



# Agriculture for Children's Empowerment (ACE)

## Value Chain Network Analysis



Buyer Ms. Gbagbo Outrich buys bitter-balls & pepper from ACE farmer John Lablah in the Palala Regional market, Kpai District, Bong County-Liberia-photographer (ACE staff Joe C. Mynen)

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## List of Acronyms

ACE	Agriculture for Children's Empowerment
AIIC	Agriculture Infrastructure Investment Cooperation
BARD	Becky's Agro Retail Dealer
CARD	Christian Association for Regional Development
CARI	Central Agricultural Research Institute
DCOF	Displaced Children and Orphans Fund
FaaB	Farming as a Business
FFD	Farmers Financial Diary
JABC	Jacob Agricultural Business Center
IRIS	IRIS Center at the University of Maryland, College Park
LAC 23	Upland variety of rice
LEAD	Liberia Entrepreneurial and Asset Development
LIFARCO	Liberia Farms and Cooperatives
LMA	Liberian Marketing Association
M&E	Monitoring and Evaluation
NERICA 14	New Rice for Africa—variety of upland rice
SIDA	Swedish International Development Agency
STRIVE	Supporting Transformation by Reducing Insecurity and Vulnerability with Economic Strengthening
USAID	United States Agency for International Development
VC	Value Chain

## Executive Summary

In September and October of 2013, the Liberia Agriculture for Children's Empowerment (ACE) project implemented by ACDI/VOCA in Liberia, a USAID/DCOF funded project, conducted a network analysis study to identify relational changes between farmers and other value chain actors within the traditional and high value vegetable value chains brought about by ACE interventions. Using data generated from focus groups with farmers, the project developed a data set of the relationships held between farmers and various value chain actors *before the project began, after the project ended, and projections into the future*. The analysis assessed the *number, strength, and diversity* of new linkages, primarily from the smallholder farmer to buyers, input dealers, and technical/financial extension service providers. Findings from the analysis revealed the ACE project was successful in strengthening and expanding farmers' networks. As a whole, the project increased the number of farmers' linkages to buyers, input suppliers, and technical/financial extension services by 43%. The number of very strong and strong relationships increased by 81%, whereas the number of occasional, weak, and very weak linkages decreased by 19% over the life of the project. In addition, the number, type, and strength of linkages varied between counties: the greatest number of new linkages formed in the more rural counties, Nimba and Bong, which had weaker value chains to begin, while the fewest number of new linkages were formed in Montserrado. The greatest number of linkages to input suppliers and buyers were in Nimba, with the greatest number of linkages to technical and financial service providers in Bong. The fewest number of new linkages formed was in Montserrado, which also had the greatest loss of linkages over the course of the project, losing six linkages to financial and technical extension service providers. Together, these findings point to important differences in value chain development programming in regards to value chain linkage development in weak, underdeveloped value chains versus strong, more mature value chains.

