vegetable	1,004	38 – 2,130

NOTES: Land area is considered to be under new management/technology practices if the respondent reported implementing at least one of the improved practices.

³⁷ The study design does not allow us to estimate the number of hectares of farm land that are *not* under improved practices. This is because the study sampled from among FED villages, rather than drawing a representative sample of all villages.

Table 5.2.4 Hectares under new or improved/rehabilitated irrigation or drainage services as a result of USG assistance

	Land Area (ha)	95% CI
Total	14,832	1,727 - 27,936
Rice	14,211	1,041 - 27,380
Vegetable	621	22 - 1,311

NOTES: Total estimates includes only rice and vegetable beneficiaries. Cassava farmers were not asked about irrigation because irrigation was not included in the list of improved practices, provided by FED, for the cassava value chain.

These tables indicate that the FED project successfully transferred skills to a significant number of farmers. However, Table 5.2.1 also indicates that these improved skills, in many cases, are **practiced by fewer than half of the FED farmers**. For example, less than 38% of cassava farmers plant improved varieties and less than half of vegetable farmers plant their crops in beds. Some of these low application rates may be explained by differences in farming methods, especially between upland and lowland rice farmers. As explained in the qualitative results, lowland farmers have better access to water and a greater opportunity to implement irrigation systems. Some of the methods, however, have seen widespread application by the FED beneficiaries. For example, 72% of rice farmers use the stale bed technique and nearly 85% of goat farmers use shelters for their herds³⁸.

Qualitative Results

54 FGDs and KIs provided information on the question of application rates: 55% indicated that application was high, 17% medium, and 28% low³⁹. Application rates are often explained by the level of effort and/or labor cost required to implement the new methods, as well as the extent to which lead farmers were able to pass on the knowledge learned from FED to the rest of the group members.

The following analysis examines application rates by value chain, each of which is characterized by its own very specific practices, technologies, and crops or products.

Rice: Among the 19 FGDs and KIs in which opinions were expressed about application rates in the rice value chain, 58% indicated high application, 5% medium, and 37% low. These 19 meetings covered 9 of the 15 rice villages and towns included in the survey. Farmers expressed opinions about the FED strategy of promoting cultivation of rice in the lowland, swampy areas, which takes advantage of abundant water for continuous irrigation. On the positive side, one focus group they said that the "Knowledge acquired under the FED project will continue to help us in the production of swamp rice". A rice seed multiplier added that "We know how to make way for water to pass in the swamp now".

But several farmers raised negative aspects of swamp rice culture that discouraged application. "We switched from lowland to upland farming because members were getting sick from diseases in the

³⁸ The FED Project helped construct the goat shelters in all three goat communities surveyed by providing construction materials.

³⁹ Rates of application based on qualitative interviews are approximate. In general, high refers to rates of application greater than two-thirds of group members, medium greater than one-third and less than two-thirds, and low less than one-third.

swamp". Sicknesses reportedly included rheumatism, which the farmers attributed to insufficient protective gears: "elders were allowed to use rain boots, while the younger ones went barefooted". According to this group, FED acknowledged the problem and advised them to switch to upland farming. Other reasons for not adopting the new methods included increased labor and/or labor costs and insufficient training⁴⁰. One female group leader tried to teach group members the methods she had learned at special FED training sessions, but a fellow group member said that "all of the women did not return after two days of work because they found the new methods were too hard". The group leader had to hire labor to complete the site preparation. Another group leader offered this assessment: "The new methods brought by FED are time consuming and sufficient farmers and patience are needed to do it; many of the women are not able to get sufficient persons on their farms". Yet, a number of farmers did note the labor-saving benefits of power tillers introduced by FED. According to one power tiller operator, "The power tiller can do the work that 10 – 12 men can do in three days in one day". It was also mentioned, however, that not everyone could afford cost of a power tiller.

Cassava: Among the 14 FGDs and KIs in which opinions were expressed about application rates in the cassava value chain, 29% indicated a high rate of application, 36% medium, and 36% as low. These meetings covered 6 of the 9 cassava villages included the survey. One group that was generally positive about FED assistance emphasized the specific types of support provided by FED rather than application rates per se. "FED took us for training for five days in CARI and two days in Gbarnga..." where they acquired skills in pre-nursery, maintaining cuttings, planting methods, nursery preparation, and preparing cuttings for market. They also received tools and cuttings. "FED asked our group to make available 5 acres...but they only provided cuttings to cover 2 acres". In a village in Lofa, the beneficiary group said that some farmers applied new methods, especially spacing, but added that "the mounds can expose our cassava to animals... heavy rain can wash the mounds down and leave the cassava naked". A group in Nimba remarked that "...some of our members are not using the new methods...because they do not have people to help with the work and maybe because some are old people". A second group in Nimba reported that the FED training did not help the group much because only a single person from the group was represented and only he had better knowledge; three group members applied the methods, but others did not due to a lack of proper understanding and insufficient labor. A cassava group in Bong shared the concern about the increased labor required by the new methods: "Adopting the new methods introduced by FED was labor intensive and could only be done in a group. We are still practicing the traditional methods of planting cassava on our individual farms".

Goats: All three surveyed goat villages (one per county) were visited for FGDs and KIs. Among the eight FGDs and KIs conducted for this value chain, 50% indicated a high rate of application, 25% medium, and 25% low. While most respondents said that they had applied the nutrition and health practices taught by FED, there were mixed opinions about the value of goat pens and shelters. A Community Animal Health Worker (CAHW) in Nimba mentioned "We have acquired better ideas for raising goats and application of the new methods is high within the community and surrounding ones as well". A group leader in Lofa indicated that the new practice of goat shelters was used in combination with the old practice of letting goats find their own food: "goats are allowed to find their own food during the day and at night they all go to bed in the fence by themselves...". Another CAHW in Lofa emphasized the nutritional and health aspects of the training received: "They trained me how to feed the goats and how to make the goats to eat well..." and "how to take care of goats and how to give the goats medicine when they get sick". A CAHW in Bong, however, gave a mixed review on application

⁴⁰ Insufficient training was mentioned in at least four of the 90 FGDs and KIs conducted for the study.

rates, saying that the goat shelter constructed by FED was currently empty due to theft⁴¹, while adding “We know how to feed the goats, and we can tell when the goats are sick”. A member of a goat association in Nimba noted that farmers are used to seeing their goats fend for themselves when allowed to roam free. As a result, having their goats fed in the shelter remains a problem for his group, as “Only few persons are carrying food for goats in the fence”. The most negative view was expressed by a CAHW in Lofa: “The goat fence is empty now and nobody is using it”.

Vegetables: All three surveyed vegetable villages (one per county) were visited for FGDs and KIIs. Group discussions were held with the two beneficiary groups in Lofa and Nimba, while a KII was held with the local implementing partner in Bong. Unlike the three other value chains previously discussed, the participants in KII and FGDs related to the vegetable value chain did not specifically address the extent to which farmers applied practices introduced by FED. However, as discussed later in this report, it appears that application rates were at least moderate, as the same interviewees reported increased incomes as a result of what was learned from FED. One representative from the Bondi Vegetable Farmers Group in Gezzie, Lofa attended a five-day training in improved farming methods (“Nursery lay out... Laying out beds...use of chemicals”) in the district capital of Voinjama, and then passed on this knowledge to other members of the group. Farmers in Nimba mentioned that FED provided fertilizer, tools, watering machine, spraying and watering cans, crates, cassava sticks, and seed rice. In Bong, the local implementing partner reported the training of 540 farmers in 27 villages in vegetable production, the provision of tools, hand washing buckets, pumps to all groups, and the construction of shelters⁴² in several villages (Santo, Totota, and Tomato Camp).

Conclusion

The FED project significantly increased the use of nearly every improved farming practice. However, 15 of the 25 improved practices were employed by less than half of the FED farmers. The qualitative data reveal that two factors appear to be important in determining whether the improved practices promoted by FED were applied by farmers or not. First, all improved practices required additional labor, which either had to be provided by the farmer himself or herself, or obtained from other persons. In some cases, farmers were either unwilling or unable to provide this additional labor due to cost or other factors. Second, the FED model was based on the use of demonstration farms. Normally, the lead farmer, and possibly a few other members of the same group, were trained in a special location along with farmers from other similar groups. These trained farmers then returned to their own villages and were expected to share their knowledge with other members of the group making use of the demonstration farm set up for this purpose. Among the trained farmers, several said that the initial training was not sufficient. Among the other farmers, i.e. members of the beneficiary group who were supposed to be trained by the FED-trained lead farmers, several said that the knowledge was not shared with them.

⁴¹ Three goat communities, one in each county, were included in the study design. In addition to approximately 20 beneficiaries surveyed in each location, one FGD and seven KIIs were conducted with beneficiaries involved in the goat value chain. In KIIs two persons mentioned theft issues related to the use of pens, but a third person in an FGD was positive about the added safety of the pen. Another reason cited for not using pens was the additional need for fodder for goats kept in pens.

⁴² According to FED reports, shelters are constructed of local materials including wood frames and plastic coverings.

3. HOW MUCH HAVE BENEFICIARY FARMERS INVESTED (CASH OR EQUIVALENT IN-KIND) COMPARED TO THE COMPARISON GROUP?

Quantitative Results

Table 5.3.1 looks exclusively at expenditures on capital equipment within the past 12 months and reveals no significant differences between the beneficiaries and the comparison farmers. The estimates vary widely due to the relatively small number of farmers who reported spending money on capital equipment. Among the FED beneficiaries, rice farmers make the largest investments. As shown in Table 5.3.2, FY13 and FY14 FED cohorts tend to make larger investments but none of the individual differences is statistically significant.

Table 5.3.1 Expenditure on capital equipment during the past year⁴³

	Beneficiary	Comparison	ATE	ATE 95% CI	P-Value
Total	\$12.48	\$21.09	(\$3.03)	(\$10.66) - \$4.60	0.44
Bong	\$10.81	\$11.34	\$0.34	(\$0.44) - \$1.11	0.39
Lofa	\$14.28	\$38.62	(\$3.65)	(\$11.22) - \$3.91	0.34
Nimba	\$13.09	\$12.23	\$0.29	(\$0.35) - \$0.92	0.38
Rice	\$13.19	\$14.47	\$0.21	(\$0.68) - \$1.10	0.64
Cassava	\$11.12	\$42.08	(\$3.42)	(\$10.98) - \$4.14	0.38
Goat	\$7.73	\$8.36	\$0.03	(\$0.33) - \$0.39	0.87
Vegetable	\$12.43	\$8.53	\$0.15	(\$0.18) - \$0.48	0.37

NOTE: Parentheses indicate negative values.

Table 5.3.2 Capital Equipment Expenditures by FY Cohort and Value Chain

Capital Equipment	FY13-14	FY15	P-Value
Total	\$13.65	\$11.47	0.02
Rice	\$13.56	\$12.65	0.45
Upland Rice	\$10.35	\$11.80	0.32
Lowland Rice	\$15.31	\$13.10	0.32
Cassava	\$14.01	\$10.43	0.1

NOTES: The P-Value column computes the statistical significance of the difference between the FY13/14 and FY15 estimates. P-values of <0.05 are traditionally considered to be statistically significant. FYs 13 and 14 are combined due to the lower number of surveys conducted for these two cohorts versus the FY 2015 cohort. Vegetable and goat value chains are excluded from the table due to small sample size per FY.

Ownership of capital equipment is another indicator of investment. Table 5.3.3 describes the average number of each type of equipment owned by the farmers. FED farmers own significantly more hand

⁴³ Capital equipment includes Cutlass / brushing / hoe / rakes / sickles / shovels; Power tiller; Mechanical weeder / hoe; Mechanical press; Mechanical grater; Sieve; Gari fryer; Goat shelters; Salt / mineral lick; Drip irrigation or sprinkler; and Cold storage box.

tools than the comparison farmer, i.e. historically FED farmers have invested more in capital equipment than comparison farmers. On average, a FED farmer owns 6.2 hand tools, which includes cutlasses and shovels, representing a 13% difference over the comparison group. Goat farmers own an average of 0.3 goat shelters, while almost none of the comparison goat farmers owned any shelters. Most of the equipment, however, remains out of reach of the farmers (both beneficiaries and comparison farmers). None of the beneficiary or comparison farmer survey respondents reported owning any mechanized equipment, although the qualitative data reveals that some of these mechanized tools, like tillers, may be owned collectively by the farming groups.

Table 5.3.3 Farm Equipment (number of pieces owned)

	Beneficiary	Comparison	Matched Difference	P-Value
Cutlass / brushing / hoe / rakes / sickles / shovels	6.2	5.5	0.7	<0.01
Power tiller	0.0	0.0	NA	NA
Mechanical weeder / hoe	0.0	0.0	NA	NA
Mechanical press	0.0	0.0	NA	NA
Mechanical grater	0.0	0.0	NA	NA
Sieve	0.0	0.0	NA	NA
Gari fryer	0.0	0.0	NA	NA
Goat shelters	0.3	0.0	0.2	<0.01
Salt / mineral lick	0.3	0.0	0.2	<0.01
Drip irrigation or sprinkler	0.0	0.0	NA	NA
Cold storage box	0.0	0.0	NA	NA

NOTES: Statistics only include relevant value chain commodities for each type of equipment. For example, gari fryer applies only to cassava farmers, salt/mineral lick applies only to goat farmers, etc. Most types of equipment have no ownership among survey respondents, so results do not change when the full sample is considered.

How do farmers finance the increased investments? One way of financing these expenditures is through loans. In many cases, loans and credit provide a valuable tool for farmers to expand their business and their income. But farmers can also be hurt by unsustainable levels of debt. Unsustainable debt could be a negative consequence of participating in the FED program, albeit an unexpected one. Table 5.3.4 reveals that FED farmers are 22%⁴⁴ more likely to take out a loan than a comparison farmer, and are slightly less likely to have repaid this loan at the time of the survey. However, the difference in the amount of outstanding debt is not significant.

Significantly, FED farmers are twice as likely to have a savings account as the comparison farmers, which is an important element of financial inclusion.

⁴⁴ Calculated by dividing the value for the ATE by the percentage of farmers who have borrowed money.

Table 5.3.4 Savings, Loans, and Debt

	Bene- ficiary	Compar- ison	ATE	ATE 95% CI	P-Value	N Ben	N Com
Ever borrowed	43.0%	36.5%	7.9%	2.6 – 13.3%	<0.01	583	638
Loan fully repaid	49.2%	56.9%	-6.0%	-11.4 – -0.7%	0.03	250	232
Debt outstanding	\$52.53	\$56.08	\$6.02	(\$28.53) - \$40.57	0.73	129	106
Believe it was good decision	70.2%	73.4%	6.8%	2.0 – 11.5%	0.01	250	232
Bank account	6.9%	3.0%	3.1%	0.9 – 5.2%	0.01	585	639

NOTE: Parentheses indicate negative values.

Qualitative Results

FGDs and KIs provided anecdotal evidence that farmer groups have made important investments in the new production technologies and practices that were introduced by FED. In addition, successful groups also made investments in housing and education for their children, which are addressed under Question #5, which discusses the changes in the quality of life experienced as a result of FED. Ten of the 90 FGDs and KIs reported increased investment in farming activities as a result of FED⁴⁵; among these were members of three of the 30 beneficiary groups surveyed. Much of the reported investment occurred in the form of contributions of labor to physical infrastructure, such as improved lowland rice fields, and goat pens and shelters, and greenhouses for vegetables, for which FED provided material and technical support. In addition, investments were also made in farming equipment, notably power tillers, which were furnished by FED on a cost sharing basis with farmers. The cost share represents an investment by farmers.

Rice: Participants in FGDs and KIs provided evidence of farmer investment in the new methods of production and processing introduced by FED. In addition to improvements in lowland rice fields, investments were also made in rice processing facilities. For example, in Bong Mines, the Fuamah District Multi-Purpose Cooperative invested in a rice drying floor in order to receive support from FED, while in Payee in Nimba County another group contributed the labor costs for the construction of a drying floor. For the construction of a rice mill in Karnplay in Nimba, the community provided the sand, aggregate, and water needed for concrete.

Cassava: FGDs and KIs with participants in the cassava value chain provided no direct indication of increased investment in farm related infrastructure or equipment.

Goats: All of the goat beneficiary villages provided the land and labor for construction of goat pens and shelters. The latter are constructed from locally available wood and imported zinc for roofs, although some farmers are reportedly beginning to use more locally produced materials, such as aluminum sheets for roofs.

⁴⁵ This does not mean that other beneficiary groups did not make investments in productive, farming related infrastructure. Such information, however, was not provided in many of the FGDs and KIs.

Vegetables: A local implementing partner in Bong mentioned that FED built rain shelters, constructed of plastic sheets and bamboo pole, in several locations in Bong County (Santo, Totota, and Tomato Camp). While it was not clear from the interview what exactly the contribution of the local villages was, FED normally required that local communities provide labor costs as a minimum investment.

Conclusion

There were no significant differences in expenditures on capital equipment between FED beneficiaries and the comparison groups, although FED farmers do possess more hand tools for use on the farm. None of the survey respondents reported owning any mechanized equipment, but the qualitative data reveal that mechanized tools such as power tillers are either owned collectively by some farming groups or by individuals who provide tilling services for a fee⁴⁶. As noted in the discussion about application of technology (Section 5.2), FED beneficiaries are much more likely to have access to mechanized equipment, such as power tillers for rice, than the comparison farmers, even if they do not personally own the tools. FED farmers are, however, twice as likely to possess a bank account—an important component of financial inclusion.

4. HOW PROFITABLE AND PRODUCTIVE ARE BENEFICIARY FARMERS COMPARED TO THE COMPARISON GROUP?

Quantitative Results

Increases in improved farming methods and investment in inputs are only important if they translate into greater productivity and higher incomes. Gross margin per hectare or animal is the standard measure of productivity in Feed the Future programs. Gross margin considers the amount of produce consumed at home, the amount and price of sales, expenditure on inputs, and units of production. Gross margin per hectare or animal is calculated as follows:

$$\text{Gross Margin} = \left[\left(TP \times \frac{VS}{QS} \right) - IC \right] / UP$$

where *TP* is total production (in kg or animals), *VS* is the value of sales (in USD), *QS* is the total quantity of sales (in kg), *IC* is the total cost of inputs (in USD), and *UP* is the total units of production (either ha or animals). In this way, gross margin extrapolates the sales price of whatever was sold to the total amount produced.

Per USAID guidelines, it is useful to first examine each of the constituent parts of the gross margin indicator:

1. Total Production by direct beneficiaries during reporting period (*TP*)
2. Total Value of Sales (USD) by direct beneficiaries during reporting period (*VS*)
3. Total Quantity (volume) of Sales by direct beneficiaries during reporting period (*QS*)
4. Total Recurrent Cash Input Costs (USD) of direct beneficiaries during reporting period (*IC*)
5. Total Units of Production: Hectares planted (for crops); Number of Animals in herd/flock/etc. (for milk, eggs, meat, live animals) for direct beneficiaries during the production period (*UP*)

⁴⁶ According to the FED Annual Report for FY 2015, “In addition to the 30 power tillers given to young entrepreneurs, USAID FED also provided power tillers to the rice business hubs (RBHs). A total of 51 power tillers were used in providing mechanized services to the farmers”.

For the purposes of this survey, the reporting period is for the one year period prior to the date of the survey.

Table 5.4.1 shows the total production (TP) of FED beneficiaries and the comparison farmers for each value chain.⁴⁷ Total production for rice and cassava is the total amount of produce (measured in kg) that the farmer reported producing in a given year, which includes produce that is sold, consumed at home, or spoiled. For goat farmers, it is the total number of goats reported to be in the herd. The table shows no major differences among rice or goat farmers, but a significant increase in total production for FED cassava farmers. Production in kilograms was not collected for vegetable farmers due to the diversity of produce. For vegetable farmers, gross margin is calculated based on the total value of vegetables produced (both sold and consumed).⁴⁸

Table 5.4.1 Total Production (TP, kg or animals)

	Beneficiary	Comparison	ATE	ATE 95% CI	P-Value	N
Rice	689.4	726.4	-13.6	-72.5 - 45.2	0.65	629
Upland Rice	702.9	768.1	NA	NA	NA	400
Lowland Rice	659.7	590.4	NA	NA	NA	161
Cassava	602.3	508.0	30.2	-0.5 - 61.0	0.05	377
Goat	3.5	3.7	0.02	-0.1 - 0.1	0.71	167
Vegetable	NA	NA	NA	NA	NA	NA

NOTES: Production in kg was not collected for vegetable farmers due to the diversity of produce. For vegetable farmers, gross margin calculations use a measure of total value, in dollars, rather than production in kg.

Table 5.4.2 estimates the total annual sales of value chain commodities among FED farmers and the comparison farmers in the same villages. FED-supported rice farmers earn approximately 12% more per year than comparison rice farmers, and the greatest income is earned by lowland rice farmers. FED-supported goat farmers earn approximately 5% more per year from goat sales. These differences are statistically significant, although the differences among cassava and vegetable growers are not. The skills imparted by FED, however, may lead to improvements over time: farmers who participated in FY13 or FY14 sell approximately 42% more of their crops than the FY15 cohort. Men who participated in the FED program earn nearly 70% more from sales, on average, than FED-supported women.

Table 5.4.2 Total value of sales (VS) of value chain commodity

	Beneficiary	Comparison	ATE	ATE 95% CI	P-Value	N
Rice	\$134.04	\$90.25	\$10.91	(\$0.58) - \$22.40	0.06	629
Upland Rice	\$77.18	\$85.70	NA	NA	NA	400
Lowland Rice	\$171.75	\$122.96	NA	NA	NA	161

⁴⁷ Due to the differences in production and units (kg and animals), it is not appropriate to aggregate production across all beneficiaries or at the county level.

⁴⁸ For vegetables, we can estimate the value of $\left(TP \times \frac{VS}{QS}\right)$ in the equation for Gross Margin, but we cannot isolate the value of QS.

	Beneficiary	Comparison	ATE	ATE 95% CI	P-Value	N
Cassava	\$87.55	\$76.83	\$2.66	(\$34.25) - \$39.56	0.89	377
Goat	\$110.48	\$76.99	\$3.89	(\$0.78) - \$7.00	0.01	167
Vegetable	\$253.90	\$161.24	\$3.11	(\$7.59) - \$13.81	0.57	120
Female	\$89.12	\$89.28	NA	NA	NA	726
Male	\$150.27	\$105.63	NA	NA	NA	522

NOTES: Parentheses indicate negative values.

Table 5.4.3 Sales Value by FY Cohort and Value Chain

Value of Sales	FY13-14	FY15	P-Value
Total	\$145.02	\$102.23	0.25
Rice	\$153.54	\$94.84	0.06
Upland Rice	\$75.40	\$79.02	0.94
Lowland Rice	\$210.18	\$89.74	0.03
Cassava	\$104.04	\$82.97	0.73

NOTES: The P-Value column computes the statistical significance of the difference between the FY13/14 and FY15 estimates. P-values of <0.05 are traditionally considered to be statistically significant. FYs 13 and 14 are combined due to the lower number of surveys conducted for these two cohorts versus the FY 2015 cohort. Vegetable and goat value chains are excluded from the table due to small sample size per FY.

Analyzing total sales, however, can be deceptive. It may be the case that FED-supported farmers consume more of their produce at home, as compared to comparison farmers. If this is the case, just looking at total sales would ignore higher levels of consumption. Conversely, total sales do not capture the amount expended on production or the amount of land under cultivation. As shown in Table 5.3.1, FED-supported farmers spend more on inputs than the comparison farmers. Without increased sales to offset the investment, FED farmers may be worse off.

Table 5.4.4 examines the quantity of sales. FED farmers sell more of their produce than comparison farmers, although the difference for cassava farmers fails to reach statistical significance (and the difference for rice farmers is on the border of significance). FED-supported rice farmers sell about 21% more produce than the comparison farmers. FED goat farmers sell about 13% more livestock, and FED cassava farmers sell about 5% more tubers. Interestingly, lowland rice farmers sell significantly more produce than upland rice farmers -- even though they produce slightly less rice overall (according to Table 5.4.1).

Rice and cassava farmers from the FY13 and FY14 cohorts sell significantly more than the FY15 cohort.