# 1. Background

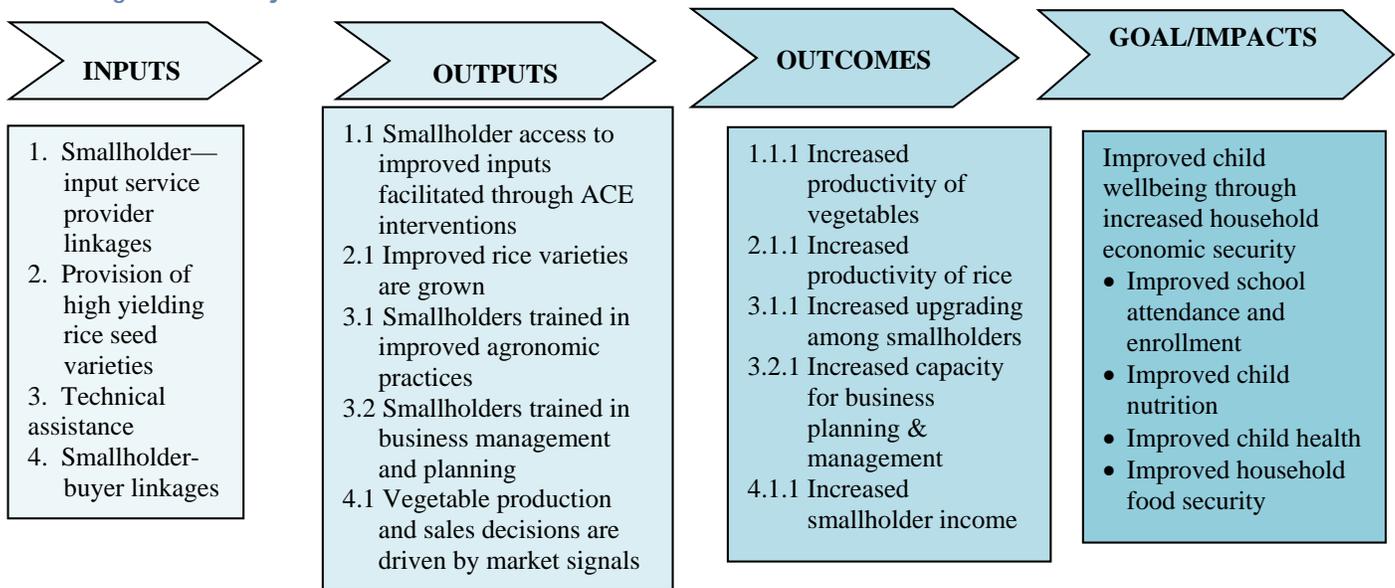
## 1.1 Project Overview

Agriculture for Children’s Empowerment (ACE) was a five-year (2008–13), \$3.2 million project implemented by ACDI/VOCA in Liberia through an associate subaward under the Supporting Transformation by Reducing Insecurity and Vulnerability with Economic Strengthening (STRIVE) Project managed by FHI360 and funded by the USAID’s Displaced Children’s and Orphans Fund (DCOF). Between 2008 and 2014, four economic strengthening projects in Africa and Asia have been implemented under STRIVE, all coupled with a comprehensive learning component, aiming to fill current knowledge gaps about effective economic strengthening approaches and their impact on reducing the vulnerability of children and youth.

The ACE project goal was to improve child wellbeing through increased household economic security in Nimba (Saclepea district), Bong (Kpai and Jorquelleh districts), and Montserrado (Mt Barclay and Fendell districts) counties in Liberia. The project provided a package of assistance to over 1,000 smallholder farming enterprises under four primary objectives:

- i) Strengthening linkages between input providers and farmers
- ii) Increasing rice production
- iii) Strengthening linkages between buyers and farmers
- iv) Upgrading through technical assistance

Figure 1. ACE Project Goal and Causal Model



ACE worked to achieve these objectives through the following three primary activity streams, each responding to specific challenges.

**1) Increasing Agricultural Production.** One of the major challenges to household economic security of smallholder farmers in Liberia is low agricultural production due to limited production capacity of farmers. To address this challenge, ACE improved farmers’ production skills through agronomic trainings and demonstrations, introduced farmers to new technologies such as motorized irrigation pumps and solar dryers allowing farmers to engage in off-season production, and facilitated equipment

loans through a local microfinance organization, Liberia Entrepreneurial and Asset Development, LEAD Inc. The off-season production, coupled with the improved agronomic production practices allowed for a consistent supply of vegetables year round, creating the opportunities for pre-harvest agreements with more established buyers.

**2) Improving Access to Inputs.** ACE encountered a very distorted inputs market at the beginning of the project, which discouraged wholesale input dealers, who were more interested in targeting the donor market, from moving from Monrovia to Bong and Nimba counties. To overcome this challenge, ACE identified community-based inputs dealers and linked them with ACE farmers willing to invest in quality inputs, through community promotional events and radio shows. The establishment of farmer-input dealer relationships and the access to improved inputs was vital to improving the production (increased yields and improved quality) within the vegetable value chain, allowing farmers to access more lucrative markets through pre-harvest arrangements based on agreed upon volumes. The linkage offered mutual benefits for both the farmers and inputs dealers as it provided the opportunity for more farmers to access quality inputs to ensure production, as well as increased the customer-base of the input dealers, resulting in increased sales.

**3) Facilitating Access to Markets.** Lack of trust between farmers and buyers was a major challenge which greatly affected the establishment of market relationships. One of ACE's lead farmers explained during an ACE-organized value chain stakeholder workshop: *"We can't trust the buyers, and the buyers can't trust us too. The lack of trust started since the war."* To address this lack of trust, ACE encouraged regular meetings and interactions in the communities and at the weekly regional markets between selected buyers and lead farmers. ACE also organized two vegetable value chain stakeholder workshops in December 2011 and February 2013 in Monrovia, Gbarnga, and Saclepea that brought together value chain actors (input dealers, farmers, buyers, Ministries of Agriculture and Internal Affairs, and NGO partners) to strengthen relationships, identify opportunities and constraints in the vegetable value chain, and draw up action plans for short- and long-term strategies to address identified constraints. Eventually farmers and buyers began to enter into pre-harvest agreements with consistent supply as ACE lead farmers were able to aggregate produce from within their communities. Several buyers were spared regular travel to the weekly regional markets, relying on a transport service to pick up bulked produce on credit with payment made to farmers at a later date.

## 1.2 ACE Value Chain Overview

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At the inception, ACE carried out a value chain selection process and determined that high-value vegetables such as lettuce, sweet bell pepper, and tomato targeting higher value market outlets (restaurants, supermarkets, hotels) in Monrovia had the most potential across the three counties of Bong, Montserrado, and Nimba. The project soon changed this strategy after ACE farmers encountered perishability issues due to the long distance from Monrovia markets, lack of storage facilities, bad road conditions and low levels of agricultural farming practices. Some communities failed to produce the volumes required to make transporting them to Monrovia worthwhile prior to the crop being damaged or dying in the field. At the same time, local people were not accustomed to eating the new crops, so there was not a strong local demand for the high value vegetables (like lettuce and tomatoes) which were more fragile than typical local crops. This resulted in some farmers not harvesting these crops on their demonstration plots. ACE then shifted focus to traditional vegetables such as bitterballs, peppers, and okra in Bong and Nimba counties, targeting local and regional markets, while staying with high value vegetables in Montserrado, due to its close proximity to Monrovia where a strong market for high value vegetables existed.

**Pre-ACE (2008).** The vegetable value chains in Bong and Nimba were highly underdeveloped at the beginning of ACE due to the long 15 year civil war that decimated the economy and uprooted many farming families. The majority of smallholders were struggling to transition to a market based agricultural system as humanitarian aid was being reduced. Rural households were faced with many constraints, including impassable market roads and close to nonexistent roads in some communities, leading to near isolation during the six-month rainy season; the continued use of outdated agricultural techniques; limited access to agricultural inputs and credit; the prohibitive cost of transportation; and rising commodity prices. These constraints led to low productivity and a reliance on imports for food commodities. In 2007, the market remained the primary source of food (81% of needs) and households were spending close to 70% of their total income on food.<sup>1</sup> Predictably, there were few vertical or horizontal linkages within the traditional vegetable value chains at the start of the project, as very few farmers were willing to buy inputs, buyers targeted imports rather than local production and there were very few organized farmer groups. Additionally, farmers in Bong and Nimba received the majority of their technical assistance from NGOs and there were no rural financial service providers at the time.

With its close proximity to Monrovia, Montserrado farmers had a distinct advantage with access to input shops and regular technical assistance from agricultural universities and local and international NGOs. These farmers could also easily sell to higher value markets such as restaurants and hotels; however, their volumes were too small to service larger institutions such as the United Nations Mission in Liberia (UNMIL).

**Post-ACE (2014).** At the end of the ACE, Liberia's agricultural sector had seen marked improvement. The traditional vegetable value chains in Bong and Nimba, particularly with the ACE cluster farmers were able to aggregate their crops for buyers.<sup>2</sup> Smallholders were able to access improved inputs such as seeds, tools and chemicals through the presence of local agro-input dealers. There were also initial signs that large commercial input providers, such as Wienco Ltd, a leading agro-input company in West Africa, were beginning to market outside of Monrovia. Many farmers were also improving production practices and farm planning through information acquired through donor programs. During the harvest season, prices for local vegetables dropped significantly due to much larger surpluses, while few farmers were capable of producing and selling during the more lucrative dry season. Buyers were also interested in engaging in pre-harvest agreements with reliable producers capable of larger production volumes. Additionally, financial institutions were expanding services to the agricultural sector; however, they mostly targeted farmers in the coffee and rubber sectors, considering vegetables to be too high of a risk. Many of the critical constraints remained, such as the poor road infrastructure, lack of storage and drying facilities, lack of trust among market actors, and poor information channels. The high cost of inputs as compared to other West African countries still remains a constraint.