Table 5.4.4 Total Quantity of Sales (QS, kg or animals)

	Beneficiary	Comparison	ATE	ATE 95% CI	P-Value	N
Rice	107.4	61.9	13.2	-2.3 - 28.8	0.10	629
Upland Rice	51.9	53.9	NA	NA	NA	400
Lowland Rice	144.0	108.0	NA	NA	NA	161
Cassava	440.7	386.9	21.2	-7.5 - 49.9	0.15	377
Goat	1.1	0.8	0.1	0.0 - 0.1	0.01	167

	Beneficiary	Comparison	ATE	ATE 95% CI	P-Value	N
	Vegetable	NA	NA	NA	NA	NA

NOTES: Quantity of sales in kg was not collected for vegetable farmers due to the diversity of produce. For vegetable farmers, gross margin calculations use a measure of total value, in dollars, rather than quantity of sales in kg.

Table 5.4.5 Sales Quantity by FY Cohort and Value Chain

	Quantity of Sales (kg)	FY13-14	FY15	P-Value
	Total	192.3	194.6	0.95
	Rice	130.6	72.7	0.02
	Upland Rice	64	41.7	0.46
	Lowland Rice	161.7	103.4	0.22
	Cassava	734.2	369.2	0.01

NOTES: The P-Value column computes the statistical significance of the difference between the FY13/14 and FY15 estimates. P-values of <0.05 are traditionally considered to be statistically significant. FYs 13 and 14 are combined due to the lower number of surveys conducted for these two cohorts versus the FY 2015 cohort. Vegetable and goat value chains are excluded from the table due to small sample size per FY.

By teaching farmers to practice improved methods, FED also encourages them to invest more in inputs, which include fertilizer, pesticides, and improved seeds and varieties. Table 5.4.6 depicts the average annual expenditure on inputs for producing the specific value chain commodity targeted by FED in each community.⁴⁹ As expected, FED farmers spend significantly more on inputs than comparison farmers in the same villages. On average, FED farmers spend about \$21 per year on inputs, which is 30% more than the comparison farmers. Increased expenditures are visible across each county and value chain, although in some cases these increases just fail to reach statistical significance. Among FED beneficiaries, lowland rice producers spend more on inputs than upland rice producers, and men spend more than women.

Table 5.4.6 Total Recurrent Cash Input Costs (IC)⁵⁰

	Beneficiary	Comparison	ATE	ATE 95% CI	P-Value	N	
	Rice	\$22.76	\$17.32	\$1.35	(\$0.27) - \$2.97	0.10	629
	Upland Rice	\$14.85	\$16.95	NA	NA	NA	400
	Lowland Rice	\$30.50	\$20.98	NA	NA	NA	161
	Cassava	\$16.19	\$13.44	\$1.13	\$0.04 - \$2.22	0.04	377
	Goat	\$10.72	\$7.04	\$0.76	(\$0.14) - \$1.67	0.10	167
	Vegetable	\$34.06	\$15.97	\$1.48	\$0.22 - \$2.74	0.02	120
	Female	\$16.53	\$13.90	NA	NA	NA	726
	Male	\$25.52	\$20.55	NA	NA	NA	522

NOTE: Parentheses indicate negative values.

⁴⁹ For example, expenditure on fertilizer for cassava would not be counted towards the total input expenditure in a community where FED focused on rice production.

⁵⁰ The survey requested the amount of expenditure on the following inputs: water, electricity, seeds, seedlings, storage, fertilizer, labor, security, medicine for animals, transportation, equipment, rent, and animal feed.

Table 5.4.7 below shows the units of production in terms of the amount of land or animals under cultivation. It reveals that, for most value chains, FED farmers are cultivating more land than the comparison farmers. FED-supported cassava farmers, for example, grow cassava on approximately 27% more land than similar, non-FED farmers. FED-supported vegetable farmers cultivate approximately 40% more land. The increase for goat farmers is smaller (a 5% increase), but still statistically significant. The amount of land cultivated for rice, however, is not significantly affected by FED support. Table 5.4.7 also shows production yields per hectare, which indicates farming intensity.

Table 5.4.7 Units of Production (UP, hectares cultivated or number of animals) and Yields (kg / ha)

	Beneficiary	Comparison	ATE	ATE 95% CI	P- Value	N
<i>Farm Land (ha) or Animals (# of head)</i>						
Rice	1.3	1.2	0.1	-0.03 – 0.17	0.20	629
Upland Rice	1.2	1.2	NA	NA	NA	400
Lowland Rice	1.1	1.3	NA	NA	NA	161
Cassava	1.3	1.1	0.3	0.26 – 0.39	<0.01	377
Goat	3.5	3.7	0.2	0.13 – 0.35	<0.01	167
Vegetable	0.8	0.5	0.2	0.22 – 0.25	<0.01	120
<i>Yields(kg/ha)</i>						
Rice	817.3	702.2	10.6	-54.00 – 75.25	0.75	629
Upland Rice	711.8	761.4	NA	NA	NA	400
Lowland Rice	940.2	548.3	NA	NA	NA	161
Cassava	645.1	633.2	-33.8	-68.93 – 1.25	0.06	400

NOTES: Land area is doubled if farmers achieved two harvests in the past year. Vegetable productivity is not analyzed here due to the diversity of vegetables produced. See the table on gross margins for a more appropriate measure. Upland and lowland rice area estimates do not match total average because not all rice farmers provided information on the type of rice cultivation.

As shown in Table 5.4.7 above, FED beneficiaries do not exhibit higher yields, or more intensive production, as measured by the number of kilograms of produce per hectare. There is no significant difference in the yields for rice farmers. FED-supported cassava farmers produce fewer kilograms per hectare than their comparison farmers, possibly due to the FED instructions related to crop spacing⁵¹. These estimates, however, may not be reliable due to the difficulty of estimating the area of land under cultivation by survey respondents. The higher farm sales for FED-supported farmers in Tables 5.4.2 and 5.4.3 suggest that productivity is indeed higher among many FED beneficiaries. There is some suggestive

⁵¹ The yields reported by surveyed farmers for this study were significantly lower than those previously reported by FED: “Rice: Improved technologies promoted by FED have contributed to increased productivity per unit area from 1.2 MT/ha of paddy rice in 2012 to an average of 3 MT/ha in 2015”.(FED Quarterly Report, 12/31/2015, page 9). However, it is important to note that the focus of this study was to determine whether FED farmers outperformed the comparison farmers using oral information provided by farmers, rather than to make highly precise estimates of yields.

evidence that FED-supported lowland rice farmers obtain higher yields than non-FED lowland farmers, but this comparison cannot be tested statistically in this research design.

Table 5.4.8, which describes gross margin calculations, encapsulates each of these five data points.⁵² The gross margins of the various groups reveal similar trends as the total sales estimates. FED-supported goat farmers have significantly higher gross margins than the relevant comparison farmers. The results for rice farmers, though not considered significant, are driven by the impressive gross margins obtained by lowland rice farmers, who report gross margins *five times higher* than their upland counterparts. As before, there are indications that the long-term effects of FED participation exceed the short-term benefits: the FY13-14 cohorts in total have gross margins that are 53% higher than the FY15 cohort, although the difference is only statistically significant for rice farmers. Men who participated in FED report higher gross margins than women.

Table 5.4.8 Gross margin of value chain commodity

	Beneficiary	Comparison	ATE	ATE 95% CI	P-Value	N
Rice	\$134.92	\$63.45	\$16.67	(\$2.78) - \$36.11	0.09	629
Upland Rice	\$45.94	\$62.30	NA	NA	NA	400
Lowland Rice	\$231.49	\$88.02	NA	NA	NA	161
Cassava	\$80.74	\$79.99	(\$11.18)	(\$62.35) - \$39.99	0.67	377
Goat	\$55.00	\$26.70	\$5.35	\$2.20 - \$8.49	<0.01	167
Vegetable	\$381.27	\$453.92	(\$7.71)	(\$26.46) - \$11.03	0.42	120
Female	\$90.17	\$104.67	NA	NA	NA	726
Male	\$160.03	\$76.21	NA	NA	NA	522

NOTES: Parentheses indicate negative values. Land area in the calculations is doubled if farmers achieved two harvests in the past year. Parentheses indicate negative values.

Table 5.4.9 Gross Margin by FY Cohort and Value Chain

Gross Margin	FY13-14	FY15	P-Value
Total	\$155.08	\$101.28	0.11
Rice	\$166.63	\$89.04	0.05
Upland Rice	\$42.65	\$48.73	0.77
Lowland Rice	\$263.68	\$157.95	0.25
Cassava	\$68.93	\$83.55	0.75

NOTES: The P-Value column computes the statistical significance of the difference between the FY13/14 and FY15 estimates. P-values of <0.05 are traditionally considered to be statistically significant. FYs 13 and 14 are combined due to the lower number of surveys conducted for these two cohorts versus the FY 2015 cohort. Vegetable and goat value chains are excluded from the table due to small sample size per FY.

⁵² Gross margins are reported in U.S. \$ per unit of production (hectare or head) over the prior 12 month period. For vegetables, we can estimate the value of $\left(TP \times \frac{VS}{QS}\right)$ in the Gross Margin equation, but we cannot isolate the value of QS. This limitation does not prevent us from estimating Gross Margin for vegetable farmers.

These estimates may be biased due to imbalances between the FED-supported farmers and the comparison farmers, as revealed in Table 3.4. Ideally, we could control for this imbalance (and the non-random selection of FED beneficiaries) by using propensity score matching (PSM) on baseline values for the indicators that are used to compute the gross margin. For example, we could compare farmers who, during the baseline, cultivated similar amounts of land, earned similar amounts of money on sales, and spent similar amounts of money on inputs. Unfortunately, this baseline data was not collected, so the next best option is to use PSM to control for observable demographic differences that create imbalances in the sample and are unlikely to be affected by the FED intervention: gender, literacy, and household size.

Table 5.4.10 below describes the results from the matching exercise. Propensity score matching does not significantly change the estimates, although the magnitude of the FED impact is slightly reduced (as expected). Using a matching protocol, only FED-supported goat farmers show a statistically significant difference from the comparison sample.

Table 5.4.10 Propensity score matching estimates of gross margin of value chain commodity

	Beneficiary	Comparison	ATE	ATE 95% CI	P-Value	N
Rice	\$135.12	\$57.94	\$14.92	\$0.28 - \$36.28	0.55	583
Cassava	\$81.18	\$93.82	(\$17.59)	(\$74.65) - \$39.48	0.55	345
Goat	\$55.00	\$35.16	\$3.90	\$0.84 - \$6.96	0.01	131
Vegetable	\$381.27	\$454.57	(\$9.15)	(\$29.67) - 11.37	0.38	111

NOTES: Propensity score estimated using logistic regression based on sex, literacy, and household size (nearest neighbor). Parentheses indicate negative values. Land area in the calculations is doubled if farmers achieved two harvests in the past year.

Table 5.4.11 provides a detailed breakdown of gross margins reported in each of 31 survey locations. The largest difference between a group of beneficiary farmers and comparison farmers was in the cassava value chain in a village in Bong, while the highest gross margin among beneficiary groups was achieved in the vegetable value chain in Lofa. A comparison cassava group in Lofa achieved the highest overall gross margin of \$737.50.

Table 5.4.11 Average Gross Margins of Beneficiary and Comparison Villages
(sorted by value chain and amount of difference; positive differences shaded in green)

	County	District	Village or Town	Survey Code	Value Chain	FY	Beneficiary Group	Comparison Group	Difference
1	Nimba	Gbehlay-Geh	Karnplay	3301	rice	14,15	\$ 287.76	\$ 22.74	\$ 265.02
2	Bong	Fuamah	Bong Mines	602	rice	13,14,15	\$ 291.27	\$ 79.86	\$ 211.41
3	Nimba	Gbehlay-Geh	Kialay	3302	rice	14,15	\$ 212.40	\$ 117.66	\$ 94.74
4	Nimba	Zoe-Geh	Korsein	3304	rice	13,14,15	\$ 119.48	\$ 25.11	\$ 94.37
5	Bong	Panta	Korya	614	rice	14,15	\$ 105.63	\$ 56.00	\$ 49.63
6	Bong	Salala	Wrepu-ta	601	rice	15	\$ 207.34	\$ 168.12	\$ 39.22
7	Lofa	Salayea	Gorlu	2102	rice	14, 15	\$ 70.02	\$ 39.20	\$ 30.82
8	Nimba	Zoe-Geh	Banplay	3305	rice	15	\$ 97.41	\$ 67.07	\$ 30.34
9	Lofa	Quardu Gboni	Bakadu Town	2104	rice	15	\$ 66.55	\$ 46.96	\$ 19.59
10	Bong	Jorquellie	Blameyea	615	rice	15	\$ 29.09	\$ 45.59	\$ (16.50)
11	Bong	Zota	Camp #2	603	rice	15	\$ 14.02	\$ 33.19	\$ (19.17)
12	Nimba	Tappita	Old Yourpea	3303	rice	15	\$ 33.07	\$ 60.32	\$ (27.25)
13	Lofa	Quardu Gboni	Barkedu	2105	rice	13,14,15	\$ 14.99	\$ 86.40	\$ (71.41)
14	Lofa	Salayea	Sucromo	2101	rice	13,15	\$ 95.70	\$ 184.00	\$ (88.30)
15	Lofa	Voinjama	Alijaizu	2103	rice	15	\$ 52.78	\$ 151.82	\$ (99.04)
16	Bong	Zota	Gbalatuah #1	606	cassava	13,15	\$ 338.72	\$ 67.86	\$ 270.86
17	Nimba	Sanniquellie-Mah	Airfield	3307	cassava	15	\$ 78.23	\$ 51.68	\$ 26.55
18	Lofa	Quardu Gboni	Town	2107	cassava	13,14,15	\$ 44.01	\$ 30.36	\$ 13.65
19	Bong	Jorquellie	Barwor	608	cassava	15	\$ 32.99	\$ 20.04	\$ 12.95
20	Lofa	Borkeza Town	Zorzor	2106	cassava	13	\$ 26.90	\$ 30.88	\$ (3.98)
21	Nimba	Zoe-Geh	Gbahnwin	3308	cassava	15	\$ 11.53	\$ 17.44	\$ (5.91)
22	Bong	Suakoko	Community	607	cassava	15	\$ 93.70	\$ 109.35	\$ (15.65)
23	Nimba	Gompa	Bain-Garr	3306	cassava	15	\$ 27.17	\$ 59.79	\$ (32.62)
24	Lofa	Quardu Gboni	Kondadu Town	2108	cassava	15	\$ 125.10	\$ 737.50	\$ (612.40)
25	Lofa	Zorzor	Barziwen	2109	goat	15	\$ 149.47	\$ 36.38	\$ 113.09
26	Nimba	Saclepea-Mah	Burtein	3309	goat	15	\$ 63.51	\$ 26.55	\$ 36.96
27	Lofa	Voinjama	Oldman Siafa	2117	goat	15	\$ 54.40	\$ 24.26	\$ 30.14
28	Bong	Yeallequellie	Varkpeh-ta	609	goat	15	\$ 15.94	\$ 19.27	\$ (3.33)
29	Lofa	Gezzie Town	Voinjama	2110	vegetable	15	\$ 490.86	\$ 386.04	\$ 104.82
30	Bong	Kpaai	Duta	610	vegetable	15	\$ 424.93	\$ 453.22	\$ (28.29)
31	Nimba	Sanniquellie-Mah	Gbedin Camp #3	3318	vegetable	15	\$ 204.98	\$ 510.72	\$ (305.74)

Qualitative Results

FGDs and KIs also provide insights into changes in productivity and gross farm incomes. 55 of 90 provided information on this subject; 62% indicated good increases in production and/or income, 24%

mixed results, and 14% reported poor results. The following discussion breaks them down by value chain participants⁵³.

Rice: Among the 21 discussions and interviews among rice value chain participants in which opinions were expressed about changes in productivity and incomes, 62% indicated good results, 29% mixed results, and 9% poor. These discussions and interviews involved nine of the 15 rice beneficiary groups surveyed by the project. While the majority of participants indicated that yields and total production had increased as a result of the application of FED methods, many expressed concerns about not being able to sell their surpluses at anticipated prices. During an FGD in Bong, group members acknowledged that the newly acquired knowledge helped them to increase production, but added that marketing was a major challenge. However, in a separate interview with this group's leader, the latter explained how the group was eventually able to get a better price by contacting different buyers than the one suggested by FED. According to a MOU between FED and the group, one company was named by FED as the buyer at USD\$18 per 50kg bag, although the farmers requested from USD\$30 to USD\$40. The group ended up selling its rice (N.B. for the purposes of consumption, not as seed rice) to two other companies at USD\$30 and USD\$32 respectively.

Another group leader in Bong County, who expressed reservations about the increased labor requirements for FED methods, was nevertheless positive about the increased yields, but concerned about low market prices: "You can use less seeds and get plenty rice more than the old method...We harvested 26 bags of rice and waited for FED to bring the buyer, but because FED did not bring anyone, we sold our rice for a lower price, USD\$16..." per 50kg bag. In Lofa, a farmer from another rice group, however, was pleased with both his production and sales: "We produced 48 bags of 50kg from the first rice harvest; we sold it at US\$18.00/50kg bag and the proceeds are being used to give loans to members of the group whenever the need arises.

A rice miller in Nimba was the only interviewee to offer comments about the ability of local rice farmers to compete with imported rice: "The mill buys seed rice from farmers in the community, have it milled and sells it for price lower than the imported rice, between US\$10 to US\$20". Imported rice is reportedly sold for a minimum of US\$30/50 kg.

Cassava: Among the 13 discussions and interviews with cassava value chain participants in which opinions were expressed about changes in productivity and gross incomes, 54% indicated good results, 23% mixed results, and 23% poor. These included four of the nine cassava farmer beneficiary groups that were part of the survey. Although 2 of these 4 groups gave somewhat mixed reviews about application rates, all four groups reported positive results in terms of production and two mentioned good results in terms of sales. A cassava nursery in Lofa reported that it had earned LD25,000 and LD 48,000 in 2 seasons. However, members of this group added that in the neighboring Borgeza village, "Cassava farmers did not experience any significant improvement in their incomes despite the increase in production. A family member belonging to Borgeza cassava group walked away with only LD500 (about USD 6.25) after the group sold huge quantity of tubers... some had sustained huge losses".

Goats: Among the six discussions and interviews with goat value chain participants in which opinions were expressed about changes in productivity and gross incomes, four indicated good results, and two indicated poor results. These were conducted in all three goat villages that were part of the survey. A CAHW in Nimba who also belongs to a goat beneficiary group mentioned reported that: "Because our

⁵³ The total number of FGDs and KIs does not equal the breakdown by sector participants, because some respondents, like Government extension workers and VSLA officials, worked in multiple sectors. They are counted in the total, but not in the breakdowns by value chain.

goats are treated and very healthy, they are very attractive to buyers”. ...the reproduction rate is high, “We started with 18 goats in 2013, and by 2015 the number rose to 47”. We are...more successful in increasing our income simply because our goats look good and buyers can see the difference. The goats are being sold for good price now, USD\$60”. In Bong, another CAHW said that “At first it was hard to sell the goat and make good money. But one of the farmers who sold only three goats in a year before FED, was able to sell 12 goats in one year and some for USD\$45”. And in Lofa, another CAHW reported similar results. According to him, the group members have been able to sell their goats. One had sold 11 goats in 2015 at the prices ranging from LD3000 to LD4000 (about US\$40-US\$50). On the negative side, a farmer in Lofa complained about poor marketing and theft; apparently, the middleman paid far less than the agreed amount. Another CAHW in Nimba highlighted the problems with poor pricing, “The male goat is sold for USD\$15, kids USD\$10, and the female goat USD\$25”.

Vegetables: FGDs and a KII were held with all three vegetable villages that were part of the survey. A KII was held with the local implementing partner in Bong, while FGDs were held with the two beneficiary groups in Lofa and Nimba. The implementing partner in Bong reported increased production, but did not comment on gross farming incomes (as noted in Table 5.4.11 above, the survey results showed a gross margin of \$424.96). In a village in Lofa where the survey recorded highest gross margin for vegetables, \$490.86, the farmer group reported that their first planting season was not good, while second one was better, but prices were 'unstable'. In Nimba, the group reported that “The FED project has increased our vegetable production in the town and we can make larger vegetable farms now” (a gross margin of \$204.98 was reported in the survey). The 0.25 ha demonstration farm produced and sold watermelon, cucumber, cabbage, maize. However, lettuce did not sell, while pepper did not grow well.

Conclusion

Although FED beneficiaries in the four value chains do not exhibit significantly higher yields than comparison farmers, those working in the goat value chain show significantly higher gross margins per unit of production. This difference persists even after correcting for an unbalance sample through PSM. The difference for goat farmers is apparently due to their higher rate of sales. Although FED rice farmers do not report cultivating significantly more land than the comparison group, they demonstrate higher annual sales, largely due to the productivity of lowland rice farmers. The effect is even larger for FED-supported goat farmers, who possess more goats and earn a 20% higher gross margin than the comparison group. FGDs and KIIs with farmers and other value chain participants lend support to the conclusion that rice and goat farmers were able to increase their gross margins as a result of FED assistance.

5. WHAT ARE THE HOUSEHOLD INCOMES OF BENEFICIARY FARMERS COMPARED TO THE COMPARISON GROUP?

Quantitative Results

The overall goal of FED is to improve the standard of living of farmers and their families. Standard of living is largely determined through household income and expenditures, as these statistics reveal the amount of money households can spend on food and other necessities. Measuring income through surveys is notoriously inaccurate. Survey respondents usually understate their true income, either because they think they may benefit from lower reported incomes (by increasing access to aid or avoiding taxes) or because they simply do not remember or have difficulty estimating different income streams. For this reason, comprehensive household expenditure surveys are a preferred method for estimating income based on the total amount the household spent on a long list of items, as well as

household assets.⁵⁴ Expenditure estimates, however, are also inaccurate, because it is difficult to remember and estimate the cost of numerous items purchased over the previous weeks and months. Nevertheless, the biases in these estimates should not be influenced by participation in the FED program, so they provide useful measures of relative welfare between the beneficiary and comparison farmers.

Table 5.5.1 presents estimates of the self-reported daily per-capita income of the various groups; it reveals no significant differences between beneficiaries and comparison farmers, either overall or among any of the counties or value chains. Although Table 5.4.8 and Table 5.4.9 show higher gross margins for FED-supported rice and goat farmers, these gains do not appear to translate into higher household income. Consistent with previous findings, FED-supported lowland rice farmers report earning more than upland rice farmers. Men who participated in FED report significantly higher incomes than women.

Table 5.5.1 Per-Capita Daily Income (Self-Reported)

	Beneficiary	Comparison	ATE	ATE 95% CI	P-Value	N
Total	\$0.31	\$0.31	(\$0.02)	(\$0.07) - \$0.04	0.57	1,293
Bong	\$0.26	\$0.30	\$0.00	(\$0.03) - \$0.04	0.96	426
Lofa	\$0.29	\$0.25	\$0.00	(\$0.03) - \$0.03	0.86	441
Nimba	\$0.36	\$0.37	(\$0.02)	(\$0.05) - \$0.01	0.16	426
Rice	\$0.31	\$0.32	(\$0.01)	(\$0.05) - \$0.03	0.61	629
Upland Rice	\$0.19	\$0.28	NA	NA	NA	400
Lowland Rice	\$0.36	\$0.45	NA	NA	NA	161
Cassava	\$0.32	\$0.29	\$0.00	(\$0.03) - \$0.03	0.98	377
Goat	\$0.23	\$0.30	(\$0.01)	(\$0.02) - \$0.00	0.17	167
Vegetable	\$0.37	\$0.25	\$0.00	(\$0.01) - \$0.02	0.61	120
Female	\$0.24	\$0.27	NA	NA	NA	726
Male	\$0.37	\$0.39	NA	NA	NA	522

NOTES: Parentheses indicate negative values. Based on self-reported monthly income from a list of potential income sources, with monthly values reported separately for typical month in rainy season and typical month in dry season. These totals transformed into daily per-capita income to be consistent with household consumption estimates.