In Montserrado, high value vegetable farmers were able to increase their production through improved practices and access to improved inputs. Producers were also better organized, forming a farmers' market at the US Embassy as well as becoming members of the Farmers' Union Network of Liberia, a national farmer association organizing farmers throughout Liberia under one umbrella to advocate for farmers to increase crop production in Liberia.

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<sup>1</sup> Comprehensive Food Security and Nutrition Survey, United Nations, October 2007

<sup>2</sup> Cluster Farmers were informal groups led by ACE lead farmers (Category A) and facilitated by ACE staff that met regularly to discuss production, marketing and project extension topics.

### 1.3 Network Analysis Study Overview

A core assumption of the ACE project was that strengthened and expanded relationships between actors within a value chain results in improved access to knowledge, skills, and resources, which coupled with improved production skills and technologies, increases production, sales, and household economic security. As part of the ACE learning component, the project conducted a network analysis study to measure relational changes between actors within the traditional and high value vegetable value chains brought about by ACE interventions. Social network analysis is a methodological approach that applies graph theory to sociological studies by measuring and mapping network relationships. Network analysis can provide insight into the strengths and weaknesses within value chain networks, revealing the degree of *redundancy* in networks (multiple relationships to different value chain actors such as buyers, or input suppliers) which can indicate resilience to shocks and stresses; *gaps* (absence of linkages with value chain actors), which can indicate unmet need; *dependency* (multiple farmers depending on just a couple of input suppliers), which can indicate vulnerability, and *fragmentation* (networks of actors isolated from one another), which can be an indication of monopolies in small informal/formal markets, presence of barriers to entry to broader markets, and absence of aggregators.

Using data generated from focus group discussions (FGDs), the project developed a data set of the farmers' relationships to various value chain actors *before the project began, after the project ended, and projections into the future*. The analysis assessed the *number, strength, and diversity* of new linkages, primarily from the smallholder farmer to buyers, input dealers, and technical/financial extension service providers. *Strength* of relationships were self-reported by focus group participants based on frequency of interactions and volumes of sales, qualified as very strong, strong, occasional, weak, and very weak.

The result of this analysis is displayed in network maps, such as the map in Figure 2.

In network maps, the lines represent linkages between actors. The linkages between value chain actors are labeled and scaled according to the type of reported relationship (i.e., the thicker the line the stronger the connection to a specific actor). An actor with a lack of linkages indicates no reported relationship. In addition, the size of each actor is scaled proportionally by the number of connections to other actors: an actor, such as a Category A farmer, who has more connections than the other farmer categories is indicated with a larger shape.

Figure 2. Nimba County Farmer Groups A, B, and C after ACE's Interventions



## 2. Network Value Chain Analysis Study

### 2.1 Study Methods

The vegetable value chain network analysis was conducted in Bong, Montserrado, and Nimba counties during September and October of 2013. The goal for the analysis was to assess the effect of ACE's interventions on the value chain actors' commercial relationships over time: i) before the project started, ii) presently at the time of project completion, and iii) the projected future. Data were collected using FGDs with ACE farmers conducted in October 2013 by two consultants subcontracted by ACE in Bong, Montserrado, and Nimba counties, in addition to in-depth interviews (IDI) with other value chain actors. Guides can be found in Annex A.

**Table 1. Farmer Category Criteria**

Category	Criteria
<b>A</b>	<ul style="list-style-type: none"> <li>• One or more acre of production capacity</li> <li>• Aggregator of at least five other farmers or more</li> <li>• Have direct buyer</li> <li>• High level of adoption of best agronomic practices and Farming as a Business</li> </ul>
<b>B</b>	<ul style="list-style-type: none"> <li>• One half to one acre of production capacity</li> <li>• Aggregator of four or less other farmers</li> <li>• Sometimes have direct buyer</li> <li>• Moderate level of adoption of best agronomic practices and Farming as a Business</li> </ul>
<b>C</b>	<ul style="list-style-type: none"> <li>• One quarter of an acre or less production capacity</li> <li>• Most vulnerable farmers</li> <li>• Slow adopters of agronomic practices</li> <li>• No direct buyer—sell locally/regional markets</li> </ul>

FGDs were formed using stratified sampling of 435 farmers: first grouping farmers from each county into three stratified groups based on production capacity and market integration (Table 2)

FGD participants were selected from each stratification using random sampling, with the exception of Category A and B where women farmers were purposefully selected to improve gender representation. In total, out of a population of 435 farmers, 93 farmers were sampled, but grouped into 9 focus groups. (Table 4).

FGDs were conducted orally, recorded, and then transcribed. The transcriptions were then compiled into data sets and analyzed using the social network analysis software Nodal. Data sets identified the linkages between farmers within each category, and other value chain actors falling into three main categories: buyers, input suppliers, and technical/ financial service providers.

**Table 2. Farmer Focus Group Sampling Framework**

Sample Stratification			Focus Groups
Category	Location	Total	Total
A	Montserrado	20	13
	Bong	36	10
	Nimba	17	10
B	Montserrado	54	10
	Bong	55	10
	Nimba	37	10
C	Montserrado	29	10
	Bong	122	10
	Nimba	65	10
<b>Totals</b>		<b>435</b>	<b>93</b>

## 2.2 Study Limitations

There were a number of limitations to the ACE network analysis study. Perhaps the single largest limitation was in the post-facto development of the pre-ACE networks. Farmers were asked to think back five years from the beginning of the ACE program to describe their networks, leaving a large margin for error in their responses.

The facilitation and transcription of the FGDs was an additional limitation in the study. FGDs were facilitated by two independent consultants. Though the two consultants participated in previous similar assignments and were also briefed by FHI360 on carrying out FGDs, they later admitted that they had not previously done this type of rigorous work, especially agriculture related discussions coupled with recording interviewees, while at the same time transcribing and coding such interviews. Transcriptions showed discrepancies between the quality and completeness of the FGDs and the transcriptions themselves between the two consultants. In addition, some of the recordings were not audible, making

them difficult to transcribe. Eventually the coding of the transcripts was completed at a later date by ACE staff and not the consultants themselves, increasing the potential of error in the coding.

A third limitation of the study is that the value chain network analysis data was collected primarily through FGDs with farmers, and thus is limited to the farmers' perspective of the impact of the project on the value chains. A more comprehensive value chain network analysis would also map linkages between other value chain actors, including but not limited to buyers, input retailers, and extension and financial service providers, providing a more complete assessment of the strengthening and growth of the value chain. While interviews were conducted with other value chain actors, including buyers, input suppliers, and extension service providers, the data collected did not lend itself to network analysis as it did not identify or qualify specific, actor-to-actor linkages.

## 2.3 Findings

### Number and Strength of Linkages

The net increase in linkages across all counties and farmer categories increased by 43% from 63 to 90, with very strong and strong linkages increasing by 68% and 150% (Table 3).

Table 3. Strength of Value Chain Linkages as Reported by ACE Farmer Project Participants

Strength	Bong		Nimba		Montserrado		Total		Change
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	
Very Strong	3	11	2	14	20	17	25	42	17
Strong	0	6	1	8	7	6	8	20	12
Occasional	10	6	1	4	6	5	17	15	-2
Weak	1	0	1	1	6	8	8	9	1
Very Weak	0	0	1	0	4	4	5	4	-1
<b>Total</b>	<b>14</b>	<b>23</b>	<b>6</b>	<b>27</b>	<b>43</b>	<b>40</b>	<b>63</b>	<b>90</b>	<b>27</b>
<b>Change</b>	<b>9</b>		<b>21</b>		<b>-3</b>		<b>36</b>		
No Relationship	14	5	24	3	8	11	46	19	-27

In addition, the overall number of VC actors to whom the farmers indicated no linkage showed a net decrease from 46 to 19, with the greatest net decrease in Nimba from 24 to 3, followed by Bong from 14 to 5, indicating an increase of new actors integrated within the value chains in Bong and Nimba. Montserrado saw an increase in VC actors with no linkage to farmers.

Table 4. Number of VC Actor Linkages per ACE Farmer Category per County

Farmer Category	Bong		Nimba		Montserrado		Total		Total Change
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	
A	4	8	4	13	16	15	24	36	12
B	7	9	1	5	15	14	23	28	5
C	3	6	1	9	12	11	16	26	10
<b>Total</b>	<b>14</b>	<b>23</b>	<b>6</b>	<b>27</b>	<b>43</b>	<b>40</b>	<b>63</b>	<b>90</b>	<b>27</b>
<b>Total Change</b>	<b>9</b>		<b>21</b>		<b>-3</b>		<b>27</b>		

Among the counties analyzed, Nimbawhich had the fewest linkages at the start of the project, reported with 6 linkages, represented the greatest change in linkages across all counties with an increase of 21 linkages to a total of 27 linkages. Bong County, with the second lowest reported number of linkages at the start of the project, reported a net increase of 9 new linkages from 14 to 23. Montserrado, which had the highest number of linkages at the start of the project with 43 linkages, reported a net loss of 3 linkages.