Per-capita daily expenditures are reported in Table 5.5.2 and show similar trends: there is no difference between the FED-supported farmers and the comparison farmers. As before, earlier cohorts have higher expenditures than the FY15 cohort, which may suggest that the benefits of the FED program increase after the first year of participation. Also consistent are higher expenditures reported by FED-supported lowland rice farmers compared to upland farmers. The difference in consumption between male and female respondents is not statistically significant, which reflects the fact that these estimates consider all household expenses (not just personal expenses).

These estimates can be compared to those from the Feed the Future interim population-based survey (PBS), which deployed the same expenditure module and was conducted just a few months before this

⁵⁴ This survey employed the same household expenditure module as used in the Feed the Future population-based survey, which included over 200 items.

evaluation in November 2015. According to the PBS, the average per-capita daily expenditures for Bong, Lofa, and Nimba counties are \$2.34, \$1.88, and \$1.97, respectively. These values are all higher than the estimates for the beneficiaries. The PBS, however, was a representative sample of the entire population in the targeted ZOI, and thus included respondents, such as urban businessmen and other workers, who typically earn higher incomes than farmers.

Table 5.3.3 below compares per capita daily expenditure by value chain and the fiscal year. Except for upland rice, all earlier groups outperformed later groups. However, the only significant difference was for the upland rice group.

Table 5.5.2 Per-Capita Daily Expenditure

	Beneficiary	Comparison	ATE	ATE 95% CI	P-Value	N
Total	\$1.70	\$1.69	(\$0.06)	(\$0.20) - \$0.08	0.38	1,222
Bong	\$1.92	\$1.88	\$0.01	(\$0.09) - \$0.12	0.83	402
Lofa	\$1.53	\$1.69	(\$0.05)	(\$0.12) - \$0.02	0.16	421
Nimba	\$1.61	\$1.54	(\$0.02)	(\$0.08) - \$0.03	0.41	399
Rice	\$1.64	\$1.58	(\$0.03)	(\$0.11) - \$0.05	0.42	609
Upland Rice	\$1.33	\$1.60	NA	NA	NA	391
Lowland Rice	\$2.04	\$1.67	NA	NA	NA	157
Cassava	\$1.88	\$1.91	\$0.01	(\$0.09) - \$0.11	0.84	360
Goat	\$1.63	\$1.75	(\$0.02)	(\$0.06) - \$0.02	0.33	136
Vegetable	\$1.73	\$1.84	(\$0.02)	(\$0.06) - \$0.02	0.33	117
Female	\$1.61	\$1.72	NA	NA	NA	707
Male	\$1.79	\$1.65	NA	NA	NA	512

NOTES: Parentheses indicate negative values.

Table 5.5.3 Per-Capita Daily Expenditure by FY Cohort and Value Chain

Household Expenditures (daily per capita)	FY13-14	FY15	P-Value
Total	\$1.74	\$1.67	0.6
Rice	\$1.70	\$1.56	0.36
Upland Rice	\$1.21	\$1.46	0.05
Lowland Rice	\$2.22	\$1.64	0.06
Cassava	\$2.18	\$1.80	0.48

NOTES: The P-Value column computes the statistical significance of the difference between the FY13/14 and FY15 estimates. P-values of <0.05 are traditionally considered to be statistically significant. FYs 13 and 14 are combined due to the lower number of surveys conducted for these two cohorts versus the FY 2015 cohort. Vegetable and goat value chains are excluded from the table due to small sample size per FY.

Incomes and expenditures can be further compared between the FED-supported villages and other, similar villages that did not receive FED assistance; results are shown in Table 5.5.4 below.⁵⁵ Since these comparison villages were selected to overlap with the baseline data, this secondary study design allows for an analysis of changes over time. Even if there are not significant differences between FED farmers and others in the same village, it may be the case that FED support benefitted the village *as a whole*. All respondents in a FED-supported village are considered to be beneficiaries, even if they did not personally participate in the program.

Table 5.5.4 depicts the average incomes and expenditures of FED-supported villages and the similar comparison villages. The table reveals no significant differences between the FED-supported villages and the comparison villages. In terms of income, both villages reported an average of \$0.30 per person per day. This is dramatically lower than the \$2.24 reported by FED villages during the baseline survey, which likely results from the inconsistencies in income reporting rather than a catastrophic decline in standards of living; it is also compromised by the small sample size of the baseline survey in the relevant areas. This small sample size also means there is no significant difference in baseline income between FED and comparison villages. The comprehensive household expenditure module also estimated nearly identical patterns of household expenditure between the two groups of villages.

Table 5.5.4 Per-capita daily Incomes and expenditures for FED-supported villages that overlap with baseline and similar comparison villages

	FED Villages	Comparison Villages	P-Value	N
Income	\$0.30	\$0.30	0.99	542
Baseline income	\$2.24	\$1.80	0.74	33
Expenditure	\$1.83	\$1.87	0.73	533

NOTE: Nine comparison villages (n=180), compared with nine matched FED villages (n=369).

The FTF PBS conducted in 2012 and 2015 provide another source of information. The same areas were surveyed during both rounds of the PBS, and approximately half of these locations received FED assistance. Comparing changes-over-time in household expenditure in areas that received FED assistance to areas that did not receive assistance provides a rough, macro-level estimate of impact.⁵⁶ Note that this measure is not particularly rigorous since FED villages and towns were not randomly selected, and thus may have demonstrated greater (or lesser) potential for economic growth.

Table 5.5.5 describes the per-capita daily household expenditure and changes-over-time in expenditure, based on the PBS data. These estimates are in constant 2010 USD so that the interim and baseline values can be compared, rather than the current USD used in previous tables. The table reveals that FED implemented its project in villages that had higher per capita daily expenditures at baseline than other areas. The tendency to work in richer villages applies both across the FED project (in six counties), and in the three counties that are the focus of this impact study. This selection bias is not

⁵⁵ These comparison villages were identified through propensity score matching using the baseline survey data. See the discussion, 'Quantitative Research', in Section 3, Methodology, for more information.

⁵⁶ Urban areas are excluded from the comparison since FED only operated in rural farming communities in the three counties, and the economic growth in these two areas is not comparable.

entirely surprising, as FED chose to work in villages that already demonstrated the capacity to produce the value chain commodity.

Table 5.5.5 Per capita daily household expenditures (2010 USD) according to PBS

	Beneficiary	Comparison	P-Value	N	
All Counties					
	Baseline	\$1.46	\$1.30	0.10	1,260
	Interim	\$1.50	\$2.04	0.10	1,383
	Matched Diff.	(\$0.01)	\$0.24	0.02	NA
Bong, Lofa, Nimba					
	Baseline	\$1.54	\$1.22	<0.01	933
	Interim	\$1.48	\$1.28	<0.01	937
	Matched Diff.	(\$0.08)	\$0.03	<0.01	NA

NOTES: Parentheses indicate negative amounts. Analysis excludes major urban areas such as Gbarnga, Ganta, Buchanan, Harbel, and Voinjama.

The table, however, also reveals that FED-supported villages did not grow as fast as the non-FED villages. Overall, households in FED villages lost \$0.01 in per capita daily expenditure, while households in Bong, Lofa, and Nimba lost an average of \$0.08. This contrasts with a gain of \$0.24 in non-FED villages overall, and a gain of \$0.03 in non-FED villages in Bong, Lofa, and Nimba. In both cases, these different rates of growth are statistically significant. But again, this is not a reliable measure of impact, as the FED locations were not randomly selected. The results from the primary impact evaluation, which shows no significant difference in household expenditures between FED beneficiaries and comparison farmers, is a more reliable estimate.

Qualitative Results

FGDs and KIs provided very few additional insights into the overall impact on net household income, beyond the findings related to farm productivity and gross farm income discussed in the previous section. One interview with a Village Savings and Loan Association in Bong provided evidence of increased income and savings. According to the VSLA representative, the "...income level of some of the farmers has improved and they are acquiring basic household assets...Most of the VSLA groups have reported increases in their single share values⁵⁷, for example, single share used to be LD\$50, then rose to LD\$250, but currently some groups are having their single share value up to LD\$650". A District Agriculture Officer in Bong County offered the following brief assessment of FED's impact: "beneficiaries have confirmed improvements in their livelihood and incomes".

Conclusion

⁵⁷ Single share represents the value of the minimum amount set by a saving group and agreed to be deposited by each member as daily savings. Usually, members are allowed to deposit up to five times this amount depending on their financial standing. These deposits are considered shares, the minimum of which is referred to as "single share". Typical values include LD\$30, LD\$50, LD\$75 and so forth depending on group's activities or members' economic status.

Using a variety of data sources to triangulate the findings, this study finds no effect on household income or expenditure as a result of the FED intervention. The significantly higher gross margins for rice and goat farmers shown in Table 5.4.3 are not translating into greater household incomes. This is not surprising given the magnitude of the differences. Table 5.4.2 shows that the increased sales for beneficiary farmers is valued at less than \$11 per year. The household income and expenditure estimates are calculated on a daily per capita basis. The \$11 in additional annual sales translates to less than \$0.01 in daily per capita consumption for a family of five. This difference is far too small to be detected through an expenditure survey.

Another factor that might help explain why higher gross margins do not translate into higher household incomes is that the gross margin calculation does not take into account all the cash costs of farm production; notably absent are interest expenses and taxes. In the case of interest expenses, it was found that FED farmers are more likely to borrow money than the comparison group, even though they are not necessarily more indebted.

6. WHAT IS THE QUALITY OF LIFE OF BENEFICIARY FARMERS AND THEIR FAMILIES COMPARED TO THE COMPARISON GROUP?

Quantitative Results

Quality of life is a multifaceted concept that encompasses a household's access to food and basic necessities, resilience to economic shocks, access to services and consumer goods, and a sense of contentment—or at least a lack of anxiety—regarding the household's situation. Table 5.6.1 describes the level of hunger and the percentage of households that were severely negatively affected by various shocks. The difference in hunger between the FED-supported households and the comparison group is not statistically significant, nor is the difference in exposure to most of the shocks. FED-supported households, however, were slightly more likely to be affected by business failure over the past year, although this could be caused by a higher percentage of FED households engaged in a formal business. FED households are less affected by deaths of household members or other family. This could be caused by chance (fewer deaths in FED households), or it could reflect a better ability to pay funeral costs or care for household members.

Table 5.6.1 Household Hunger and Welfare Shocks

	Beneficiary	Comparison	Matched Difference	P-Value
Mod-Severe Hunger	17.6%	20.7%	1.3%	0.58
<i>In past year, severely affected by:</i>				
Drought, flood, fire	12.6%	10.8%	1.9%	0.32
Crop diseases / pests	53.2%	57.0%	-3.2%	0.25
Livestock deaths / stolen	45.3%	53.8%	-0.8%	0.77
Business failure	17.6%	12.4%	3.6%	0.07
Loss of job	10.2%	9.0%	-0.1%	0.96
Large fall in crop prices	44.0%	42.7%	1.0%	0.72
Large rise in price of food	52.9%	48.6%	2.3%	0.41
Large rise in price of inputs	24.9%	23.2%	1.9%	0.43
Water shortage	26.1%	26.3%	1.8%	0.46
Restricted access to market	9.0%	8.9%	2.0%	0.24

	Beneficiary	Comparison	Matched Difference	P-Value
Sickness /accident of HH member	58.9%	58.2%	4.3%	0.13
Death of HH member	19.9%	16.5%	5.3%	0.02
Death of other family member	67.3%	58.8%	8.3%	<0.01
Crime / theft / burglary / assault	18.1%	19.5%	0.9%	0.69
House damaged / destroyed	16.2%	10.1%	0.9%	0.63

NOTE: Matched difference is computed in the same way as ATE. This terminology is used when not all of the indicators could plausibly be affected by the FED intervention. In these cases, the differences cannot be called a treatment effect. Some of the indicators, such as hunger, could be considered a treatment effect and so matched difference and ATE are interchangeable.

The more positive aspects of quality of life are displayed in Table 5.6.2. FED-supported households are more likely to have electricity than the comparison households, although the overall rate of electricity is higher among the comparison group. Again, this discrepancy is caused by the way in which the matched difference is computed. A high concentration of electricity among comparison households in a few locations results in a high population-level estimate. But FED-supported farmers have more electricity than the comparison farmers in more locations, so the matched difference/average treatment effect is positive for this indicator.⁵⁸

FED-supported households are slightly less likely to have access to improved water. In terms of assets and consumer goods, FED-supported households do better. FED beneficiaries are approximately 10% more likely to possess a mobile phone and 45% more likely to own a motorbike.⁵⁹ It is not clear, however, whether households had access to these services or assets before the start of the FED program.

Table 5.6.2 Household Assets and Subjective Welfare

	Beneficiary	Comparison	Matched Difference	P-Value
Electricity	6.0%	13.8%	2.5%	0.03
Improved water	86.4%	86.0%	-3.2%	0.03
Phone	73.6%	65.5%	6.7%	0.01
Radio	62.7%	63.4%	-2.8%	0.29
Generator	6.2%	6.4%	1.9%	0.14
Fan	0.9%	1.8%	-0.1%	0.89
Motorbike	19.1%	11.0%	4.9%	<0.01

⁵⁸ This finding appears contradictory, since the overall percentage of comparison farmers is higher than the overall percentage of FED farmers, and generators are owned at similar rates between the two groups. The positive ATE results from the broad access to electricity among FED farmers across many survey locations, compared to a high concentration of comparison farmers with electricity in only a few locations. Further, the survey asked about electricity separate from generator ownership. Presumably, FED farmers are accessing electricity from other sources, such as solar panels.

⁵⁹ These percentages are calculated by dividing the matched difference by the comparison group estimate.

	Beneficiary	Comparison	Matched Difference	P-Value
<i>Satisfied with:</i>				
Health	74.7%	72.9%	3.0%	0.23
Financial situation	36.5%	28.6%	6.3%	0.02
House	63.5%	64.2%	1.1%	0.67
Job / Source of income	51.4%	39.7%	7.6%	0.01
Life as a whole	69.4%	59.7%	10.0%	<0.01
<i>Subjective wealth</i>				
Current situation is “comfortable”	7.1%	4.8%	2.6%	0.03
Situation 3 years ago was “comfortable”	10.4%	6.7%	0.8%	0.60
Expect in 3 years to be “comfortable”	65.3%	54.4%	10.7%	<0.01

Subjective indicators of happiness reveal major differences between the two groups. FED beneficiaries are significantly more likely to be satisfied with their current financial situation, their job, and their life as a whole. FED farmers are about 17% more likely to be satisfied than the comparison group⁶⁰. Similar trends are observed in the subjective wealth indicators. FED-supported households are 54% more likely to describe their current situation as “comfortable”, and 20% more likely to expect their situation in three years to be comfortable. These trends are consistent with earlier findings that FED beneficiaries may improve their incomes over time.

Qualitative Results

FGDs and KIIS provided a significant amount of anecdotal evidence of changes in the quality of life of beneficiary farmers. 28 of the 90 discussions and meetings provided opinions about changes in the quality of life due to FED; 25 were positive and three were negative. Participants spoke about improvements in nutrition, decrease in hunger, improved housing, increased savings, and better educational opportunities for their children.

Nutrition: A county agriculture official in Nimba who had expressed concerns about the difficulties in marketing increased production, nevertheless noted the following: “There is livelihood improvement. With the increased production as a result of the FED Project, many households have much to eat and hunger is therefore being tackled”. In Lofa an extension officer remarked that “Hunger is reduced and people are not going to neighboring Guinea for food”. A CAHW in Nimba, who also raises goats, noted that in addition to increased income from the sale of goats, “The goats are also consumed in households, meaning, they provide families with much needed nutrition”. A vegetable farmer in Nimba noted increased household food consumption: “...our family can eat more food two times a day”. And a VSLA representative in Nimba remarked: “Many families are eating on time and some are eating three times a day”.

Housing: The same VSLA representative in Nimba spoke about investments in housing among beneficiary farmers: “Three persons built houses, one of the houses is a four-bedroom house, while the

⁶⁰ Calculated by dividing the percentage for ‘Matched Difference’ by the percentage of comparison farmers

others have three bedrooms each”. An implementing partner in Bong noted that “The lead farmer was able to construct a new house”, while another VSLA official in Nimba spoke of a daughter who “...has been living with her father all along, but now she is preparing to move into her own house, awaiting its completion. She has already purchased the roofing materials for her house”.

Savings: While the focus of this study is on changes in income and quality of life at the farm level, several beneficiary groups highlighted the role of VLSAs in providing a safe place for increased incomes from farming activities. A farmers group in Bong mentioned that the “VLSA introduced by FED has helped us to be able to save money”.

Education: Comments from beneficiary farmers included: “We are able to pay our children school fees...”, “We can sell more vegetables and paid our children school fees”, and the “VSLA is helping women and they can send their children to school.” A rice seeds multiplier in Nimba noted that “Children’s tuitions are being paid...” thanks to increased incomes made possible by FED. And a power tiller operator in Lofa discussed his own education as well as his children’s: “I am sending myself to the community college and can also provide schools fees for my children.”

In the three FGDs and KIs in which negative opinions were expressed about the impact of FED on quality of life, two groups summed up their dissatisfaction in general terms: “Many of us were not part of the planting process”, and “the ...Farming Group did not benefit from the project”. And, in the third case, as mentioned previously, a group in Nimba complained about the negative impact of the project on the health of some members: “members were getting sick from diseases in the swamp”.

Conclusion

FED beneficiaries do not exhibit any significant differences from the comparison households in terms of moderate to severe hunger, according to the survey results. However, this may be due to the data collection, which coincided with Liberia’s lean season when household food stocks are at their annual low before the harvest. It could be the case that FED farmers eat significantly more than the comparison group in the months following the harvest (i.e. December through April), but run out of food at around the lean season. The study finds, however, that beneficiaries are significantly happier and more optimistic than comparison farmers. FED beneficiaries are more likely to be satisfied with their financial situation and career prospects, and are more likely to see a brighter future for themselves and their families. FGDs and KIs tend to present a generally more positive view of the impact of FED on nutrition, housing, savings, and education, although these impressions were provided by a relatively small sample of FED stakeholders that include that both beneficiaries and other project participants or observers.

RECOMMENDATIONS

Ten recommendations for future programs and activities are offered for USAID consideration. They are grouped into four areas: 1) Selection and Support of Value Chains and Commodities; 2) Targeted Value Chains; 3) Supporting Institutions; 4) Performance Monitoring and Evaluation.

1. Carefully Select and Support Value Chains and Commodities

1.1 Select Value Chains that Demonstrate Comparative Advantage and for Which Anticipated Assistance Benefits are Worth the Associated Costs: Future interventions should be based on timely analysis prior to the selection of specific value chains within targeted regions. Analysis needs to identify value chains that might offer comparative advantage, either at present or in the future with the removal of trade impediments and other market distortions. There is no point in trying to develop value chains that do not demonstrate economic comparative advantage, for such value chains will not generate economic value sustainably even with initial technical assistance. There are a range of methodologies that can be applied to determine a value chain's potential comparative advantage, ranging from more rigorous methods such as Domestic Resource Cost (DRC) analysis to less rigorous but easier-to-implement methodologies like simply benchmarking local value chain production costs against world prices.

The fact that the survey did not find significant differences between beneficiary and comparison farmers on all measures does not necessarily mean that the value chains and commodities selected are not worth supporting in the future, but it does suggest that alternative or additional assistance is needed to make value chain markets function better. Once promising value chains have been identified, it is important to conduct cost-benefit analysis (CBA) to make sure that the anticipated benefits from assistance programs are worth their costs. Such analysis should take into account a broad range of factors starting with current, historical, and projected market demand and supply for the commodity in question. In addition, program managers should consider the suitability of soils and climatic conditions, current capacity of farmers and support institutions (e.g. extension services and banks), and the motivation of prospective participants to produce and/or sell the particular commodity.

1.2 Remove Trade and Other Barriers and Market Distortions: In addition to directly assisting production of value chains that demonstrate economic comparative advantage, it is important to focus on removing any barriers or distortions that impede purchase of supplies or selling of goods to markets. These might include: poorly developed input markets; access to finance; absence of infrastructure, particularly roads and reliable electricity of reasonable cost; non-tariff barriers and other impediments to domestic and international trade facilitation; trade policy constraints; and tax policy constraints.

2. Capitalize on Promising Areas in the Four Targeted Value Chains:

2.1 Rice: The fact that the study showed higher returns to lowland rice than upland rice provides some vindication for the project strategy of focusing on lowland rice in spite of its generally higher costs. In future activities that promote lowland rice cultivation program implementers should ensure that farmers are aware of the additional labor costs involved, that the tools and equipment are readily available to assist in the process of reclaiming wetlands for productive use, and that financing is available to cover higher costs. And given the fact that the success of Liberian rice is closely tied to international rice

markets, it is extremely important to strengthen the farm-to-market linkages that showed some success under FED.

2.2 Cassava: The selection of cassava as a target value chain had much to do with its importance in the current diet of rural Liberians and its high tolerance to drought, rather than its marketability. Future interventions that focus on cassava should continue the dissemination of improved cultivation practices promoted by FED, the distribution of improved varieties through private market channels, and the continued encouragement of value-added activities that increase marketability.

2.3 Goats: USAID interventions should continue to emphasize the importance of herd health management, through the use of low cost shelters as well as continued support for Community Animal Health Workers (CAHWs). The transition to lower costs materials for goat shelters was reportedly in process prior to the conclusion of the FED Project. In addition, ongoing training from local NGOs and government extension workers is needed for CAHWs. The latter appear to have played an important role in the FED Project in improving animal health and productivity, but were at times hampered by the lack of timely supply of vaccinations and medicines.

2.4 Vegetables: Although the survey did not show significant differences between beneficiary and comparison vegetable farmers, there appear to be significant opportunities in the future for rural households to produce vegetables for both for home consumption and for sale into local markets. In fact, a vegetable village in Lofa County had the highest gross margin per hectare per year of any of the 31 beneficiary groups surveyed. Expanded use of low cost rain shelters will allow households to grow and harvest short-cycle vegetables in the rainy season, while low cost irrigation will facilitate cultivation in the dry season.

3. Strengthen Local Support Institutions;

3.1 Increase Use of Local Non-Government Organizations as Implementing Partners

The role of local non-government organizations, which have greater flexibility and sometimes more expertise than government extension services, should be continued and strengthened from the outset of the project to its conclusion. Local implementing partners (primarily local NGOs), which were contracted by FED in each of the three counties reviewed in this report, played a key role in disseminating improved practices. However, some of these partners voiced concerns: 1) their lack of involvement in the selection of beneficiary groups; 2) the short-term nature of their agreements with the principal implementing organization; and 3) the lack of coordination between input provision, which was the responsibility of DAI, and service provision, which was the primary responsibility of the local partners

3.2 Build on Project Successes with Private Input and Service Suppliers

Future interventions should build on the success of FED in expanding the availability of private support services, notably farm-to-market transportation by tuk-tuks and tilling services. As noted in the results of Focus Group Discussions and Key Informant Interviews, these services were especially appreciated by farmers and provided additional income to operators. USAID should also encourage the expansion of private input suppliers of seeds, fertilizer, pesticides, herbicides, and fungicides, farm tools, and farm machinery.

3.3 Maximize the Use of Existing Farmer Organizations

Future interventions need to carefully examine how to best deliver program goods services to maximize program outreach and impact. In the case of FED, the use of farmer groups and village demonstration farms were key elements in its implementation strategy. Such an approach had the potential advantage of reaching a much wider audience than an approach that might have relied solely on project outreach to individual farmers. However, it also seemed to be somewhat problematic in cases where farmers had not previously worked collaboratively. The approach worked best in cases where there was an existing association that has already been formed by local residents and/or farmers to address common interests and concerns.

3.4 Ensure the Availability of Credit for New Methods and Technologies

Although the role of the VSLAs was not specifically within the purview of this impact study, they were mentioned positively in several key informant interviews. In future interventions, USAID should continue to strengthen local financial institutions both as depositories for savings as well as a source for short term production credit and longer term credit for equipment. Successful adoption of new methods and technologies will depend on the availability of credit for production and investment purposes.

3.5 Improve Coordination with Government of Liberia Institutions

Local government officials, including county and district agriculture officers, interviewed for this study were generally supportive of FED objectives and activities, and were proud to mention their efforts to facilitate the work of the project. Many of them suggested that future projects like FED should coordinate more closely with local government officials and keep them better informed. Several of these officials specifically mentioned the critical importance of proper community entry.

4. Enhance Performance Monitoring and Evaluation

4.1 Establish a Clear Performance Management Plan at the Outset

Performance monitoring and evaluation systems need to be established at the outset of each program, given high priority by program leadership, and managed by dedicated staff who possess the appropriate knowledge and motivation. Of particular importance is the collection of credible baseline information for beneficiary and comparison groups that is subsequently compared to results achieved following program interventions⁶¹. Managers should decide at the outset of a new program if they want an impact evaluation or not, and if so, plan for it with a rigorous baseline.

This is especially important in agriculture programs, since farmers in low income countries do not often keep detailed or accurate records of their performance during the prior period. And farmer recollection of past performance is notoriously unreliable.

The best approach is to initially collect whatever baseline data are available, whether based on records or recall, or preferably both. Subsequent data collection should be more rigorous and in conformance with the guidelines established by the project's monitoring and evaluation staff manager, the project manager, and reviewed and approved by USAID.

It is important to note that the collection of baseline data is not just something that needs to be done in the first year of a project. Baseline data should be collected every time a new activity is undertaken or a

⁶¹ 'Significant attention is required to ensure that baseline data are collected early in the project lifespan, before any significant implementation has occurred', USAID Evaluation Policy, January 2011 updated October 2016, page 7.

new beneficiary is added to an existing activity. For example, in the case of FED, where new beneficiaries were added each fiscal year, baseline data should have been collected prior to the start of assistance to each new group of beneficiaries.

4.2 Consider Possible Trade-offs between Program Measurement and Program Impact

This Impact Study of the FED Project highlights the trade-offs that may arise between the objectives of accurately assessing impact on the one hand, and maximizing program impact on the other hand. In order to fully achieve the former objective, systems need to be put in place at the outset of a project that collect baseline data on beneficiaries and control groups, facilitate the random selection of beneficiaries and controls, and monitor changes that occur in both groups over the course of project implementation. This approach is consistent with the design of random controlled trials in scientific and social experiments. However, in order to achieve the second objective, i.e. maximizing impact, program managers should also take into account certain characteristics of program beneficiaries, especially motivation to participate in the program, and the willingness to try new approaches; this makes a totally random selection infeasible. Such an approach does not imply that programs select only the most technically qualified candidates. Indeed, higher impact may be achieved by selecting those that are less technically qualified, but are more motivated to achieve results and more willing to try new approaches.

In the case of FED, managers selected beneficiary farmers to some extent on the expectation that that they were more likely, due to their skills, attitudes, behaviors, and/or experience, than non-selected farmers to adopt the farming practices promoted by the project. Such non-random selection procedures may have been in the best interests of achieving maximum program impact, but did not strictly conform to the requirements of controlled experiments.

Managers of future USAID interventions, whether related to Feed the Future or other areas, need to be cognizant of these trade-offs and decide what is most important for achieving the development and foreign policy objectives of foreign assistance programs.

ANNEXES

ANNEX I: EVALUATION STATEMENT OF WORK

SCOPE OF WORK USAID/LIBERIA FOOD AND ENTERPRISE DEVELOPMENT (FED) IMPACT SURVEY

1. Objective

The findings of a recent data quality assessment demonstrate that Feed the Future (FTF) indicator data reported by USAID/Liberia's flagship Food and Enterprise Development (FED) contractor are so poor that they cannot be used for reporting or decision-making purposes. While the FTF Population-Based Survey (PBS) provides Zone of Influence (ZOI) level data for FTF high-level indicators (poverty, per capita expenditure, stunting), the improvements seen between baseline (2012) and interim (2015) cannot be imputed to FED alone. The objective of the impact study is to capture the magnitude of the impact of USAID/Liberia's value-chain investments in FED on agricultural productivity and profitability, investment and earnings, and quality of life.

2. Background

Due to decades of mismanagement, and civil war which ravaged its economy, Liberia continues to be one of the world's poorest countries. The situation was exacerbated in early 2014 when the Ebola Virus Disease (EVD) outbreak, the worst recorded EVD epidemic in history, created panic in Liberia and the entire sub-region. Fortunately, to date, the direct impact of EVD on the agriculture sector in Liberia has been minimal although the loss of lives and the devastating effects of the outbreak on wasting and other malnutrition-related problems, especially in children and women, are of serious concern.

Liberia is designated as a focus country for FTF, which aims to address the fundamental causes of food insecurity and undernutrition by sustainably increasing agricultural productivity, supporting and facilitating access to markets, and increasing incomes for the rural poor to meet their food and other needs, including reducing undernutrition. In Liberia, FTF focuses on smallholder farmers, particularly women, and aims to help vulnerable Liberians escape hunger and poverty and provide children with services to improve their nutritional status. FED activities are implemented within a six-county ZOI. These six counties include 75 percent of Liberia's population and over two-thirds of Liberian farmers. According to preliminary interim PBS findings (2015) the prevalence of poverty in the ZOI is 39.8 percent, compared to a baseline value of 49.4 percent in 2012.

The objectives of FED are to 1. transform value chains of principal staple crops (rice and cassava); 2. develop income and diet diversification in vegetable and goat value chains with a focus on expanding vegetable horticulture and re-establishing goat husbandry; and 3. advance the enabling environment, with a focus on agricultural research and policy advocacy as well as private-sector market-structure development.

3. Scope of Work

FED investments have been concentrated in the three "breadbasket" counties of Bong, Lofa and Nimba, from which the impact study sample of intervention and control farmer households will be drawn. Most

FED indicator data cannot be used as a baseline or comparator due to its poor quality. Hence a rigorous methodology is required allowing comparisons between beneficiaries and non-beneficiaries and controlling to the extent possible for a number of dependent variables and for the likely impact of non-USAID investments in agriculture and other sectors, including emergency assistance provided to combat the Ebola epidemic. Estimated sample size is 1,200 farmer households, 600 beneficiaries and 600 controls.

The table below shows the approximate number of FED farmer beneficiaries by County and District aggregated for the 2013, 2014 and 2015 reporting years:

Bong		Lofa		Nimba	
Fuamah	3,724	Foya	3,800	Bain-Garr	2,737
Jorquelleh	6,565	Kolahun	2,464	Boe & Quella	150
Kokoya	552	Quardu Gboni	2,472	Gbehlay-Geh	6,985
Kpail	2,084	Salayea	3,036	Gbi & Dor	50
Panta	4,310	Voinjama	4,213	Gbor	101
Salala	1,729	Zorzor	3,326	Leeweahpea-Mahn	16
Sanoyea	79			Meinpea-Mahn	237
Suakoko	2,461			Saclepea-Mahn	3,557
Yelequellah	1,110			Sanniquellie-Mahn	1,628
Zota	1,194			Tappita	4,249
				Twan River	300
				Yarwein	94
				Yarpea Mahn	51
				Yarwin Mehnsionoh	1,540
				Zoe-Gbao	8,813
Total	23,808	Total	19,312	Total	30,508

The contractor shall consult with USAID/Liberia and FED to determine the 2-3 districts in each county that will provide the sample of FED beneficiaries and shall propose the most economical yet rigorous method for defining the control population and collecting data from both intervention and control samples.

USAID/Liberia expects the contractor to carry out the following major tasks:

- a. **Planning and Preparation:** The proposed contractor has recent on the ground experience in Liberia and an inception visit will not be necessary. Telephone and e-mail consultations and document review will provide the basis for the development of a country data plan, which will also serve as a workplan, providing a detailed timeline of major activities and allocation of LOE.

The country data plan should outline the overall strategy for conducting the impact survey, including a thorough description of data collection and analysis methods, as well as a sampling methodology, including the sampling frame to be used, sample size calculations, weighting, etc.

- b. **Draft Survey Instruments:** The contractor will be required to develop the survey questionnaires and any other data collection instruments. This includes translating the questionnaire into local languages, as needed. The questionnaires must include selected key variables from the 2012 FED Baseline Survey Report as well as the FTF outcome indicators, as listed below (see 4. data to be collected).
- c. **Train Enumerators and Field Supervisors:** The contractor will recruit and train enumerators to collect quantitative and qualitative data. Recruitment may be directly by the

contractor, or through a local implementing partner. In addition to recruiting an equal number of men and women enumerators, the contractor should also plan for reserve enumerator capacity in case of illness, resignation or termination. The contractor should develop a comprehensive training plan and use rigorous practical exercises to ensure enumerators acquire the necessary skills to conduct the survey. Enumerators and field supervisors should have strong personal, cultural, and linguistic ties with the counties where they will conduct interviews and discussions.

- d. **Data Collection:** Data collection should take place as soon as possible given the impending rainy season and FED demobilization. Data shall be collected using high-quality electronic hand-held devices. Data should be securely stored within these devices and a system set up to immediately upload data into a database. Geo-codes should be recorded for all interviews -- if not automatically by the hand held devices then by some other means. Backup power supply is crucial. Throughout the data collection, the contractor shall provide significant oversight through skilled field supervisors to ensure the integrity of the data is maintained.

It is strongly recommended that in addition to the farmer survey, the contractor should conduct a limited set of key informant interviews and focus group discussions in order to add context to the survey findings. Key informants may include county agricultural officials, extension officers, men and women community leaders and traditional authorities.

- e. **Data Entry and Cleaning:** Immediately the data are collected they will be uploaded into a database. Statistical software programs shall be used for data cleaning and analysis. Continued strong supervision is essential to maintaining data integrity.
- f. **Data Analysis and Reporting.** The contractor will be responsible for all data analysis and report writing. An annotated outline of the components and tables to be included in the draft impact study report should be provided to USAID/Liberia within ten days after the completion of data collection. The draft impact study report should be submitted to USAID at a date to be negotiated between USAID/Liberia and the contractor, but adhering as closely as possible to the target date in the illustrative timeline provided in section 5 below. The final report shall be submitted within three working days of receiving comments from USAID/Liberia on the draft report.

Data shall be disaggregated by County and by intervention vs. control. Statistical tests of significance shall be conducted as appropriate.

- g. **Release Datasets to USAID/Liberia:** Per ADS 579, once data analysis and reporting is complete, the implementer will release its dataset to USAID, where it will be made open for public use on the USAID and Feed the Future websites.

Data, and the information derived from data, are assets for USAID, its partners, the academic and scientific communities, and the public at large. The value of data used in strategic planning, design, implementation, monitoring, and evaluation of USAID's programs is enhanced when those data are made available throughout the Agency and to all other interested stakeholders, in accordance with proper protection and redaction allowable by law.

4. Data to be collected

- Basic demographic data on the respondent: age, sex, educational level etc.

- Type of household per FTF classification
- Off-and non-farm employment and sources of household income
- Ownership of consumer durables and when acquired
- Livestock ownership
- Household dwelling characteristics
- Loans, savings and investments (for example in agricultural assets or children's education)
- Gross margin per hectare, animal or cage of selected product. In order to calculate the indicator value accurately, the following data must be collected from each respondent. Each data point should be presented **separately** and the calculations/formulae used to arrive at gross margin should be provided:
 - o Total production in metric tons (MT)
 - o Land area in hectares from which the total production was harvested
 - o Total value of sales converted to USD
 - o Total volume of sales in MT
 - o Total input costs
- Number of hectares under new technologies or management practices
- Number of farmers who have applied new technologies or management practices

5. Timeline

An illustrative schedule of activities and deliverables for the impact study is provided below. If adjustments are needed to the proposed timeline, the selected implementer should consult with USAID/Liberia. **All plans, questionnaires, schedules and reports must be review and approved prior to release/utilization by USAID/Liberia.**

Task	Deliverable	Completion Date
Country Data Plan/Workplan	Data plan w/ detailed workplan	May 13
Draft Survey Instrument/FGD protocols	Draft Questionnaire/guidelines	May 20
Final Survey Instruments	Final Questionnaire/guidelines	May 27
Selection and Training of Enumerators/Field Supervisors	Training materials	June 10
Data Collection	Survey and interview schedule	July 29
Data Cleaning & Analysis	Analysis schedule	August 12
Draft Survey Findings	Draft report	August 26
Final Survey Findings	Final Report	September 9
Release Dataset	Cleaned dataset	TBD

6. Personnel Requirements

The contractor's survey team should be composed of personnel with recognized experience conducting population-based surveys in rural areas characterized by infrastructure deficiencies. Team members should also be familiar with the Feed the Future Initiative and have substantial knowledge of integrated agriculture and nutrition programs in West Africa. The following are designated as key personnel:

Team Leader: The survey team leader must possess a post-graduate degree, preferably a Ph.D., in agricultural economics, applied statistics or related field. S/he should have a minimum 10 years of experience designing and implementing population-based surveys, supervising data collection, and training enumerators. The preferred candidate will be familiar with USAID agriculture activities in West Africa. Experience in Liberia a plus.

The team leader will be the primary point of contact for USAID/Liberia. S/he will be responsible for overseeing the development of the survey tools, ensuring the application of appropriate sampling methodologies, supervising data collection and analysis, and providing high-level oversight to the survey process. The team leader will be the principal author of the survey report.

Research Analyst: The Research Analyst must possess a post-graduate degree in agricultural economics, anthropology, statistics, or a related field. S/he should have at least 5 years of experience working in food security, agriculture, or community development, preferably in West Africa. S/he should also have demonstrated experience implementing large scale surveys and must possess strong English-language writing skills.

The Research Analyst will support the team leader in developing the data collection tools, finalizing the survey instrument, and ensuring all logistical considerations are accounted for, including procurement of hand held devices for mobile data collection. S/he will also share responsibility for training enumerators, ensuring they have the skills and capacity to undertake the survey.

The contractor shall propose additional expatriate and local personnel as necessary and sufficient to bring the survey to a successful conclusion. These may include a statistician (maximum 20 days LOE), an agricultural economist (maximum 30 days LOE), OR a rural sociologist (maximum 30 days LOE). Local enumerators should have at least a high school education and previous experience with field-based data collection, preferably through the use of hand-held devices. USAID prefers recruitment of enumerators previously trained by the contractor if possible.

7. Level of Effort

Estimated level of effort is illustrated in the table below:

Task	Responsible party	Calendar days
Pre-deployment document review	Team leader, statistician, research analyst	3
Draft workplan	Team leader, statistician, research analyst	3
Travel to Liberia	Team leader, statistician, research analyst, economist/sociologist	2
In brief; prepare draft survey instrument and finalize workplan	Team leader, statistician, research analyst, economist/sociologist	5
Recruit and train/refresh train enumerators	Team leader, research analyst (statistician returns to home base)	5

Field test draft survey instrument and revise as needed	Entire team	5
Finalize and translate survey instrument, upload to tablets, continue enumerator training	Entire team	5
Data collection: based on 2 local teams + one field supervisor per county	Entire team: team leader, research analyst and economist/sociologist also deploy to field one to each county (economist/sociologist returns to home base at close of data collection)	50
Data cleaning and analysis	Team leader, research analyst Statistician (remotely)	10
Report writing	Team leader, research analyst Statistician, economist/sociologist (remotely)	15
Debrief and presentation of draft report	Team leader, research analyst	1
USAID comments on draft report	EG team	5
Finalize report	Team leader, research analyst	3
Total days		112

8. Management

USAID/Liberia will provide support to the contractor in identifying documents and arranging meetings with key stakeholders prior to the initiation of data collection. The implementer is responsible for arranging other meetings as identified during the course of this assessment and advising USAID/Liberia prior to each of those meetings. The contractor is also responsible for arranging transportation, including air travel, vehicle rental, and drivers as needed to conduct field work and planning/ dissemination meetings. USAID/Liberia personnel will be made available to the team for consultations regarding technical issues, before and during the impact survey. The contractor should also accommodate the participation of USAID staff from the Mission and from BFS/Washington in the survey. The participation of these personnel will not result in the contractor incurring any costs.

ANNEX II: EVALUATION METHODS AND LIMITATIONS

Impact Estimator

The most rigorous estimate of impact in this research design is derived through the matched sample of beneficiary farmers and comparison farmers within the same village or towns. The analysis focuses on the average treatment effect—both aggregated at the project level, and disaggregated by county, value chain, and cohort year. These estimates and their associated standard errors are calculated as follows:

$$\hat{\tau}_{ATE} = \sum_{EA \in S} \frac{n_{EA}}{n} \left(\frac{1}{n_{EA1}} \sum_{EA \cap T} y_i - \frac{1}{n_{EA0}} \sum_{EA \cap C} y_i \right)$$
$$\hat{\sigma}_{ATE} = \sqrt{\sum_{EA \in S} \left(\frac{n_{EA}}{n} \right)^2 \left(\frac{\hat{\sigma}_{EA1}^2}{n_{EA1}} + \frac{\hat{\sigma}_{EA0}^2}{n_{EA0}} \right)}$$

where y_i is the observed outcome of interest in farmer i ; S is a set of strata; T and C are the collections of units in treatment and control; n and n_{EA} denote the number of all units and units in the EA respectively; n_{EA1} and n_{EA0} denote the number of treated and untreated surveys in the EA; and $\hat{\sigma}_{EAj}^2$ is the estimated variance of potential outcomes under treatment condition j in the EA. All analyses of the program effects use the survey location (EA) as the unit of analysis, since this is the level of the matching.

These equations assume random assignment of the treatment and control farmers within each community. The estimates, therefore, will rest on the assumption that, before the start of the project, the FED beneficiaries were indistinguishable from the comparison group in terms of the key indicators (gross revenue, etc.).

Sample Cluster

Clustering the surveys together makes it easier to reach the areas and identify the beneficiaries and comparison farmers. Too many observations in each cluster, however, reduce the statistical power of the estimates due to intra-cluster correlation. In general, it is not recommended to exceed 30 observations for each group (treatment and comparison) in a single cluster. A standard textbook in survey sampling explains the problem:

Elements within a cluster are often physically close together and hence tend to have similar characteristics. Thus, the amount of information about a population parameter may not be increased substantially as new measurements are taken within a cluster... Because measurements cost money, an experimenter will waste money by choosing too large a cluster size.⁶²

This intra-cluster correlation, however, also serves a useful purpose in the research design. By selecting comparison farmers from the same areas as the beneficiaries, we obtain data from farmers who share “similar characteristics” and thus form a suitable comparison group. The choice of 30 clusters of 20 beneficiaries and 20 comparison farmers (proposed here) derives from the need to balance the costs and difficulties associated with reaching survey locations in Liberia with the need for statistical power and coverage of the beneficiary population.

⁶² Scheaffer, Richard L., William Mendenhall, III, R. Lyman Ott, Kenneth Gerow. 2012. *Elementary Survey Sampling* (Boston: Brooks/Cole).

Power Calculations

Two power measures are relevant for this study design: the design effect and the detectable effect size. The design effect is calculated as follows:

$$DE = 1 + (\rho(m - 1))$$

where ρ is the expected within-cluster correlation coefficient (estimated at 0.05) and m is the number of surveys in each cluster (in this case 20).

The detectable effect size is calculated as follows:

$$DES = S \sqrt{AB/N}$$

where S is the standard deviation of measurement (assumed to be equal to 1.0 in this case); A is calculated as $1/q_1 + 1/q_0$, where q_1 is the proportion of the total in the treatment group (0.5) and q_0 is the proportion in the control group (0.5); B is calculated as $(Z_\alpha + Z_\beta)^2$, where Z is the standard normal deviate for α (defined as 0.05 for 95% confidence) and β (defined as 0.20 for 80% power), respectively.

Sampling Weights

Sampling weights are used to provide population-level estimates based on a representative survey sample. In the case of this analysis, the survey weights are also used to estimate the total number of direct and indirect beneficiaries. The core idea behind surveys is that, through random selection, the characteristics of the surveyed households can be generalized to an entire population, without having to interview everyone.

In many cases, it is easy to compute the sampling weights. For example, suppose a survey randomly selects 100 households from a total population of 1,000 households. The probability that a household is selected is $100 / 1,000 = 1/10$. The sampling weight for each survey is simply the inverse of this probability, e.g. 10. Once derived, sampling weights are easy to interpret. If a survey has a weight of 10, that implies the survey represents 10 households in the general population. The sum of the weights provides an estimate of the total population, in this case $100 * 10 = 1,000$ households.

Computing the sampling weights for complex survey designs is more challenging—and this research design is especially complex. The sample is stratified between (a) county; (b) overlap with the baseline survey; (c) value chain commodity; and (d) FY15 and FY13/14 cohorts. Further, the sample includes comparison households within each FED community, as well as separate comparison villages that did not receive FED support.

The result is four separate equations, which will be described in the following subsections. Note that each section describes an equation for the probability of selection, because it is more intuitive to understand. The sampling weight is the inverse of this probability.

Sampling weights for FY15 beneficiaries

The probability of selection for an FY15 beneficiary is the probability that the FY15 group is selected from among all FY15 groups in the stratum, multiplied by the probability that any individual farmer in the group is selected. Each stratum in this category is defined by (a) county; (b) overlap with the baseline survey; and (c) value chain. For example, a stratum might be defined as all FY15 groups in Lofa County

who grow rice and live in a community that was surveyed during the baseline. The probability of selection for farmer i in group j and stratum k is defined as follows:

$$P_{i,FY15} = G_k \times \frac{N_j}{N_k} \times \frac{S_j}{\hat{N}_j}$$

where G_k is the number of groups selected from the stratum; N_j is the number of farmers in group j according to the database provided by FED; N_k is the total number of FED beneficiaries in stratum k according to the database provided by FED; S_j is the number of surveys conducted among farmers in group j ; and $\hat{N}_j$ is the estimated number of farmers based on the survey teams contact with the farming group. The difference between N_j and $\hat{N}_j$ arises from the fact that some farmers may have dropped out of the group before receiving assistance. These differences are important for estimating the number of direct beneficiaries. The sampling weight is the inverse of this probability: $W_{i,FY15} = 1/P_{i,FY15}$.

Sampling weights for FY13/14 beneficiaries

The survey sample was constructed by first selecting a FY15 group, and then selecting FY13 and FY14 groups from within the same community (when those groups exist). The probability of selection for an FY13/14 beneficiary is the probability that the FY15 group is selected from among all FY15 groups in the stratum, multiplied by the probability that the FY13 (or FY14) group was selected from all the FY13 (or FY14) groups in the community, and then multiplied by the probability that a particular farmer was selected from among the group members. In practice, it was extremely rare to encounter more than one group that received As before, each stratum in this category is defined by (a) county; (b) overlap with the baseline survey; and (c) value chain. The probability of selection for farmer i in group j and stratum k is defined as follows:

$$P_{i,FY13/14} = G_k \times \frac{\sum N_{j,FY15}}{N_{k,FY15}} \times \frac{N_j}{\sum N_j} \times \frac{S_j}{\hat{N}_j}$$

where G_k is the number of FY15 groups selected from the stratum; $\sum N_{j,FY15}$ is the total number of FY15 FED beneficiaries in the village (not just the group selected) according to the database provided by FED; $N_{k,FY15}$ is the total number of FY15 FED beneficiaries in stratum k according to the database provided by FED; N_j is the number of FY13 or FY14 members of the selected group according to the FED database; $\sum N_j$ is the total number of FY13 or FY14 beneficiaries for the specific value chain in the village; S_j is the number of surveys conducted among farmers in group j ; and $\hat{N}_j$ is the estimated number of farmers based on the survey teams contact with the farming group. In practice, very few villages had multiple FY13 or FY14 groups that received assistance for the same value chain. The sampling weight is the inverse of this probability: $W_{i,FY13/14} = 1/P_{i,FY13/14}$.

Sampling weights for comparison households

Comparison households are (a) located in villages that received FED assistance; (b) did not personally receive FED assistance or assistance from another similar program; and (c) have at least one household member involved in producing the specific value chain. The sampling probability is the probability that the village is selected (not necessarily the specific FY15 group), multiplied by the probability that the household is selected. The probability of selection for household i in village j and stratum k is defined as follows:

$$P_{i,comp} = G_k \times \frac{\sum N_j}{N_k} \times \frac{S_j}{HH_j}$$

where G_k is the number of groups selected from the stratum; $\sum N_j$ is the total number of FY15 beneficiaries located in the village (not only those beneficiaries from the selected FY15 group); N_k is the total number of FED beneficiaries in stratum k according to the database provided by FED; S_j is the

number of surveys conducted among eligible households in village j ; and HH_j is the total number of households in the village, as counted by the field teams. As before, the sampling weight is the inverse of this probability: $W_{i,comp} = 1/P_{i,comp}$.

Sampling weights for comparison villages

Comparison villages are villages that were (a) surveyed during the baseline; (b) did not receive FED assistance; and (c) were judged to be similar to FED villages based on propensity score matching. Since no population data were available for these villages, each village was selected with equal probability from among the set of suitable villages, stratified by county. All of the comparison villages are focused on rice production. The probability of selection for household i in village j , county k is as follows:

$$P_{i,cv} = \frac{V_k}{\sum V_k} \times \frac{S_j}{HH_j}$$

where V_k represents the number of villages selected in county k (in this case, three villages were selected in each county); $\sum V_k$ represents the number of suitable villages in county k ; S_j is the number of surveys conducted among eligible households in village j ; and HH_j is the total number of households in the village, as counted by the field teams. As before, the sampling weight is the inverse of this probability: $W_{i,cv} = 1/P_{i,cv}$.

ANNEX III: UNDERSTANDING THE AVERAGE TREATMENT EFFECT (ATE) ESTIMATOR

This memo provides additional information on the average treatment effect (ATE) estimator used to analyze the impact of the Food and Enterprise Development (FED) project in Liberia. The memo proceeds in three parts: (1) an overview of some key terms and concepts in impact evaluation; (2) an explanation of the components of the ATE estimator; and (3) a case-study that examines how the ATE can differ from the population-level estimates.

Overview of Key Terms and Concepts in Impact Evaluation

The goal of an impact evaluation is to measure the effect(s) of a specific intervention on a target population, in this case the farmers who participated in the FED project. For the physical sciences conducted in a laboratory, impact is easy to measure. For example, if a researcher imparts force on a ball and the ball begins to roll, it is clear that the force caused the change in the ball's position. This is because, in a controlled environment, there is no other conceivable cause of the ball's motion.

Understanding impact in the real world, especially when the impact is on people, is much harder. For example, if an unemployed person completes a job training course and then succeeds in finding a job, it is not clear whether the job resulted from the improved skills imparted by the training program, changes in the local economy, a new personal connection, serendipity, or some other factor. To identify impact, a researcher would ideally analyze pairs of people who are exactly the same in every way. By providing the training program to only one person in each identical pair and comparing the different outcomes, the impact of the program on employment becomes clear.

The central challenge of designing an impact evaluation, therefore, is identifying a *counterfactual*, i.e. a comparison group that provides some indication of how the beneficiaries would fare in the absence of the intervention. The most straightforward way of constructing a comparison group is through random selection. Continuing with the example of job training, a program could identify 100 unemployed people eligible for the project and then randomly select 50 of them to receive the training program. Because the selection is random, the treatment and comparison groups are expected to share similar characteristics. In practice, there are always differences between the treatment and comparison groups, but these differences do not have a systematic bias.

The impact of a project is computed from the difference between the treatment and comparison groups. This impact is known as the **average treatment effect (ATE)**. Nearly all impact evaluations report their results in terms of the ATE, although other types of impact estimators may also be reported.⁶³ The specific research design determines the equation used to compute the ATE, but the general concept is the same: a difference of means between the treatment and control populations.

Components of the ATE Estimator

An impact evaluation that relies on a pure random sample of individuals in a laboratory can use the simplest ATE estimator:

⁶³ Other estimators, more common in drug trials, include: Conditional average treatment effect, intent-to-treat effects, complier average treatment effects, quantile average treatment effects, mediation effects, log-odds treatment effect, and attributable effects.

$$\hat{\tau}_{ATE} = \frac{1}{N} \sum y_i(1) - \frac{1}{N} \sum y_i(0)$$

where $\hat{\tau}_{ATE}$ is the average treatment effect, N is the sample size, and $y_i(1)$ and $y_i(0)$ refer to the treatment and control groups, respectively. This equation may look complicated, but it is simply a difference in means: for each outcome of interest, you compute the average value among the treatment population and subtract the average value of the comparison group. In this case, the difference in the population means is identical to the ATE.

The FED survey, of course, was not conducted in laboratory. In order to ensure coverage of the population, the study stratified its surveys according to county, value chain, cohort year, and overlap with the baseline survey. For logistical reasons, surveys in the field are almost always clustered--and the FED impact survey is no exception. In this case, a farming group was randomly selected and then a number of survey respondents was selected from within that group.

Stratification and clustering require changes to the ATE. This is because people who live in the same location are likely to share certain attributes, while people in different strata are likely to differ on those attributes. For example, suppose a survey interviewed 100 beneficiaries and 100 comparison farmers. Suppose further that 80 of the beneficiary farmers are located in Nimba county and 20 are located in Bong, while only 20 comparison farmers are located in Nimba and the rest are in Bong County. A simple difference in means between these two populations would ignore the differences in agriculture and economy between these two counties.

Two tools are used to account for stratification and clustering: survey weights and an adjusted ATE estimator. Survey weights account for stratification to produce reliable population-level estimates. The ATE uses these survey weights, but also accounts for how clustering affects the estimate of impact of a project. For this reason, the ATE often diverges from the difference in population means. The ATE used in the FED impact study is as follows:

$$\hat{\tau}_{ATE} = \sum_{EA \in S} \frac{n_{EA}}{n} \left(\frac{1}{n_{EA1}} \sum_{EA \cap T} y_i - \frac{1}{n_{EA0}} \sum_{EA \cap C} y_i \right)$$

where y_i is the observed outcome of interest in farmer i ; S is a set of strata; T and C are the collections of units in in treatment and control; n and n_{EA} denote the number of all units and units in the enumeration area (EA) respectively; and n_{EA1} and n_{EA0} denote the number of treated and untreated surveys in the EA.⁶⁴

The notation is difficult to parse, but the equation can be broken down into simpler components. First, let's examine the difference in means part of the equation, which appears in the parentheses. The expression $\frac{1}{n_{EA1}} \sum_{EA \cap T} y_i$ is the average value of the outcome of interest (gross margin, etc.), computed using survey weights, for the beneficiary farmers in a specific EA; the expression $\frac{1}{n_{EA0}} \sum_{EA \cap C} y_i$ is the weighted average for the comparison farmers in that same location. Taking the

⁶⁴ This ATE estimator derives from the following peer-reviewed paper, which analyzes an impact evaluation in Lofa County, Liberia: Fearon et al. 2009. "Can development aid contribute to social cohesion after civil war? Evidence from a field experiment in post-conflict Liberia." *American Economic Review* 99(2).

averages in this way eliminates the effect of imbalances in the response rate. For example, suppose the survey interviewed 20 beneficiary farmers but only 15 comparison farmers. This equation corrects for the imbalance in the number of surveys; it also adjusts for differences in the survey weights between and within the two groups.

Second, let's examine how these village-level differences between beneficiaries aggregates to an average treatment effect. The fraction $\frac{n_{EA}}{n}$ adjusts the importance of the village-level differences based on the relative size of the farming group and stratum. Larger farming groups and larger strata (for example, rice farmers in Nimba County) have more weight on the overall estimate. These weighted results are then added together for the overall estimate.

The result of this procedure is to downplay the influence of "outlier" communities, compared to the population estimate. For example, if there are large differences in outcome between beneficiaries and comparison farmers in one community, but the differences are not great in the other locations, the ATE will be less than the difference in the population estimates. The next section provides a more detailed discussion of why this is the case, as well as a concrete example.

Why the ATE Differs from Population-Estimates

In most studies, the ATE is very similar to a simple difference in population estimates. In the FED study, however, there are a few instances where the ATE is substantially different than the population estimates--or even appears to contradict them. This section first explains why these differences exist and then provides a case study of a particular estimate in the report: farmers who believe that taking out a loan was a good idea.

To understand why this research design can produce counter-intuitive ATE estimates, it is necessary to compare this research design to a "typical" population-based survey. A typical survey design identifies strata based on major geographic and/or population divisions: county, urban/rural, male/female, etc. The number of surveys allocated to each stratum usually follows the relative population of each stratum, since this results in the most efficient survey estimates (i.e. this design produces more precise estimates with the same number of surveys). Such a survey design is known as "self-weighting" and results in survey weights that are either identical for all respondents, or at least very similar. Some surveys will "over-sample" key areas of interest, which results in more variation. For example, the population-based survey for USAID/Liberia's Feed-the-Future program had weights ranging from 24 to 516. By contrast, the weights for the FED impact study, due to its complicated use of stratification, vary from 4 to 1,232.

In typical surveys, respondents in the same locations share the same survey weights. This is not the case in the FED study, where up to three different farm groups were surveyed in each location, as well as a comparison group. The result is a highly unequal distribution of weights within some communities. For example, in one of the Lofa county locations, some surveys have a weight of 85 while others have a weight of 1,232. The surveys with high weights will have a large impact on the population estimates, but not much extra impact on the ATE.

The difference between the ATE and the population estimates is counterintuitive, but a concrete example can make the logic clearer. Table 5.3.4 in the study shows that 70.2% of beneficiary farmers and 73.4% of comparison farmers believe it was a good decision to take out a loan. These population estimates show that, on average, comparison farmers are more likely to believe that a loan was a good idea than the FED farmers. The study, however, estimates a *positive* ATE of 6.8%. According to the ATE, participating in the FED project makes a farmer *more likely* to believe that a loan was a good idea.

How can this be? How is it possible that comparison farmers are more likely to believe a loan was a good idea, while at the same time the FED project made beneficiary farmers more likely to hold these same beliefs? Recall that the ATE combines the village-level results, while the population-level estimate compiles the individual results. Table 1 shows the village-level averages, which were computed using survey weights. Two things are worth noting. First, the percentages are higher for FED beneficiaries in 18 of the 32 locations (56%), which influences the ATE towards estimating a positive impact.

Second, the locations with high values for comparison farmers also tend to have high weights. For example, 83.3% of comparison farmers in location 2105 believe a loan was a good idea, with an average weight of 1,232. This weight is more than five times the overall average weight of 220 for comparison farmers. FED farmers in this location are 100% likely to think a loan was a good idea, but with a weight of 105--only 25% above the overall average weight. Overall, only 4 locations with above-average support also had above-average weights for the beneficiary group. By contrast, 8 locations for the comparison group exhibited above-average support and above-average weight. Combining these two factors means that the population estimate is pushed upwards for the comparison group, while the ATE estimate is pushed upwards for the beneficiaries.

Does this split between the population estimate and the ATE mean that one of the estimates is wrong? No. Both estimates are correct. The population estimate means that, on average, comparison farmers are more likely than beneficiary farmers to believe a loan was a good idea. But an impact study is not concerned with a population estimate: these views could be caused by a number of factors unrelated to the FED project. The impact study is concerned with how the beneficiary farmers compare with a *counterfactual*, which is composed of similar farmers *in the same communities*. Thus the ATE estimates that the FED project *increased the likelihood that farmers believe a loan was a good idea*. The fact that both of these statements can be true at the same time is counter-intuitive, but not impossible.

Table 1. Village-level results for "Do you believe the loan was a good idea?"

EA	Beneficiary Support (%)	Beneficiary Avg. Weight	Comparison Support (%)	Comparison Avg. Weight
601	28.6	20	75	64
602	49.1	389	20	20
603	71.4	106	62.5	114
605	75	111	75	290
606	100	58	71.4	266
607	66.7	47	66.7	131
608	83.3	52	60	98
609	75	42	66.7	56
610	71.4	34	66.7	364
614	70	113	71.4	216
615	100	95	83.3	584
2101	85.1	7	63.6	40
2102	57.4	15	57.1	37
2103	83.3	53	100	156
2104	69.2	59	62.5	122
2105	100	105	83.3	1232
2106	100	18	100	66
2107	81.6	110	77.8	486
2108	16.7	67	16.7	97
2109	66.7	19	75	92
2110	100	28	75	46
2117	85.7	15	85.7	44
3301	80.7	52	83.3	6
3302	77.8	72	81.8	89
3303	88.9	152	80	497
3304	53.7	468	63.6	762
3305	80	76	55.6	80
3306	100	33	50	47
3307	66.7	118	85.7	382
3308	75	118	70	307
3309	100	27	100	166
3318	83.9	22	33.3	72

ANNEX IV: SURVEY QUESTIONNAIRE

Part I

- A. Location / Basic data module
- B. Dwelling module
- C. Consent and Basic Demographics (part I)
- D. Screener Module
- E. IF VALUE CHAIN IS RICE
- F. IF VALUE CHAIN IS CASSAVA
- G. IF VALUE CHAIN IS Goats
- H. IF VALUE CHAIN IS VEGETABLES
- C. (CONT.) Demographics and Household Characteristics (PART II)
- CX. Subjective Welfare
- I. Household Income and Production
- J. Household Expenditures, Use of Inputs, and Equipment
- K. Use of Credit for business purposes
- L. Household Hunger
- M. Recent shocks to household welfare

A. Location / Basic data module

A1	Start time	Collected automatically
A2	End time	Collected automatically
A3	Date	Collected automatically
A4	Enumerator ID	_____ [integer]
A5	Location ID	_____ [integer]
A6	Value Chain Commodity for this location <i>Information can be found at top of beneficiary lists</i>	Rice Cassava Goat Vegetables
A7	Type of Survey	Beneficiary Comparison (Random Selection)
A8	[If Beneficiary survey] Year of Participation in FED project <i>Information can be found at top of beneficiary list</i>	FY13 FY14 FY15
A9	[If Beneficiary survey] Number on list <i>Please enter the number next to the person's name on the list</i>	_____ [integer]
A10	[If comparison survey] Household ID	_____ [integer]
A11	GPS coordinates	Collected by tablet

B. Dwelling module

B1	ROOF TOP MATERIAL (OUTER COVERING) OBSERVE (DO NOT ASK) :	None Thatched / mat / palm / bamboo Wood planks Tarpaulin / plastic Zinc / metal / aluminum Cement / Concrete Shingles / tiles Mud
B2	EXTERIOR WALL MATERIAL OBSERVE (DO NOT ASK) :	None Thatched / mat / palm / bamboo Wood planks Tarpaulin / plastic Zinc / metal / aluminum Cement / Concrete Shingles / tiles

		Mud
B3	FLOOR MATERIAL OBSERVE (DO NOT ASK)	None Thatched / mat / palm / bamboo Wood planks Tarpaulin / plastic Zinc / metal / aluminum Cement / Concrete Shingles / tiles Mud

C. Consent and Basic Demographics (part I)

C1	[ONLY FOR COMPARISON SURVEY] Does anyone in this household produce [insert name of specific value chain commodity]?	Yes No → END SURVEY
C2	[For a random percentage (TBD) of COMPARISON households?] Are any female members of the household involved in producing this item?	Yes No
C2a	[IF BENEFICIARY OR C1=YES] Does this person consent to be interviewed? [IF C2=YES] <i>Enumerator should ask to interview one of the female household members involved in the production of the value chain commodity.</i>	Yes → Continue survey No – decline to participate No – too busy No – Not home and could not be re-contacted → END SURVEY
C3	Sex	Male Female
C4	Age	_____ [integer]
C6	Are you the head of the household?	Yes No
C10	How many people can eat from the same pot in this household most days?	_____ [integer]

D. Screener Module

D1	Are you a member of a farmer group or kuu?	Farmer group Kuu
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		Both No Decline to answer
D2	[If D1=Farmer group, kuu, or both] In the past three years (since 2013), has this group received assistance from FED (Food and Enterprise Development Program), a program of USAID?	Yes No Don't know
D3	[IF D1=YES] In the past three years (since 2013), has this group received assistance from any other organization or program?	Yes No Don't know
D4	[IF D1=YES] In the past three years (since 2013), has this group ever received assistance from the Ministry of Agriculture?	Yes No Don't know / Decline to answer
D5	In the past three years, have you personally received assistance from FED (Food and Enterprise Development Program), a program of USAID?	Yes No Decline to answer
D5a	In the past three years, have you received assistance from an NGO or the Ministry of Agriculture?	Yes No Decline to answer
D6	[If D3=YES, D4=YES, D5=YES, D5a=YES] What kind of assistance did you or your group receive?	Inputs (seeds, plants, fertilizer, tools) Financial assistance (loans, credit) Instruction in farming methods (how to plant crops, raise livestock, etc.) Other assistance
D7	Are you currently involved in a communal / demonstration farm?	Yes No Decline to answer
D7a	[If D7=YES] Who provides support for this communal farm? <i>Mark all that apply</i>	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know

D7b	[IF D7=YES] What does the communal / demonstration farm produce? <i>Mark all that apply</i>	Rice Cassava Vegetables Goats Other Decline to answer
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Farming land/animals, methods, and inputs module (to be asked to all respondents)

E. IF VALUE CHAIN IS RICE:

E1	What size is the farm land that you are planting rice on? <i>Enter amount in hectares. Only include personal land, not communal / demonstration farms.</i>	_____ [integer]
E2	How much seed rice did you plant last season on your personal land? <i>Enter amount in buckets or bags (25kg)</i>	_____ [integer]
E5	Do you make seed beds for the rice on your personal land?	Yes No Don't Know
E6	[If E5=YES] Do you put the rice in the seed beds within one week, or do you wait more than one week to put the rice in the seedbeds?	Within one week More than one week No set schedule / can be more or less than one week Don't know
E6a	[If E6=More than one week] Where did you learn that you should wait before putting the rice in the seed beds?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Decline to answer
E6b	[IF E6a=Friend/family/farm group] Where did they learn?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
E7X	Do you scatter the seed rice directly onto the field or do you put the seeds in a nursery and let them sprout first?	Scatter Nursery Decline to answer
E7		

	[IF E7X = Nursery] After the seed rice sprouts, how many days do you wait before moving the seedling to the field?	15 days or less More than 15 days No set schedule / can be more or less than 15 days Don't know
E7a	[If E7=15 days or less] Where did you learn that you should move the seedlings to the field in less than 15 days?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Decline to answer
E7b	[IF E7a=Friend/family/farm group] Where did they learn?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
E8	In the past year, have you used urea fertilizer on your farm? <i>Personal farm, not communal / demonstration farm</i>	Yes No Don't know
E9	[If E8=Yes] When you use the urea fertilizer, do you spread it on the ground, or dig a hole and put it down inside?	Spread on ground In hole Don't know
E9a	[If E9=In hole] Where did you learn that you should put the urea in the ground?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Decline to answer
E9b	[IF E9a=Friend/family/farm group] Where did they learn?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
E10	[If E8=Yes] Where did you get the urea fertilizer?	Bought at store or from trader Friend / family /farmer group FED / USAID NGO Ministry of Agriculture Don't know

E11	[IF E10=Friend/family/farm group] Where did they get the urea fertilizer?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
E12	Do you use any irrigation or ditches to control water on your farm? <i>Personal farm, not demonstration / communal farm</i>	Yes No Don't know
E12a	[If E12=Yes] Where did you learn about irrigation / water control?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Decline to answer
E12b	[IF E12a=Friend/family/farm group] Where did they learn?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
E13	In the past year, have you used any improved rice seeds (NERICA) on your farm? <i>Personal farm, not communal / demonstration farm</i>	Yes No Don't Know
E13a	[If E13=Yes] Where did you get these improved seeds?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Decline to answer
E13b	[IF E12a=Friend/family/farm group] Where did they get the seeds?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know

F. IF VALUE CHAIN IS CASSAVA:

F1		_____ [integer]
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	What is the size of the farm land that you are planting cassava on? <i>Enter amount in hectares. Only include personal farm land, not communal / demonstration farm</i>	
F2	How many cassava stems did you plant last season on your farm? <i>Enter number of plants / stems</i> <i>Only include personal farm, not communal / demonstration farm</i>	_____ [integer]
F3	Do you plant your cassava on flat ground, or do you build a mound / ridge and put the plant there?	Flat Mound / ridge Don't know
F3a	[If F3=Mound / ridge] Where did you learn to plant cassava like this?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Decline to answer
F3b	[IF F3a=Friend/family/farm group] Where did they learn?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
F4	How far apart do you plant your cassava? <i>Personal farm, not communal / demonstration farm</i>	1 meter / one step Less than 1 meter / step More than 1 meter / step Don't know
F4a	[If F4=1 meter / one step] Where did you learn to plant cassava like this?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Decline to answer
F4b	[IF F4a=Friend/family/farm group] Where did they learn?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know

F5	When you plant cassava on your farm, do you plant one stem or more than one stem per hold/mound/ridge	One stem More than one stem Depends / different amounts Don't know
F5a	[If F5=One stem] Where did you learn to plant cassava like this?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Decline to answer
F5b	[IF F5a=Friend/family/farm group] Where did they learn?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
F6	In the past year, have you used any of the improved varieties of cassava (TMS series of IITA, Caricas) on your farm? <i>Personal farm, not demonstration or communal farm.</i>	Yes No Don't Know
F6a	[If F6=Yes] Where did you get the improved cassava?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Decline to answer
F6b	[IF F6a=Friend/family/farm group] Where did they get the improved cassava?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
F7	When you plant cassava on your farm, do you let it be by itself in the field or do you plant other crops with it? <i>Personal farm, not communal / demonstration farm</i>	By itself Other crops Don't know
F8	[If F7=Other crops] What other crops do you plant with the cassava?	Legumes (peanuts and cowpeas) Other
F8a	[If F8=Legumes] Where did you learn to plant cassava like this?	Friend/family/farm group FED / USAID

		NGO Ministry of Agriculture Salesman / businesses / trader Decline to answer
F8b	[IF F8a=Friend/family/farm group] Where did they learn?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know

G. IF VALUE CHAIN IS GOATS:

G1	How many goats do you own?	_____ [integer]
G2	Do you have shelters especially for the goats, or do the goats stay in your house or just stay outside?	Shelters House / another non-dedicated structure Outside Don't know
G2x	[If G2=Shelters] Who built the shelters?	Myself / friends / family FED / USAID NGO Ministry of Agriculture Other Decline to answer
G2a	[If G2=Shelters & G2x=Myself/friends/family] Where did you learn to build these shelters?	Friend/family/producer group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Decline to answer
G2b	[IF G2a=Friend/family/farm group] Where did they learn?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
G3	Are your goats vaccinated?	Yes No Don't know
G3a	[If G2=Yes] Who vaccinated them?	Friend/family/producer group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Local veterinary provider Don't know
G4	Have your goats been dewormed?	Yes No Don't know
G4a		

	[If G4=Yes] Who dewormed them?	Friend/family/producer group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
G5	Do your goats have ear tags?	Yes No Don't know
G5a	[If G4=Yes] Who tagged them?	Friend/family/producer group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
G6	Do you have a salt / mineral lick for your goats?	Yes No Don't know
G6a	[If G6=Yes] Where did you get this, or who taught you how to build it?	Friend/family/producer group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
G7	Have your goats received veterinary services?	Yes No Don't know
G7a	[If G7=Yes] Who provided the veterinary services?	Friend/family/producer group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know

H. IF VALUE CHAIN IS VEGETABLES:

H1	What is the farm size that you are planting vegetables on? <i>Enter amount in hectares (or another unit?)</i> <i>Personal land, not communal / demonstration land</i>	_____ [integer]
H2	Who taught you how far apart you should be planting the vegetables?	Friend/family/producer group FED / USAID NGO

		Ministry of Agriculture Salesman / businesses / trader Don't know
H2a	[IF H2=Friend/family/farm group] Where did they learn?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
H3	Do you plant your vegetables on flat ground or do you build plant beds? <i>Personal farm, not communal / demonstration farm</i>	Flat ground Plant beds Don't know
H3a	[If H3=Plant beds] Where did you learn to build plant beds?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Decline to answer
H3b	[IF H3a=Friend/family/farm group] Where did they learn?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
H4	In the past year, have you used any compost or fertilizer for your vegetables? <i>Personal farm, not communal / demonstration farm</i>	Yes No Don't know
H4a	[If H4=Yes] Where did you get it from / who taught you how to use it?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Decline to answer
H4b	[IF H4a=Friend/family/farm group] Where did they get the compost / fertilizer?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
H5		

	In the past year, have you planted any improved high value vegetable varieties (high yielding and disease resistant) on your farm? <i>Personal farm, not communal / demonstration farm.</i>	Yes No Don't Know
H5a	[If H5=Yes] Where did you get these improved seeds?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Decline to answer
H5b	[IF H5a=Friend/family/farm group] Where did they get the seeds?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know
H6	Do you use any irrigation or ditches to control water on your farm? <i>Personal farm, not communal / demonstration farm</i>	Yes No Don't know
H6a	[If H6=Yes] Where did you learn about irrigation / water control?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Decline to answer
H6b	[IF H6a=Friend/family/farm group] Where did they learn?	Friend/family/farm group FED / USAID NGO Ministry of Agriculture Salesman / businesses / trader Don't know

SCREENING CRITERIA

(NOTE: “!=” MEANS “DOES NOT EQUAL”)

General idea:

Exclude people who (a) directly benefitted from FED, (b) was given inputs or instructions by someone who benefitted from FED, or (c) benefitted directly from an NGO providing similar services (communal farm)

CONTINUE SURVEY IF:

No direct benefits from FED or similar program :

D2 != YES

D7 != Yes and D7a != FED or NGO and D7b != specific value chain commodity

No indirect benefits from FED:

E4a, E6b, E7b, E9b, E11, E12b, E13b != “FED/ USAID”

F3b, F4b, F5b, F6b, F8b != “FED / USAID”

G2b != “FED / USAID”

H2a, H3b, H4b, H5b, H6b != “FED / USAID”

C. (CONT.) Demographics and Household Characteristics (part II)

C5	What dialect do you speak besides English?	[List of ethnic groups / languages]
C7	[IF C6=No] What is your relation to the head of the household?	Spouse Son/Daughter Son-/Daughter-in-law Grandson / Granddaughter Father / Mother Nephew / Niece Nephew / Niece of Spouse Uncle / Aunt Uncle / Aunt of Spouse Cousin Brother-in-law / Sister-in-law Father-in-law/ Mother-in-law Other relative Servant / maid Laborer Other relationship (not family) Decline to answer / No response
C8	What is the highest level of education you have completed?	Less than P1 / no school Primary level 1-3 Primary level 4-6 Secondary junior 7-9 Secondary senior 10-12 University or above Technical or vocational Adult literacy only (no formal education) Koranic / religious only (no formal education) Decline to answer / no response

C9	Can you read and write?	Cannot read or write Can (sign) write only Can read only Can read and write Decline to answer
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C11	Does this household have electricity?	Yes No Don't know
C11a	[If C11 = Yes] About how many hours per day does the household use electricity?	_____ [integer]
C12	What is the main source of lighting for this household?	Electricity via national grid (LEC) Solar panel Propane Generator (private) Generator (shared / public) Lanterns (kerosene) Lanterns (battery / Chinese lamp) Other: _____
C13	How many children between the ages of 5 and 16 are members of this household?	_____ [integer]
C14	[If C13 > 0] How many of these children are currently attending school?	_____ [integer]
C15	What is the main source of drinking water for your household?	[Options from FtF survey] Liberia Water and Sewer Corporation Community hand pump Well Nearby water body

C16	How many of the following does your household own?	
A	Mobile phones	
B	Radio	
C	Generator	
D	Motorcycle	
E	Vehicle	
F	Bicycle	
G	Television	
H	Electric fan	

CX. Subjective Welfare

Now we would like to ask you about how satisfied you are with different aspects of your life

CX1	Your health? (Are you well in your body?)	Very satisfied Satisfied Dissatisfied Very dissatisfied
CX2	Your financial situation? (Do you have money to take care of you and your family?)	Very satisfied Satisfied Dissatisfied Very dissatisfied
CX3	Your housing? (Your house)	Very satisfied Satisfied Dissatisfied Very dissatisfied
CX4	Healthcare available to your household? (When you are feeling sick do you have a clinic or doctor/nurse to help you get well?)	Very satisfied Satisfied Dissatisfied Very dissatisfied
CX5	Education available to your household?	Very satisfied Satisfied Dissatisfied Very dissatisfied
CX6	Your job / business / source of income?	Very satisfied Satisfied Dissatisfied Very dissatisfied
CX7	Your life as a whole?	Very satisfied Satisfied Dissatisfied Very dissatisfied
CX8	Just thinking about your current circumstances, would you describe yourself as:	Rich Comfortable Can manage to get by Never have quite enough Poor
CX9		Rich

	Just thinking about your circumstances that you were living in 3 years ago , would you describe yourself as:	Comfortable Can manage to get by Never have quite enough Poor
CX10	If you imagine your life in the future, 3 years from now , do you think you will be:	Rich Comfortable Can manage to get by Never have quite enough Poor

I. Household Income and Production

I1. What are the sources of cash income for the household? Please check all that apply.

	Income Category	Y/N	Average Monthly Income Dry Season (LD / USD)	Average Monthly Income Rainy Season (LD / USD)
A	Sales of field crops			
B	Business			
C	Mining			
D	Sale of cash crop			
E	Skilled Labor			
F	Casual Labor			
G	Petty Trade			
H	Salary/Gov't. job			
I	Remittances			
J	Agricultural wage labor			
K	Firewood/charcoal sales			
L	Sales of livestock/products			
M	Sales of orchard products			
N	Handicrafts			
O	Other Gov't benefits			
P	Begging			
Q	Driver			
R	Motorbike			
S	Other – please specify			

IX1	[If D7=YES] Thinking about the communal / demonstration farm: How much was produced in total from this communal farm last harvest?	_____ [integer] (25kg bags / buckets) [unit options]
IX1a	[If D7=YES] How much of this was sold?	_____ [integer] (25kg bags / buckets) [unit options]

IX1b	[IX1a > 0] What was the price per [25kg bag / bucket]?	
IX2	[If D7=YES] Over the past year, did you personally receive any produce or money from the communal / demonstration farm?	Yes No Decline to answer
IX2a	[If IX2 = YES] Did you personally receive produce, money, or both?	Produce Money Both Decline to answer
IX2b	[If IX2a = Produce or Both] How much produce?	_____ [integer] (Bags / kg) [unit options]
IX2c	[If IX2a = Money or Both] How much money?	_____ [integer] (LD / USD)

I2	[IF VALUE CHAIN IS RICE OR CASSAVA]: How many 50kg bags of [rice / cassava] did you personally produce during the last harvest? <i>This does NOT include any produce from communal / demonstration farms</i>	_____ [integer]
I3	[If I2 > 0] How many of these bags did you sell?	_____ [integer]
I4	[If I3 > 0] How much money did you receive for ONE bag? <i>If sold bags at different prices, try to estimate an average price</i>	_____ [integer] USD / LD (select one)
I5	[If I2 > 0] How many of these bags did you keep to use at home?	_____ [integer]
I5	[If I2 > 0] How many of these bags were extra (bags that you wanted to sell but were not able to, even though they were not spoiled)?	_____ [integer]
I6	[If I2 > 0] About how much of your harvest was spoiled (not usable for food)?	None A small amount (less than half) About half

		More than half Nearly all Don't know
I7	[IF value chain is goats] In the past year, how many goats have you sold?	_____ [integer]
I8	[If I7 > 0] How much money did you receive for ONE goat? <i>If sold goats at different prices, try to estimate an average price</i>	_____ [integer] USD / LD (select one)
I9	[IF value chain is goats] In the past one year, how many goats have you killed for eating in your household?	_____ [integer]
I10	[IF value chain is goats] In the past one year, how many of your goats have died?	_____ [integer]
I11	[IF value chain is goats] In the past one year, how many goats have been born?	_____ [integer]
I12	[If value chain is vegetables] In the past one year, how much money have you received from selling vegetables that you produced on your personal land? <i>This does NOT include any produce from communal / demonstration farms</i>	_____ [integer] USD / LD (select one)
I13	[If value chain is vegetables] About how much of your harvest was eaten at home?	None A small amount (less than half) About half More than half Nearly all Don't know
I14	[If value chain is vegetables] About how much of your harvest was spoiled?	None A small amount (less than half) About half More than half Nearly all Don't know

I15	[If value chain is vegetables] About how much of your harvest was extra (vegetables that you wanted to sell but were not able to, even though they were not spoiled)?	None A small amount (less than half) About half More than half Nearly all Don't know
I15A	[If value chain is vegetables] What did you do with this extra produce?	Stored it Processed it Donated it Discarded it Don't know

I16	How many animals do you have?	
A	Cattle	
B	Goats	
C	Sheep	
D	Chicken / Ducks, Guinea fowl	
E	Pigs	

I17	Does anyone in the household have a bank account?	Yes No Don't know
I18	[If I17 =Yes] If you added up all the money in all the bank accounts for people in this household, about how much money would it be?	_____ LD / USD

J. Household Expenditures, Use of Inputs, and Equipment

J1	How much money did you spend on the following items to support your agricultural activities over the past one year?	_____ (LD / USD)
A	Water	_____ (LD / USD)
B	Electricity (Generator, fuel, oil, maintenance, etc.)	_____ (LD / USD)
C	Seed rice	_____ (LD / USD)
Ca	Other seeds (vegetables, etc.)	
D	Seedlings / cuttings / stems for rice, cassava, or vegetables	_____ (LD / USD)
E	Storage for crops or goats	_____ (LD / USD)
F	Fertilizer for rice	_____ (LD / USD)
Fa	Fertilizer for cassava	
Fb	Fertilizer for vegetables	
G	Pesticides for rice	_____ (LD / USD)
Ga	Pesticides for cassava	
Gb	Pesticides for vegetables	
H	Hired labor for rice	_____ (LD / USD)
Ha	Hired labor for cassava	

Hb	Hired labor for vegetables	
Hc	Hired labor for goats	
Hd	Hired labor for other tasks	
I	Hired security / enforcement	_____ (LD / USD)
J	Veterinary medicine for goats	_____ (LD / USD)
Ja	Veterinary medicine for other animals	
K	Transportation	_____ (LD / USD)
L	Equipment	_____ (LD / USD)
M	Rent	_____ (LD / USD)
N	Food for goats	_____ (LD / USD)
O	Food for other animals	

J2. How many people (both paid and unpaid, including family and yourself) work on your agriculture and livestock production?

Number of laborers – PAID: Men _____ Women _____

Number of laborers – UNPAID: Men _____ Women _____

J3	How many pieces of each type of equipment do you own? <i>Enter 0 if they do not own the item.</i>	
A	Cutlasses / Brushing	
B	Power tiller	
C	Mechanical weeder / rotating hoe	
D	Rice mill	
E	Mechanical thresher	
F	Mechanical press	
G	Mechanical grater	
H	Sieve	
I	Gari fryer	
J	Goat shelters	
K	Salt / mineral licks for animals	
L	Drip irrigation or sprinkler system	
M	Cold storage boxes (cooler)	

J4	In the past one year, have you received any of the following items at no cost for use on your farm? <i>Personal farm, not communal / demonstration farm</i>	
A	Seed rice	Yes No Decline / don't know
B	Other seeds (vegetables, etc.)	Yes No Decline / don't know
C	Seedlings / cuttings / stems for rice, cassava, or vegetables	Yes No

		Decline / don't know
D	Storage for crops or goats	Yes No Decline / don't know
E	Fertilizer for rice	Yes No Decline / don't know
F	Fertilizer for cassava	Yes No Decline / don't know
G	Fertilizer for vegetables	Yes No Decline / don't know
H	Pesticides for rice	Yes No Decline / don't know
I	Pesticides for cassava	Yes No Decline / don't know
J	Pesticides for vegetables	Yes No Decline / don't know
K	Veterinary medicine for goats	Yes No Decline / don't know
L	Veterinary medicine for other animals	Yes No Decline / don't know
M	Transportation	Yes No Decline / don't know
N	Equipment	Yes No Decline / don't know
O	Rent	Yes No

		Decline / don't know
P	Food for goats	Yes No Decline / don't know
Q	Food for other animals	Yes No Decline / don't know

J5	Other Expenditures: In the past year how much did you spend on the following items that were not directly related to agricultural production?	
A	Education?	_____ (LD / USD)
B	Housing?	_____ (LD / USD)
C	Other	_____ (LD / USD)

K. Use of Credit for business purposes

K1	In the past three years, has anyone in the household borrowed any money to support your agriculture or livestock activities?	Yes No Don't know
K2	[If K1=Yes] What was the loan for? <i>Mark all that apply</i>	Seeds / seedlings / cuttings / young animals Fertilizer / pesticides / vaccinations Labor Equipment / shelters / storage School Fees Medical expenses Non-agricultural business Other household or personal expenses (food, etc.) Other: _____
K3	[If K1=Yes] How much was the loan for? <i>List the original amount of the loan. If more than one loan, list the total amount (add all the loans together)</i>	_____ LD / USD
K4	[If K1=Yes] Have you repaid the loan?	Yes No Don't know
K5	[If K4=No] How much money is left to repay? <i>If more than one loan, list the total balance</i>	_____ LD / USD

K6	[If K1=Yes] Do you think it was a good decision to borrow the money?	Yes No Don't know
K7	[If K1=Yes] What was the source of the loan(s)? Mark all that apply	Family / friends / farm group Bank Microfinance Solidarity group Community savings / credit group / VSLA Informal lender Other:_____
K8	Do you plan to borrow money in the future to support your agriculture or livestock activities?	Yes No Don't know
K9	[If K8=Yes] Who do you plan to borrow money from?	Family / friends / farm group Bank Microfinance Solidarity group Community savings / credit group / VSLA Informal lender Other:_____
K10	[If K8=Yes] What would you use the loan for?	Seeds / seedlings / cuttings / young animals Fertilizer / pesticides / vaccinations Labor Equipment / shelters / storage Household expenses Other:_____

L. Household Hunger

L1	In the past 1 month, was there ever no food to eat of any kind in your house because of lack of resources to get food?	Yes No
L2	[If L1 = Yes] How often did this happen in the past 1 month?	Rarely (1-2 times) Sometimes (3-10 times) Often (more than 10 times)

L3	In the past 1 month, did you or any household member go to sleep at night hungry because there was not enough food?	Yes No
L4	[If L3 = Yes] How often did this happen in the past 1 month?	Rarely (1-2 times) Sometimes (3-10 times) Often (more than 10 times)
L5	In the past 1 month, did you or any household member go a whole day and night without eating anything at all because there was not enough food?	Yes No
L6	[If L5 = Yes] How often did this happen in the past 1 month?	Rarely (1-2 times) Sometimes (3-10 times) Often (more than 10 times)

M. Recent shocks to household welfare

M1	Over the past 1 year, was your household severely affected negatively by any of the following?	
A	Drought, floods, or fire	Yes No Don't know
B	Crop disease / pests	Yes No Don't know
C	Livestock deaths / stolen	Yes No Don't know
D	Household business failure	Yes No Don't know
E	Loss of job	Yes No Don't know
F	Large fall in sale prices for crops	Yes No

		Don't know
G	Large rise in price of food	Yes No Don't know
H	Large rise in prices for inputs (seeds, fertilizer)	Yes No Don't know
I	Water shortage	Yes No Don't know
J	Restricted access to markets	Yes No Don't know
K	Sickness or accident of household member (including EVD)	Yes No Don't know
L	Death of household member	Yes No Don't know
M	Death of other family member (not in the household)	Yes No Don't know
N	Crime / theft / burglary / assault	Yes No Don't know
O	Dwelling damaged, destroyed	Yes No Don't know
M2	<i>Question for enumerator:</i> What is the status of this interview?	Complete Partially complete Not complete

Part II

A. Household Consumption Expenditure

Food Consumption Over Past One Week

FOOD ITEM	ITEM CODE	Over the past one week, did you or others in your household eat any [FOOD ITEM]?	How much in total did your household eat in the past week?		How much of what you ate came from purchases?		How much did you spend on what was eaten last week? If your family ate part but not all of something you purchased, estimate what you spent only on the part that was consumed.	How much of what you ate came from your household's own production?		CHECK E1.06A. IF E1.06A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."	How much of what you ate came from gifts or other sources?		CHECK E1.07A. IF E1.07A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."
E1.01		E1.02	E1.03A QUANTITY	E1.03B UNIT	E1.04A QUANTITY	E1.04B UNIT	E1.05 USD/ LRD	E1.06A QUANTITY	E1.06B UNIT	E1.06C ESTIMATE USD/LRD	E1.07A QUANTITY	E1.07B UNIT	E1.07C ESTIMATE USD/LRD
Cereals, Grains and Cereal Products	01-20												
Maize/Corn boiled	01	YES.....1 NO... 2→ NEXT ITEM											
Maize/Corn roasted	02	YES.....1 NO... 2→ NEXT ITEM											
Rice	03	YES.....1 NO... 2→ NEXT ITEM											
Wheat flour	04	YES.....1 NO... 2→ NEXT ITEM											
Bulgar wheat	05	YES.....1 NO2→ NEXT ITEM											
Farina	06	YES.....1 NO2→ NEXT ITEM											

FOOD ITEM	ITEM CODE	Over the past one week, did you or others in your household eat any [FOOD ITEM]?	How much in total did your household eat in the past week?		How much of what you ate came from purchases?		How much did you spend on what was eaten last week? If your family ate part but not all of something you purchased, estimate what you spent only on the part that was consumed.	How much of what you ate came from your household's own production?		CHECK E1.06A. IF E1.06A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."	How much of what you ate came from gifts or other sources?		CHECK E1.07A. IF E1.07A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."
E1.01		E1.02	E1.03A QUANTITY	E1.03B UNIT	E1.04A QUANTITY	E1.04B UNIT	E1.05 USD/ LRD	E1.06A QUANTITY	E1.06B UNIT	E1.06C ESTIMATE USD/LRD	E1.07A QUANTITY	E1.07B UNIT	E1.07C ESTIMATE USD/LRD
Bread	07	YES.....1 NO... 2→ NEXT ITEM											
Cookies/fritters/kala	08	YES.....1 NO2→ NEXT ITEM											
Biscuits	09	YES.....1 NO... 2→ NEXT ITEM											
Spaghetti, macaroni, pasta	10	YES.....1 NO... 2→ NEXT ITEM											
Breakfast cereal/ Quaker oats, corn meal	11	YES.....1 NO... 2→ NEXT ITEM											
Rice/Plantain porridge	12	YES.....1 NO2→ NEXT ITEM											
Infant feeding cereals (for example Gerber, Cerelac)	13	YES.....1 NO... 2→ NEXT ITEM											
Any other cereals	17-20	YES.....1 NO... 2→ NEXT ITEM											
Roots, Tubers, and Plantains	21-35												

FOOD ITEM	ITEM CODE	Over the past one week, did you or others in your household eat any [FOOD ITEM]?	How much in total did your household eat in the past week?		How much of what you ate came from purchases?		How much did you spend on what was eaten last week? If your family ate part but not all of something you purchased, estimate what you spent only on the part that was consumed.	How much of what you ate came from your household's own production?		CHECK E1.06A. IF E1.06A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."	How much of what you ate came from gifts or other sources?		CHECK E1.07A. IF E1.07A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."
E1.01		E1.02	E1.03A QUANTITY	E1.03B UNIT	E1.04A QUANTITY	E1.04B UNIT	E1.05 USD/ LRD	E1.06A QUANTITY	E1.06B UNIT	E1.06C ESTIMATE USD/LRD	E1.07A QUANTITY	E1.07B UNIT	E1.07C ESTIMATE USD/LRD
Cassava tubers	21	YES.....1 NO... 2→ NEXT ITEM											
Cassava flour	22	YES.....1 NO... 2→ NEXT ITEM											
White sweet potato	23	YES.....1 NO... 2→ NEXT ITEM											
Red/Orange/Yellow sweet potato	24	YES.....1 NO... 2→ NEXT ITEM											
Eddoes	25	YES.....1 NO2→ NEXT ITEM											
White yams	26	YES.....1 NO2→ NEXT ITEM											
Irish potato/white potato	27	YES.....1 NO... 2→ NEXT ITEM											
Potato crisps	28	YES.....1 NO... 2→ NEXT ITEM											
Plantain, cooking banana	29	YES.....1 NO... 2→ NEXT ITEM											

FOOD ITEM	ITEM CODE	Over the past one week, did you or others in your household eat any [FOOD ITEM]?	How much in total did your household eat in the past week?		How much of what you ate came from purchases?		How much did you spend on what was eaten last week? If your family ate part but not all of something you purchased, estimate what you spent only on the part that was consumed.	How much of what you ate came from your household's own production?		CHECK E1.06A. IF E1.06A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."	How much of what you ate came from gifts or other sources?		CHECK E1.07A. IF E1.07A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."
E1.01		E1.02	E1.03A QUANTITY	E1.03B UNIT	E1.04A QUANTITY	E1.04B UNIT	E1.05 USD/ LRD	E1.06A QUANTITY	E1.06B UNIT	E1.06C ESTIMATE USD/LRD	E1.07A QUANTITY	E1.07B UNIT	E1.07C ESTIMATE USD/LRD
Cocoyam	30	YES.....1 NO... 2→ NEXT ITEM											
Any other roots, tubers, or plantains	29-35	YES.....1 NO... 2→ NEXT ITEM											
Nuts, Pulses, and Seeds 36-50													
Bean, white	36	YES.....1 NO... 2→ NEXT ITEM											
Bean, brown (Kpakutoweh/"you will kill me")	37	YES.....1 NO... 2→ NEXT ITEM											
Butter Beans	38	YES.....1 NO2→ NEXT ITEM											
Kidney Beans	39	YES.....1 NO2→ NEXT ITEM											
Split Peas	40	YES.....1 NO2→ NEXT ITEM											
Bread nuts	41	YES.....1 NO2→ NEXT ITEM											

FOOD ITEM	ITEM CODE	Over the past one week, did you or others in your household eat any [FOOD ITEM]?	How much in total did your household eat in the past week?		How much of what you ate came from purchases?		How much did you spend on what was eaten last week? If your family ate part but not all of something you purchased, estimate what you spent only on the part that was consumed.	How much of what you ate came from your household's own production?		CHECK E1.06A. IF E1.06A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."	How much of what you ate came from gifts or other sources?		CHECK E1.07A. IF E1.07A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."
E1.01		E1.02	E1.03A QUANTITY	E1.03B UNIT	E1.04A QUANTITY	E1.04B UNIT	E1.05 USD/ LRD	E1.06A QUANTITY	E1.06B UNIT	E1.06C ESTIMATE USD/LRD	E1.07A QUANTITY	E1.07B UNIT	E1.07C ESTIMATE USD/LRD
Groundnut/Peanuts	42	YES.....1 NO... 2→ NEXT ITEM											
Groundnut flour	43	YES.....1 NO... 2→ NEXT ITEM											
Any other nuts or pulses (specify)	45-50	YES.....1 NO... 2→ NEXT ITEM											
Vegetables 51-70													
Collard green	51	YES.....1 NO2→ NEXT ITEM											
Potato greens	52	YES.....1 NO2→ NEXT ITEM											
Cassava leaf	53	YES.....1 NO2→ NEXT ITEM											
Platto leaf	54	YES.....1 NO2→ NEXT ITEM											

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E1.01		E1.02	E1.03A QUANTITY	E1.03B UNIT	E1.04A QUANTITY	E1.04B UNIT	E1.05 USD/ LRD	E1.06A QUANTITY	E1.06B UNIT	E1.06C ESTIMATE USD/LRD	E1.07A QUANTITY	E1.07B UNIT	E1.07C ESTIMATE USD/LRD
Bitter leaf	55	YES.....1 NO2→ NEXT ITEM											
Gathered wild green leaves	56	YES.....1 NO2→ NEXT ITEM											
Any other cultivated green leafy vegetables, fresh or processed	57	YES.....1 NO... 2→ NEXT ITEM											
Bitter ball/eggplant	58	YES.....1 NO2→ NEXT ITEM											
Onion, fresh or processed	59	YES.....1 NO2→ NEXT ITEM											
Cabbage, fresh or processed	60	YES.....1 NO2→ NEXT ITEM											
Tomato, fresh or processed	61	YES.....1 NO... 2→ NEXT ITEM											
Cucumber, fresh or processed	62	YES.....1 NO... 2→ NEXT ITEM											

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Pumpkin, fresh or processed	63	YES.....1 NO... 2→ NEXT ITEM											
Okra, fresh or processed	64	YES.....1 NO... 2→ NEXT ITEM											
Mushroom, fresh or processed	65	YES.....1 NO... 2→ NEXT ITEM											
Squash	66	YES.....1 NO2→ NEXT ITEM											
Carrots	67	YES.....1 NO2→ NEXT ITEM											
Kaytalay	68	YES.....1 NO2→ NEXT ITEM											
Tinned Vegetables	69	YES.....1 NO2→ NEXT ITEM											
Any other vegetables, fresh or processed	63-70	YES.....1 NO... 2→ NEXT ITEM											

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Meat, Fish and Animal products (Other than Dairy)	71-90												
Eggs	71	YES.....1 NO... 2→ NEXT ITEM											
Dried fish	72	YES.....1 NO... 2→ NEXT ITEM											
Fresh fish, crawfish, crab, kissmeat	73	YES.....1 NO... 2→ NEXT ITEM											
Beef (cow meat)	74	YES.....1 NO... 2→ NEXT ITEM											
Goat	75	YES.....1 NO... 2→ NEXT ITEM											
Pork	76	YES.....1 NO... 2→ NEXT ITEM											
Mutton (sheep meat)	77	YES.....1 NO... 2→ NEXT ITEM											
Chicken	78	YES.....1 NO... 2→ NEXT ITEM											

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E1.01		E1.02	E1.03A QUANTITY	E1.03B UNIT	E1.04A QUANTITY	E1.04B UNIT	E1.05 USD/ LRD	E1.06A QUANTITY	E1.06B UNIT	E1.06C ESTIMATE USD/LRD	E1.07A QUANTITY	E1.07B UNIT	E1.07C ESTIMATE USD/LRD
Other poultry – duck, guinea fowl, doves, etc.	79	YES.....1 NO... 2→ NEXT ITEM											
Small animal – groundhog, opossum rabbit, mice, etc.	80	YES.....1 NO... 2→ NEXT ITEM											
Insects, for example, caterpillar, bug bug, grasshopper, bamboo worm etc.	81	YES.....1 NO... 2→ NEXT ITEM											
Tinned meat or fish	82	YES.....1 NO... 2→ NEXT ITEM											
Smoked fish	83	YES.....1 NO... 2→ NEXT ITEM											
Smoked meat	84	YES.....1 NO2→ NEXT ITEM											
Bush meat, fresh	85	YES.....1 NO2→ NEXT ITEM											
Fish Soup/Sauce	86	YES.....1 NO... 2→ NEXT ITEM											

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E1.01		E1.02	E1.03A QUANTITY	E1.03B UNIT	E1.04A QUANTITY	E1.04B UNIT	E1.05 USD/ LRD	E1.06A QUANTITY	E1.06B UNIT	E1.06C ESTIMATE USD/LRD	E1.07A QUANTITY	E1.07B UNIT	E1.07C ESTIMATE USD/LRD
Any other meat	85-90	YES.....1 NO... 2→ NEXT ITEM											
Fruits	91-110												
Mango	91	YES.....1 NO... 2→ NEXT ITEM											
Banana	92	YES.....1 NO... 2→ NEXT ITEM											
Citrus – naartje, orange, grapefruit, etc.	93	YES.....1 NO... 2→ NEXT ITEM											
Pineapple	94	YES.....1 NO... 2→ NEXT ITEM											
Papaya/pawpaw	95	YES.....1 NO... 2→ NEXT ITEM											
Guava	96	YES.....1 NO... 2→ NEXT ITEM											
Soursop	97	YES.....1 NO2→ NEXT ITEM											

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E1.01		E1.02	E1.03A QUANTITY	E1.03B UNIT	E1.04A QUANTITY	E1.04B UNIT	E1.05 USD/ LRD	E1.06A QUANTITY	E1.06B UNIT	E1.06C ESTIMATE USD/LRD	E1.07A QUANTITY	E1.07B UNIT	E1.07C ESTIMATE USD/LRD
Bread Fruit	98	YES.....1 NO2→ NEXT ITEM											
Avocado/Butter pear	99	YES.....1 NO... 2→ NEXT ITEM											
Wild fruit (ex, monkey apple)	100	YES.....1 NO... 2→ NEXT ITEM											
Apple	101	YES.....1 NO... 2→ NEXT ITEM											
Watermelon	102	YES.....1 NO2→ NEXT ITEM											
Any other fruits	100-110	YES.....1 NO... 2→ NEXT ITEM											
Milk and Milk Products	111-125												
Fresh milk	111	YES.....1 NO... 2→ NEXT ITEM											
Powdered milk	112	YES.....1 NO... 2→ NEXT ITEM											

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Tinned Milk	113	YES.....1 NO2→ NEXT ITEM											
Butter	114	YES.....1 NO... 2→ NEXT ITEM											
Soured milk	115	YES.....1 NO... 2→ NEXT ITEM											
Yoghurt	116	YES.....1 NO... 2→ NEXT ITEM											
Cheese	117	YES.....1 NO... 2→ NEXT ITEM											
Infant feeding formula (for bottle, for example Guigoz, Sma Progress)	118	YES.....1 NO... 2→ NEXT ITEM											
Any other milk or milk products	119-125	YES.....1 NO... 2→ NEXT ITEM											
Sugar, Fats, and Oil	126-135												
Sugar	126	YES.....1 NO... 2→ NEXT ITEM											

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Sugar Cane	127	YES.....1 NO... 2→ NEXT ITEM											
Margarine - Blue band	128	YES.....1 NO2→ NEXT ITEM											
Cooking oil	129	YES.....1 NO... 2→ NEXT ITEM											
Palm oil	130	YES.....1 NO2→ NEXT ITEM											
Palm butter	131	YES.....1 NO2→ NEXT ITEM											
Coconut oil	132	YES.....1 NO2→ NEXT ITEM											
Palm Kernel Oil	133	YES.....1 NO2→ NEXT ITEM											
Any other sugars, fats, or oils	129-135	YES.....1 NO... 2→ NEXT ITEM											
Beverages	136-155												

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Tea/Hata'i	136	YES.....1 NO... 2→ NEXT ITEM											
Coffee	137	YES.....1 NO... 2→ NEXT ITEM											
Cocoa, Milo	138	YES.....1 NO... 2→ NEXT ITEM											
Kool Aid/Foster Clark	139	YES.....1 NO2→ NEXT ITEM											
Fruit juice	140	YES.....1 NO... 2→ NEXT ITEM											
Freezes (flavoured ice)	141	YES.....1 NO... 2→ NEXT ITEM											
Soft drinks (Coca-cola, Fanta, Sprite, etc.)	142	YES.....1 NO... 2→ NEXT ITEM											
Palm wine	143	YES.....1 NO... 2→ NEXT ITEM											
Bottled Mineral water	144	YES.....1 NO... 2→ NEXT ITEM											

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Bag of Mineral water	145	YES.....1 NO... 2→ NEXT ITEM											
Plastic water/Big bag (not treated)	146	YES.....1 NO2→ NEXT ITEM											
Beer (Club, Heineken,etc.)	147	YES.....1 NO... 2→ NEXT ITEM											
Cane Juice	148	YES.....1 NO... 2→ NEXT ITEM											
Wine or liquor	149	YES.....1 NO... 2→ NEXT ITEM											
Any other beverages	151-155	YES.....1 NO... 2→ NEXT ITEM											
Spices & Miscellaneous	156-170												
Salt	156	YES.....1 NO... 2→ NEXT ITEM											
Black (dried) Pepper (season)	157	YES.....1 NO... 2→ NEXT ITEM											

FOOD ITEM	ITEM CODE	Over the past one week, did you or others in your household eat any [FOOD ITEM]?	How much in total did your household eat in the past week?		How much of what you ate came from purchases?		How much did you spend on what was eaten last week? If your family ate part but not all of something you purchased, estimate what you spent only on the part that was consumed.	How much of what you ate came from your household's own production?		CHECK E1.06A. IF E1.06A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."	How much of what you ate came from gifts or other sources?		CHECK E1.07A. IF E1.07A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."
E1.01		E1.02	E1.03A QUANTITY	E1.03B UNIT	E1.04A QUANTITY	E1.04B UNIT	E1.05 USD/ LRD	E1.06A QUANTITY	E1.06B UNIT	E1.06C ESTIMATE USD/LRD	E1.07A QUANTITY	E1.07B UNIT	E1.07C ESTIMATE USD/LRD
Chicken soup season	158	YES.....1 NO2→ NEXT ITEM											
Yeast, baking powder, bicarbonate of soda	159	YES.....1 NO... 2→ NEXT ITEM											
Tomato sauce (bottle)	160	YES.....1 NO... 2→ NEXT ITEM											
Hot sauce (Kaytalay sauce etc.)	161	YES.....1 NO... 2→ NEXT ITEM											
Mayonnaise	162	YES.....1 NO2→ NEXT ITEM											
Jam, jelly	163	YES.....1 NO... 2→ NEXT ITEM											
Sweets, candy, chocolates	164	YES.....1 NO... 2→ NEXT ITEM											
Honey	165	YES.....1 NO... 2→ NEXT ITEM											
Any other seasonings, sweets, spices, condiments, etc.	164-170	YES.....1 NO... 2→ NEXT ITEM											

FOOD ITEM	ITEM CODE	Over the past one week, did you or others in your household eat any [FOOD ITEM]?	How much in total did your household eat in the past week?		How much of what you ate came from purchases?		How much did you spend on what was eaten last week? If your family ate part but not all of something you purchased, estimate what you spent only on the part that was consumed.	How much of what you ate came from your household's own production?		CHECK E1.06A. IF E1.06A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."	How much of what you ate came from gifts or other sources?		CHECK E1.07A. IF E1.07A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."
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Cooked Foods from Vendors	171-190												
Maize - boiled or roasted (vendor)	171	YES.....1 NO... 2→ NEXT ITEM											
Chips (vendor)	172	YES.....1 NO... 2→ NEXT ITEM											
Cassava - boiled (vendor)	173	YES.....1 NO... 2→ NEXT ITEM											
Eggs – boiled or fried (vendor)	174	YES.....1 NO... 2→ NEXT ITEM											
Chicken (vendor)	175	YES.....1 NO... 2→ NEXT ITEM											
Meat (vendor)	176	YES.....1 NO... 2→ NEXT ITEM											
Fish (vendor)	177	YES.....1 NO... 2→ NEXT ITEM											
Doughnut/kala (vendor)	178	YES.....1 NO... 2→ NEXT ITEM											

FOOD ITEM	ITEM CODE	Over the past one week, did you or others in your household eat any [FOOD ITEM]?	How much in total did your household eat in the past week?		How much of what you ate came from purchases?		How much did you spend on what was eaten last week? If your family ate part but not all of something you purchased, estimate what you spent only on the part that was consumed.	How much of what you ate came from your household's own production?		CHECK E1.06A. IF E1.06A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."	How much of what you ate came from gifts or other sources?		CHECK E1.07A. IF E1.07A IS > 0, ASK: "Please tell me how much it would have cost to buy that much [FOOD ITEM] if you had to purchase it in the market today."																																								
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Sausage (vendor)	179	YES.....1 NO2→ NEXT ITEM																																																			
Meal eaten at restaurant or cook shop	180	YES.....1 NO... 2→ NEXT ITEM																																																			
Any other food purchased from a vendor	181-190	YES.....1 NO..... 2→ SKIP TO E1.08																																																			
RESPONSE CATEGORIES FOR E1.03b/1.04b/1.06b/1.07b – UNITS <table border="0"> <tr> <td>KILOGRAMME.....01</td> <td>BUNCH 08</td> <td>OX-CART (UNSHELLED) 14</td> <td>BASIN 21</td> </tr> <tr> <td>50 KG. BAG 02</td> <td>PIECE 09</td> <td>LITRE..... 15</td> <td>SACHET/TUBE 22</td> </tr> <tr> <td>90 KG. BAG 03</td> <td>HEAP 10</td> <td>CUP 16</td> <td>TOTAL.....23</td> </tr> <tr> <td>PAIL (SMALL) 04</td> <td>BALE.....11</td> <td>TIN 17</td> <td>25 KG BAG 24</td> </tr> <tr> <td>PAIL (LARGE) 05</td> <td>BASKET (DENGU) 12</td> <td>GRAM 18</td> <td>Era Paint Cup 25</td> </tr> <tr> <td>NO. 10 PLATE 06</td> <td>(SHELLED) 12</td> <td>MILLILITRE..... 19</td> <td>Pound.....26</td> </tr> <tr> <td>NO. 12 PLATE 07</td> <td>BASKET (DENGU) (UNSHELLED).....13</td> <td>TEASPOON..... 20</td> <td>Gallon.....27</td> </tr> <tr> <td></td> <td></td> <td></td> <td>PIECE.....28</td> </tr> <tr> <td></td> <td></td> <td></td> <td>BOTTLE.....29</td> </tr> <tr> <td></td> <td></td> <td></td> <td>OTHER (SPECIFY) 96</td> </tr> </table>														KILOGRAMME.....01	BUNCH 08	OX-CART (UNSHELLED) 14	BASIN 21	50 KG. BAG 02	PIECE 09	LITRE..... 15	SACHET/TUBE 22	90 KG. BAG 03	HEAP 10	CUP 16	TOTAL.....23	PAIL (SMALL) 04	BALE.....11	TIN 17	25 KG BAG 24	PAIL (LARGE) 05	BASKET (DENGU) 12	GRAM 18	Era Paint Cup 25	NO. 10 PLATE 06	(SHELLED) 12	MILLILITRE..... 19	Pound.....26	NO. 12 PLATE 07	BASKET (DENGU) (UNSHELLED).....13	TEASPOON..... 20	Gallon.....27				PIECE.....28				BOTTLE.....29				OTHER (SPECIFY) 96
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NOTE: ANY UNIT LISTED <u>MUST</u> BE ABLE TO BE CONVERTED TO A STANDARDIZED UNIT. THIS CONVERSION WILL HAPPEN DURING DATA ANALYSIS; IT SHOULD NOT BE DONE IN THE FIELD BY THE INTERVIEWER.													

QNO.	QUESTION	RESPONSE CATEGORIES
E1.08	Over the past one week, did any people who are not members of your household eat any meals in your household?	YES.....1 NO 2→ SKIP TO E1.12
E1.09	Over the past one week, how many people who are not members of your household ate meals in your household?	E1.09. NUMBER OF PEOPLE
E1.10	Over the past one week, what was the total number of days in which any meal was shared with people who are not members of your household?	E1.10. NUMBER OF DAYS
E1.11	Over the past one week, what was the total number of meals that were shared with people who are not members of your household?	E1.11. NUMBER OF MEALS

E1.12	Over the past one week, did your household purchase pet food for family pets like a cat or a dog?	YES.....1 NO 2→ GO TO E1.14
E1.13	How much did you spend on pet food last week?	ENTER AMOUNT IN USD/LRD: _____
E1.14	Over the past one week, were there any other expenditures on pets?	YES.....1 NO 2→ GO TO MODULE E2
E1.15	How much did you spend on other purchases for pets last week?	ENTER AMOUNT IN USD/LRD: _____

Non-Food Expenditures Over Past 7 Days

<u>ONE WEEK RECALL</u>		Over the past one week (7 days), did your household purchase or pay for any [ITEM]?	How much did you pay (how much did they cost) in total?
ITEM	ITEM CODE		
E2.01	191-210	E2.02	E2.03 USD/LRD
Charcoal	191	YES 1 NO 2→ NEXT ITEM	
Wood	192	YES 1 NO2→ NEXT ITEM	
Kerosene	193	YES 1 NO 2→ NEXT ITEM	
Cigarettes or other tobacco	194	YES 1 NO 2→ NEXT ITEM	
Candles	195	YES 1 NO 2→ NEXT ITEM	
Matches / Lighter	196	YES 1 NO 2→ NEXT ITEM	
Newspapers or magazines	197	YES 1 NO 2→ NEXT ITEM	
Internet café	198	YES 1 NO2→ NEXT ITEM	

Public transport - Bus/Minibus (not for school or health care purposes)	199	YES 1 NO 2 → NEXT ITEM	
Public transport – pen pen, taxi (not for school or health care purposes)	200	YES 1 NO 2 → NEXT ITEM	
Other Public transport - (not for school or healthcare purposes)	201	YES 1 NO 2 → NEXT ITEM	
Any other weekly non-food expenditures (excluding school and healthcare)	200-210	YES 1 NO 2 → NEXT ITEM	

Non-Food Expenditures Over Past One Month

<u>ONE MONTH RECALL</u> ITEM	ITEM CODE	Over the past <u>one month</u> , did your household purchase or pay for any [ITEM]?	How much did you pay (how much did they cost) in total?
E3.01	211-240	E3.02	E3.03 USD/LRD
Milling fees for grains, oil, cassava (not including cost of grain itself)	211	YES 1 NO 2 → NEXT ITEM	
Bar soap (body soap)	212	YES 1 NO 2 → NEXT ITEM	
Clothes soap/iron soap/ detergent	213	YES 1 NO 2 → NEXT ITEM	
Toothpaste, toothbrush, mouthwash	214	YES 1 NO 2 → NEXT ITEM	
Toilet paper	215	YES 1 NO 2 → NEXT ITEM	
Vaseline, skin creams and oils, lotions	216	YES 1 NO 2 → NEXT ITEM	
Other personal products (shampoo, razor blades, cosmetics, hair products, etc.)	217	YES 1 NO 2 → NEXT ITEM	
Light bulbs	218	YES 1 NO 2 → NEXT ITEM	
Postage stamps or other postal fees	219	YES 1 NO 2 → NEXT ITEM	
Donation - to church, charity, beggar, etc.	220	YES 1 NO 2 → NEXT ITEM	

<u>ONE MONTH RECALL</u>			
ITEM	ITEM CODE	Over the past <u>one month</u> , did your household purchase or pay for any [ITEM]?	How much did you pay (how much did they cost) in total?
E3.01	211-240	E3.02	E3.03 USD/LRD
Petrol, diesel, gas, fuel	221	YES.....1 NO..... 2→ NEXT ITEM	
Motor vehicle service, repair, or parts	222	YES.....1 NO..... 2→ NEXT ITEM	
Bicycle/pen pen service, repair, or parts	223	YES.....1 NO..... 2→ NEXT ITEM	
Wages paid to servants	224	YES.....1 NO..... 2→ NEXT ITEM	
Repairs & maintenance to dwelling	225	YES.....1 NO2→ NEXT ITEM	
Repairs and maintenance to household and personal items (radios, watches, etc., excluding battery purchases)	226	YES.....1 NO..... 2→ NEXT ITEM	
Expenditures on pets	227	YES.....1 NO2→ NEXT ITEM	
Utilities: Natural gas, electricity, water	228	YES.....1 NO..... 2→ NEXT ITEM	
Batteries	229	YES.....1 NO..... 2→ NEXT ITEM	
Recharging of mobile phones or batteries	230	YES.....1 NO..... 2→ NEXT ITEM	
Phone credit, scratch cards, air time for cell phones	231	YES.....1 NO..... 2→ NEXT ITEM	
Generator maintenance	232	YES.....1 NO2→ NEXT ITEM	
Any other monthly non-food expenditures (excluding school and healthcare)	233	YES.....1 NO2→ NEXT ITEM	
HEALTH EXPENDITURES (include estimated value of any in-kind payments, or borrowed amounts)			
Anything related to illnesses and injuries, including for prescribed medicine, tests, consultation, & in-patient fees	234	YES.....1 NO..... 2→ NEXT ITEM	

<u>ONE MONTH RECALL</u>			
ITEM	ITEM CODE	Over the past <u>one</u> month, did your household purchase or pay for any [ITEM]?	How much did you pay (how much did they cost) in total?
E3.01	211-240	E3.02	E3.03 USD/LRD
Medical care not related to an illness - preventative health care, pre-natal/antenatal visits, check-ups, under-5 visits, immunization visits, etc.	235	YES.....1 NO..... 2→ NEXT ITEM	
Non-prescription medicines, for example, Panadol, Fansidar, cough syrup, aspirin, etc.	236	YES.....1 NO..... 2→ NEXT ITEM	
Transportation used to access health-related services or care that did not require an overnight stay in a health facility or at a traditional healer's dwelling	237	YES.....1 NO..... 2→ NEXT ITEM	
Any other health expenditures: Specify _____	236-240	YES.....1 NO..... 2→ MODULE E4	

Non-Food Expenditures Over Past Three Months

<u>THREE MONTH RECALL</u>			
ITEM	ITEM CODE	Over the past three months, did your household purchase or pay for any [ITEM]?	How much did you pay (how much did they cost) in total?
E4.01	241-290	E4.02	E4.03 USD/LRD
Infant and children's clothing, for example trousers, shirts, jackets, undergarments, blouses, dresses, skirts (excluding uniforms/required school clothing)	241	YES.....1 NO..... 2→ NEXT ITEM	
Baby nappies/diapers/pampers and baby powder	242	YES.....1 NO..... 2→ NEXT ITEM	
Clothing for adult men, for example trousers, shirts, jackets, undergarments	243	YES.....1 NO..... 2→ NEXT ITEM	
Clothing for adult women, for example blouses, shirts, lappas, dresses, skirts, undergarments	244	YES.....1 NO..... 2→ NEXT ITEM	
Children's shoes	245	YES.....1 NO..... 2→ NEXT ITEM	
Men's shoes	246	YES.....1 NO..... 2→ NEXT ITEM	
Women's shoes	247	YES.....1 NO..... 2→ NEXT ITEM	

<u>THREE MONTH RECALL</u>		Over the past three months, did your household purchase or pay for any [ITEM]?	How much did you pay (how much did they cost) in total?
ITEM	ITEM CODE		
E4.01	241-290	E4.02	E4.03 USD/LRD
Cloth, thread, or other sewing materials	248	YES.....1 NO..... 2→ NEXT ITEM	
Laundry (outside of home), dry cleaning, tailoring fees	249	YES.....1 NO..... 2→ NEXT ITEM	
Bowls, glassware, plates, silverware, cooking utensils (for example cookpots, stirring spoons, whisks) etc.	250	YES.....1 NO..... 2→ NEXT ITEM	
Cleaning utensils (brooms, brushes, etc.)	251	YES.....1 NO..... 2→ NEXT ITEM	
Torch / flashlight	252	YES.....1 NO..... 2→ NEXT ITEM	
Umbrella	253	YES.....1 NO..... 2→ NEXT ITEM	
Kerosene lamp/hurricane lamp	254	YES.....1 NO..... 2→ NEXT ITEM	
Chinese lamp / battery-operated lamp	255	YES.....1 NO2→ NEXT ITEM	
Stationery, paper, pens (excluding school related)	256	YES.....1 NO..... 2→ NEXT ITEM	
Books (excluding school related)	257	YES.....1 NO..... 2→ NEXT ITEM	
Music, movies, CDs, DVDs	258	YES.....1 NO..... 2→ NEXT ITEM	
TV/DSTV	259	YES.....1 NO2→ NEXT ITEM	
Tickets for sports / entertainment / video clubs	260	YES.....1 NO..... 2→ NEXT ITEM	
House decorations	261	YES.....1 NO..... 2→ NEXT ITEM	
Guest house/hotel (not related to school or health)	262	YES.....1 NO..... 2→ NEXT ITEM	
Any other non-food quarterly (bought every 3 months) items: Specify_____	280-290	YES.....1 NO.....2→ MODULE E5	

Non-Food Expenditures Over Past One Year (12 Months)

ONE YEAR (12 MONTH) RECALL ITEM	ITEM CODE	Over the past one year (twelve months), did your household purchase or pay for any [ITEM]?	How much did you pay (how much did they cost) in total?
E5.01	291-330	E5.02	E5.03 USD/LRD
Carpet, rugs, drapes, curtains, floor mats	291	YES 1 NO 2→ NEXT ITEM	
Towels, sheets, blankets	292	YES 1 NO 2→ NEXT ITEM	
Mat for sleeping or for drying grain/flour	293	YES 1 NO 2→ NEXT ITEM	
Mosquito net	294	YES 1 NO 2→ NEXT ITEM	
Mattress	295	YES 1 NO 2→ NEXT ITEM	
Sports equipment, musical instruments, toys or other hobby equipment	296	YES 1 NO 2→ NEXT ITEM	
Camera, film, film processing, photo printing	297	YES 1 NO 2→ NEXT ITEM	
Cement	298	YES 1 NO 2→ NEXT ITEM	
Bricks	299	YES 1 NO 2→ NEXT ITEM	
Planks, lumber, or timber for construction	300	YES 1 NO 2→ NEXT ITEM	
Zinc, roofing material	301	YES 1 NO2→ NEXT ITEM	
Council/group membership or community activity fees	302	YES 1 NO 2→ NEXT ITEM	
Insurance — health (MASM, etc.), auto, home, life	303	YES 1 NO 2→ NEXT ITEM	
Fines or legal fees	304	YES 1 NO 2→ NEXT ITEM	

<u>ONE YEAR (12 MONTH) RECALL</u>			
ITEM	ITEM CODE	Over the past one year (twelve months), did your household purchase or pay for any [ITEM]?	How much did you pay (how much did they cost) in total?
E5.01	291-330	E5.02	E5.03 USD/LRD
Anniversary, birthday	305	YES 1 NO2→ NEXT ITEM	
<i>Dowry</i>	306	YES 1 NO 2→ NEXT ITEM	
Wedding/Marriage ceremony costs	307	YES 1 NO 2→ NEXT ITEM	
Funeral costs, household members	308	YES 1 NO 2→ NEXT ITEM	
Funeral costs, non-household members (relatives, neighbors/friends)	309	YES 1 NO 2→ NEXT ITEM	
HEALTH EXPENDITURES over last 12 months (include estimated value of any in-kind payments or borrowed amounts)			
Hospitalizations or overnight stay in any hospital – total cost for treatment	310	YES 1 NO 2→ NEXT ITEM	
Travel to and from the medical facility for any overnight stay(s) or hospitalization	311	YES 1 NO 2→ NEXT ITEM	
Food costs during overnight stay(s) at the medical facility or hospitalization (if not already included above)	312	YES 1 NO 2→ NEXT ITEM	
Over-night(s) stay at a traditional healer's or faith healer's dwelling – total costs for treatment	313	YES 1 NO 2→ NEXT ITEM	
Travel costs to the traditional healer's or faith healer's dwelling for overnight stay(s)	314	YES 1 NO 2→ NEXT ITEM	
Food costs during overnight stay(s) at the traditional healer's or faith healer's dwelling	315	YES 1 NO 2→ NEXT ITEM	
EDUCATION EXPENDITURES over last 12 months (include estimated value of any in-kind payments or borrowed amounts)			
Tuition, including extra tuition fees	316	YES 1 NO 2→ NEXT ITEM	
Expenditures on after school programs and tutoring	317	YES 1 NO 2→ NEXT ITEM	

<u>ONE YEAR (12 MONTH) RECALL</u>	ITEM CODE	Over the past one year (twelve months), did your household purchase or pay for any [ITEM]?	How much did you pay (how much did they cost) in total?
E5.01	291-330	E5.02	E5.03 USD/LRD
School books and stationery	318	YES 1 NO 2→ NEXT ITEM	
School uniform	319	YES 1 NO 2→ NEXT ITEM	
Boarding fees	320	YES 1 NO 2→ NEXT ITEM	
Contribution to school building maintenance	321	YES 1 NO 2→ NEXT ITEM	
Transport to and from school	322	YES 1 NO 2→ NEXT ITEM	
Parent/Teacher Association and other related fees	323	YES 1 NO 2→ NEXT ITEM	
Other: Specify_____	324	YES 1 NO 2→ NEXT ITEM	

NON-FOOD ITEMS THAT MAY OR MAY NOT HAVE BEEN PURCHASED						
<u>ONE YEAR (12 MONTH) RECALL</u>		Over the past one year (12 months) did your household gather, purchase or pay for any [ITEM]?			FOR ITEMS THAT WERE GATHERED: What was the total estimated value of [ITEM] that you used?	FOR ITEMS THAT WERE BOUGHT: How much did you spend in total on [ITEM]?
ITEM	Item Code	(NOTE THAT THE VALUE OF THESE ITEMS SHOULD BE ENTERED <u>ONLY</u> IF THEY WERE PURCHASED OR USED FOR HOUSEHOLD USE, NOT FOR INVESTMENT PURPOSES)	What was the estimated total quantity of [ITEM] used?		Did your household gather the [ITEM], or did your household purchase or pay for the [ITEM]?	
E5.04	323-325	E5.05	E5.06a Quantity	E5.06b Unit	E5.06c FILTER	E5.07 (USD/LRD) E5.08 (USD/LRD)

<u>ONE YEAR (12 MONTH) RECALL</u>		Over the past one year (twelve months), did your household purchase or pay for any [ITEM]?	How much did you pay (how much did they cost) in total?				
ITEM	ITEM CODE		E5.03 USD/LRD				
E5.01	291-330	E5.02					
Woodpoles, bamboo	325	YES 1 NO 2 → NEXT ITEM			GATHERED.....1 → E5.07 PURCHASED/PAID..... 2 → E5.08	→ SKIP TO NEXT ITEM	
Grass for thatching roof or other use	326	YES 1 NO 2 → NEXT ITEM			GATHERED.....1 → E5.07 PURCHASED/PAID..... 2 → E5.08	→ SKIP TO NEXT ITEM	
Other: Specify _____	327	YES 1 NO 2 → NEXT ITEM			GATHERED.....1 → E5.07 PURCHASED/PAID..... 2 → E5.08	→ SKIP TO MODULE E6	

Housing Expenditures

QNO.	QUESTION	RESPONSE CATEGORIES						
E6.01	What is the status of the possession of your home, for example, do you rent, own, pay a mortgage, live there for free, or is it provided by your employer?	OWN.....1 BEING PURCHASED.....2 EMPLOYER PROVIDES.....3 FREE 4 → E6.04 RENTED.....5 → E6.05 DON'T KNOW/NON-RESPONSE/NA.... 98						
E6.02	If you <u>sold this dwelling</u> today, how much would you receive for it?	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> DON'T KNOW/NON-RESPONSE/NA.....999998						

E6.03	How old is this house, in years?	DON'T KNOW/ NON-RESPONSE/NA.....998 → SKIP TO E6.06				
E6.04	If you <u>rented this dwelling out</u> today, how much rent would you receive?	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%;">E6.04A USD/LRD</th> <th style="width: 50%;">E6.04B UNIT</th> </tr> </thead> <tbody> <tr> <td> DON'T KNOW/NON-RESPONSE /NA.....99998 → SKIP TO E6.06 </td> <td> DAY 1 WEEK 2 MONTH 3 YEAR 4 → SKIP TO E6.09 DON'T KNOW/ NON-RESPONSE /NA.....99998 </td> </tr> </tbody> </table>	E6.04A USD/LRD	E6.04B UNIT	DON'T KNOW/NON-RESPONSE /NA.....99998 → SKIP TO E6.06	DAY 1 WEEK 2 MONTH 3 YEAR 4 → SKIP TO E6.09 DON'T KNOW/ NON-RESPONSE /NA.....99998
E6.04A USD/LRD	E6.04B UNIT					
DON'T KNOW/NON-RESPONSE /NA.....99998 → SKIP TO E6.06	DAY 1 WEEK 2 MONTH 3 YEAR 4 → SKIP TO E6.09 DON'T KNOW/ NON-RESPONSE /NA.....99998					
E6.05	How much do you pay to rent this dwelling?	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%;">E6.05A USD/LRD</th> <th style="width: 50%;">E6.05B UNIT</th> </tr> </thead> <tbody> <tr> <td> DON'T KNOW/NON-RESPONSE /NA.....99998 → SKIP TO E6.09 </td> <td> DAY 1 WEEK 2 MONTH 3 YEAR 4 → SKIP TO E6.09 DON'T KNOW/ NON-RESPONSE /NA.....99998 </td> </tr> </tbody> </table>	E6.05A USD/LRD	E6.05B UNIT	DON'T KNOW/NON-RESPONSE /NA.....99998 → SKIP TO E6.09	DAY 1 WEEK 2 MONTH 3 YEAR 4 → SKIP TO E6.09 DON'T KNOW/ NON-RESPONSE /NA.....99998
E6.05A USD/LRD	E6.05B UNIT					
DON'T KNOW/NON-RESPONSE /NA.....99998 → SKIP TO E6.09	DAY 1 WEEK 2 MONTH 3 YEAR 4 → SKIP TO E6.09 DON'T KNOW/ NON-RESPONSE /NA.....99998					
E6.06	Do you pay a mortgage on this house, that is, a regular payment towards purchasing the house?	YES 1 NO 2 → SKIP TO E6.09				
E6.07	How often do you make mortgage payments?	ONCE A MONTH 1 ONCE EVERY 3 MONTHS 2				

		ONCE EVERY 6 MONTHS 3 ONCE A YEAR 4 OTHER (SPECIFY) 6					
E6.08	How much do you pay each time you make a payment on your mortgage?	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td> </tr> </table> AMOUNT IS VARIABLE.....99996 DON'T KNOW/ NON-RESPONSE.....99998					
E6.09	In the past one month, how much did you spend on repairs & maintenance to this house?	<table border="1"> <tr> <td></td><td></td><td></td><td></td><td></td> </tr> </table> DON'T KNOW/ NON-RESPONSE.....99998					

Durable Goods Expenditures

ITEM	Item Code	Does your household own a [ITEM]?	How many [ITEM]s do you own?	How many years have you had this item or in what year did you buy it? IF MORE THAN ONE ITEM, AVERAGE AGE.	If you wanted to sell one of these [ITEM]s today, how much would you receive? IF MORE THAN ONE, AVERAGE VALUE.	Did you purchase or pay for any of these [ITEM]s in the last 12 months?	How much did you pay for all these [ITEM]s all together (total) in the last 12 months?
E7.01	341-370	E7.02	E7.03 NUMBER	E7.04 YEAR	E7.05 USD/LRD	E7.06	E7.07 USD/LRD
Bed	341	YES 1 NO2→ NEXT ITEM				YES 1 NO.....2→ NEXT ITEM	
Table	342	YES 1 NO2→ NEXT ITEM				YES 1 NO2→ NEXT ITEM	
Chair	343	YES 1 NO2→ NEXT ITEM				YES 1 NO2→ NEXT ITEM	

ITEM	Item Code	Does your household own a [ITEM]?	How many [ITEM]s do you own?	How many years have you had this item or in what year did you buy it? IF MORE THAN ONE ITEM, AVERAGE AGE.	If you wanted to sell one of these [ITEM]s today, how much would you receive? IF MORE THAN ONE, AVERAGE VALUE.	Did you purchase or pay for any of these [ITEM]s in the last 12 months?	How much did you pay for all these [ITEM]s all together (total) in the last 12 months?
E7.01	341-370	E7.02	E7.03 NUMBER	E7.04 YEAR	E7.05 USD/LRD	E7.06	E7.07 USD/LRD
Fan	344	YES 1 NO2→ NEXT ITEM				YES 1 NO..... 2→ NEXT ITEM	
Air conditioner	345	YES 1 NO2→ NEXT ITEM				YES 1 NO..... 2→ NEXT ITEM	
Radio	346	YES 1 NO2→ NEXT ITEM				YES 1 NO..... 2→ NEXT ITEM	
CD/DVD Player, VCR, Tape player	347	YES 1 NO2→ NEXT ITEM				YES 1 NO..... 2→ NEXT ITEM	
Television	348	YES 1 NO2→ NEXT ITEM				YES 1 NO..... 2→ NEXT ITEM	
Sewing machine	349	YES 1 NO2→ NEXT ITEM				YES 1 NO..... 2→ NEXT ITEM	
Kerosene stove	350	YES 1 NO2→ NEXT ITEM				YES 1 NO..... 2→ NEXT ITEM	
Electric stove/hot plate	351	YES 1 NO2→ NEXT ITEM				YES 1 NO..... 2→ NEXT ITEM	
Gas stove	352	YES 1 NO2→ NEXT ITEM				YES 1 NO..... 2→ NEXT ITEM	
Electric Refrigerator	353	YES 1 NO2→ NEXT ITEM				YES 1 NO..... 2→ NEXT ITEM	
Kerosene Refrigerator	354	YES 1 NO2→ NEXT ITEM				YES 1 NO2→ NEXT ITEM	
Washing machine	355	YES 1 NO2→ NEXT ITEM				YES 1 NO..... 2→ NEXT ITEM	
Bicycle	356	YES 1 NO2→ NEXT ITEM				YES 1 NO..... 2→ NEXT ITEM	

ITEM	Item Code	Does your household own a [ITEM]?	How many [ITEM]s do you own?	How many years have you had this item or in what year did you buy it? IF MORE THAN ONE ITEM, AVERAGE AGE.	If you wanted to sell one of these [ITEM]s today, how much would you receive? IF MORE THAN ONE, AVERAGE VALUE.	Did you purchase or pay for any of these [ITEM]s in the last 12 months?	How much did you pay for all these [ITEM]s all together (total) in the last 12 months?
E7.01	341-370	E7.02	E7.03 NUMBER	E7.04 YEAR	E7.05 USD/LRD	E7.06	E7.07 USD/LRD
Boat, Canoe, Ferry	357	YES 1 NO2→ NEXT ITEM				YES 1 NO 2→ NEXT ITEM	
Motorcycle/scooter	358	YES 1 NO2→ NEXT ITEM				YES 1 NO 2→ NEXT ITEM	
Car	359	YES 1 NO2→ NEXT ITEM				YES 1 NO 2→ NEXT ITEM	
Mini-bus	360	YES 1 NO2→ NEXT ITEM				YES 1 NO 2→ NEXT ITEM	
Truck/Pick up/Lorry	361	YES 1 NO2→ NEXT ITEM				YES 1 NO 2→ NEXT ITEM	
Cane juice mill	362	YES 1 NO2→ NEXT ITEM				YES 1 NO2→ NEXT ITEM	
Sofa set/upholstered chair	363	YES 1 NO2→ NEXT ITEM				YES 1 NO 2→ NEXT ITEM	
Coffee table (for sitting room)	364	YES 1 NO2→ NEXT ITEM				YES 1 NO 2→ NEXT ITEM	
Cupboard, drawers, bureau	365	YES 1 NO2→ NEXT ITEM				YES 1 NO 2→ NEXT ITEM	
Desk	366	YES 1 NO2→ NEXT ITEM				YES 1 NO 2→ NEXT ITEM	
Clock	367	YES 1 NO2→ NEXT ITEM				YES 1 NO 2→ NEXT ITEM	
Iron for pressing clothes (either charcoal or electric)	368	YES 1 NO2→ NEXT ITEM				YES 1 NO 2→ NEXT ITEM	
Computer & and associated accessories	369	YES 1 NO2→ NEXT ITEM				YES 1 NO 2→ NEXT ITEM	

ITEM	Item Code	Does your household own a [ITEM]?	How many [ITEM]s do you own?	How many years have you had this item or in what year did you buy it? IF MORE THAN ONE ITEM, AVERAGE AGE.	If you wanted to sell one of these [ITEM]s today, how much would you receive? IF MORE THAN ONE, AVERAGE VALUE.	Did you purchase or pay for any of these [ITEM]s in the last 12 months?	How much did you pay for all these [ITEM]s all together (total) in the last 12 months?
E7.01	341-370	E7.02	E7.03 NUMBER	E7.04 YEAR	E7.05 USD/LRD	E7.06	E7.07 USD/LRD
Satellite dish	370	YES 1 NO2→ NEXT ITEM				YES 1 NO..... 2→ NEXT ITEM	
Solar panel	371	YES 1 NO2→ NEXT ITEM				YES 1 NO..... 2→ NEXT ITEM	
Generator	372	YES 1 NO 2→ MODULE F				YES 1 NO.....2→ MODULE F	
Local hoes for garden or farm	373	YES 1 NO2→ NEXT ITEM					
Cutlasses	374	YES 1 NO2→ NEXT ITEM					
Coal pots	375	YES 1 NO2→ NEXT ITEM					
Other household tools (rake, whipper, digger etc.)	376	YES 1 NO2→ NEXT ITEM					
Mill (cassava, rice, steam/gin)	377	YES 1 NO2→ NEXT ITEM					
Rice dryer	378	YES 1 NO2→ NEXT ITEM					
Water pump	379	YES 1 NO2→ NEXT ITEM					
Any other gathered items	380	YES 1 NO2→ NEXT ITEM					

ANNEX V: KEY INFORMANT INTERVIEW (KII) GUIDE

Targets:

- USAID: AOR and others
- FED personnel
- Government of Liberia: ministries and county officials
- Donors
- Local agriculture development experts
- Participating farmer groups, farmers, and entrepreneurs

Note: Skip items not relevant to the particular target interview.

1. Identifying information: (Name, affiliation, title/position, gender, location)

2. How did you learn about the FED Project?

3. What has been the nature of your involvement with FED? (e.g. recipient of FED services, provider of FED services, GOL oversight or regulatory body, GOL goods or services provider, private goods or services provider operating independently of FED, private independent goods or services provider, other donor, other interested party, etc.)

4. In your opinion, what are the most important constraints to increasing farmer incomes? (e.g. better access to markets, technology, education and training, etc.)

5. Do you think that FED has had a positive impact on farmer incomes and livelihoods? If yes, why do you think it did? If no, why not?

6. What, in your opinion, were the most important factors that contributed to success in increasing farmer incomes?

7. Is there a particular crop (rice, cassava, vegetables, goats) that, in your opinion, has been more successful than others?

8. Are you aware of particular years (or seasons) when FED farmers were more successful?

9. Was there a particular technology, in your opinion, that contributed to increased incomes?

10. Do you know if there is a particular region in which the FED project has been more successful than others?

11. Do you think that FED participants were more successful in increasing incomes than farmers that did not participate? Why do you think so?

12. In your opinion, did non-participants adopt any practices that were introduced by FED? If so, are you aware of which practices and which farmers or farmer groups? How did this happen?

13. Do you feel that the Ebola Virus Disease affected FED outcomes?

14. **Would you suggest in the approach taken by FED to increase farmers' incomes and improve their livelihoods?** If so, what kinds of changes would you like to see (e.g. alternative regions, crops, technologies, target groups, etc.)

Additional questions for farmer associations:

1. **Did you participate in the FED project** (i.e. did the group and/or its members receive services from FED?)
2. **What was the nature of your participation?**
3. **If you did not participate, what were the reasons for not participating** (FED did not include them, they were not interested, etc.)?
4. **What is the legal status of your organization?**
5. **In your opinion, what kinds of assistance would be most useful in increasing farmer incomes and improving livelihoods?**

ANNEX VI: FOCUS GROUP DISCUSSION (FGD) PROTOCOL

For Beneficiaries

Note to FGD Facilitator: the FGDs seek to elicit qualitative nuance and context that will help us better understand, interpret and situate the data from the large survey instrument. Illustrative quotes and differing viewpoints may be particularly valuable. Time may not permit addressing all prompts at each FGD.

PROTOCOL:

Introduction: *Since 2012, the USAID Food and Enterprise Development Project (FED) has been working with Liberian farmers in the counties of Lofa, Bong, Nimba, Grand Bassa, Margi, and Montserrado to increase production and incomes and improve livelihoods. Each of you here today participated in one or more activities or events sponsored by FED. The aim of this focus group discussion is to enable us to learn as much as we can about your experiences and your views of the project.*

Ground Rules: *First, here are a few “ground rules” to help us enjoy a productive discussion:*

- 1. Only one person should speak at a time;*
- 2. Please no side conversations with those sitting near you;*
- 3. Let’s avoid having one or two people dominate the conversation; and*
- 4. Be sure to hear from everyone; we want to hear as many different voices, stories and perspectives as possible.*

Opening Prompt (optional, as a way of encouraging discussion): *To get started, we will go around the room asking everyone to **briefly** respond to the following question: What one key fact should we know about **your local community** that is important in understanding the challenges facing farming households?*

Follow-On Prompts:

- 1. How did you first learn of FED?*
- 2. Why did you want to participate in the project?*
- 3. In what ways has your life changed as a result of participating in FED?*
- 4. What are the most important challenges you face in your community?*
- 5. Has FED support helped you to address these challenges?*
- 6. Are there areas in which you need additional advice or support?*
- 7. What is your overall assessment of FED?*
- 8. What are your suggestions for making it more effective?*

Concluding Statement: Thank you so much for participating in this focus group discussion. Your contributions have been quite helpful to our evaluation work. Should you find that you have other inputs to share or other comments or suggestions please contact us at: rrousseau@internationaldevelopmentgroup.com.

ANNEX VII. LIST OF FED TECHNOLOGIES AND PRACTICES

Value Chain	C
Increase Agricultural Productivity and Profitability	
Rice	L
	S
	P
	V
	F
	P
	H
Cassava	P
	P
	L
	S
	P
Vegetable	F
	P
	L
	S

Value Chain	C
	F
	P
	H
	P
Goat	A
	A
Business Development Services/Practices	
All	B

ANNEX VIII: DISCLOSURE OF ANY CONFLICTS OF INTEREST

Name	Richard E. Rousseau
Title	Consultant
Organization	International Development Group
Evaluation Position?	☐ X Team Leader ☐ Team member
Evaluation Award Number (contract or other instrument)	
USAID Project(s) Evaluated (Include project name(s), implementer name(s) and award number(s), if applicable)	Food and Enterprise Development (FED) Project, Development Alternatives, Inc.
I have real or potential conflicts of interest to disclose.	☐ X Yes ☐ No
If yes answered above, I disclose the following facts: Real or potential conflicts of interest may include, but are not limited to: 1. Close family member who is an employee of the USAID operating unit managing the project(s) being evaluated or the implementing organization(s) whose project(s) are being evaluated. 2. Financial interest that is direct, or is significant though indirect, in the implementing organization(s) whose projects are being evaluated or in the outcome of the evaluation. 3. Current or previous direct or significant though indirect experience with the project(s) being evaluated, including involvement in the project design or previous iterations of the project. 4. Current or previous work experience or seeking employment with the USAID operating unit managing the evaluation or the implementing organization(s) whose project(s) are being	My son is employed by Winrock International, a subcontractor to Development Alternatives, Incorporated, the lead implementing organization for the Food and Enterprise Development (FED) Project . My son has no past or current involvement in FED.

evaluated. 5. Current or previous work experience with an organization that may be seen as an industry competitor with the implementing organization(s) whose project(s) are being evaluated. 6. Preconceived ideas toward individuals, groups, organizations, or objectives of the particular projects and organizations being evaluated that could bias the evaluation.	
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I certify (1) that I have completed this disclosure form fully and to the best of my ability and (2) that I will update this disclosure form promptly if relevant circumstances change. If I gain access to proprietary information of other companies, then I agree to protect their information from unauthorized use or disclosure for as long as it remains proprietary and refrain from using the information for any purpose other than that for which it was furnished.

Signature	Richard E. Rousseau Digitally signed by Richard E. Rousseau DN: cn=Richard E. Rousseau, o, ou, email=richarderousseau@gmail.com, c=US Date: 2017.02.10 08:18:57 -05'00'
Date	

Name	Nicholai Lidow
Title	Survey Specialist
Organization	International Development Group
Evaluation Position?	☐ Team Leader ☒ Team member
Evaluation Award Number (contract or other instrument)	
USAID Project(s) Evaluated (Include project name(s), implementer name(s) and award number(s), if applicable)	
I have real or potential conflicts of interest to disclose.	☐ Yes ☒ No
If yes answered above, I disclose the following facts: Real or potential conflicts of interest may include, but are not limited to: 1. Close family member who is an employee of the USAID operating unit managing the project(s) being evaluated or the implementing organization(s) whose project(s) are being evaluated. 2. Financial interest that is direct, or is significant though indirect, in the implementing organization(s) whose projects are being evaluated or in the outcome of the evaluation. 3. Current or previous direct or significant though indirect experience with the project(s) being evaluated, including involvement in the project design or previous iterations of the project. 4. Current or previous work experience or seeking employment with the USAID operating unit managing the evaluation or the implementing organization(s) whose	

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Signature	<i>Nicholas Lidow</i>
Date	9 February 2017

U.S. Agency for International Development
1300 Pennsylvania Avenue, NW
Washington, DC 20523