When comparing the number of linkages by Farmer Category for each county (Table 3), Category A farmers reported the greatest net change in number of linkages at an increase of 12 linkages, compared to category B and C farmers who reported net increases of 5 and 10 linkages respectively.

Network graphs of the pre and post-ACE networks illustrate the increased number, diversity, and strength of linkages across Farmer A, B, and C categories. In addition, pre and post-ACE maps show an increase of shared linkages to value chain actors between farmer groups, an indicator of a more reliable system of actors.

Farmers from Categories A, B, and C reported 46 linkages with entirely new value chain actors to whom farmers reported no previous linkage, accounting for 51% of the total value chain linkages reported. Nimba had the greatest number of linkages with new value chain actors with 24 linkages accounting for 89% of their total linkages, followed by Bong with 14 linkages to new actors accounting for 61%, and Montserrado, with 8 new linkages accounting for 20% of all linkages (Table 5).

In regards to the number of existing relationships strengthened over the life of the project, Bong showed the greatest number of relationships strengthened, with 35.7% of existing relationships strengthened over the life of the project,

followed by Montserrado, with 18.6% strengthened, and 0% reported as strengthened in Nimba County. Comparing farmer categories, Farmers in Category A had the greatest increase in relationships,

Figure 3. Bong, Nimba, Montserrado Farmer Networks Pre and Post ACE

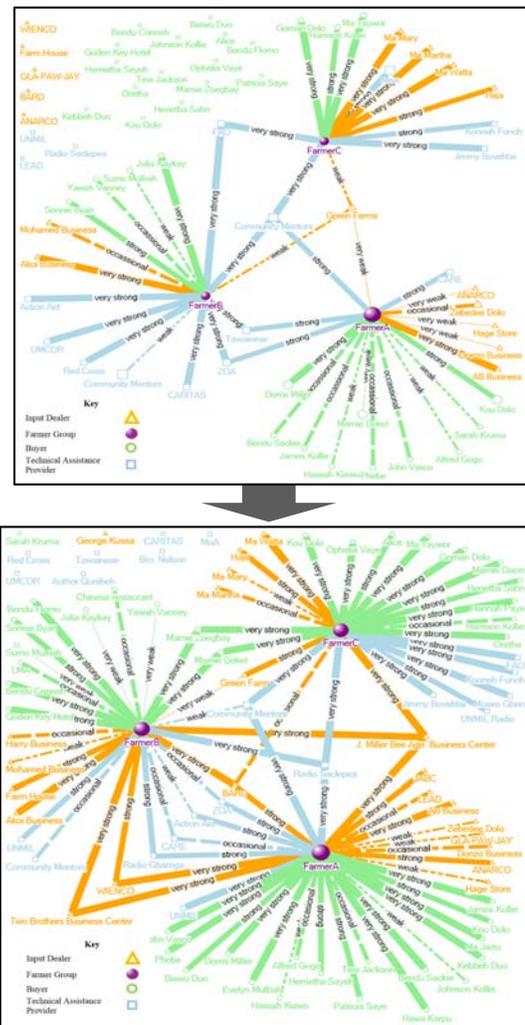


Table 5. Number of Linkages with New Value Chain Actors

Farmer Category	Bong	Nimba	Montserrado	Total New	Total Linkages	Percent
A	5	10	4	19	36	53%
B	3	5	4	12	28	43%
C	6	9	0	15	26	58%
<b>Total New</b>	<b>14</b>	<b>24</b>	<b>8</b>	<b>46</b>	<b>90</b>	<b>51%</b>
<b>Total Linkages</b>	<b>23</b>	<b>27</b>	<b>40</b>	<b>90</b>		
<b>Percent</b>	<b>61%</b>	<b>89%</b>	<b>20%</b>	<b>51%</b>		

strengthened at 45.8%, followed by Category B farmers at 8.7%, and Category C Farmers at 0% (Table 6).

**Table 6. Number of Preexisting Relationships Strengthened Over Life of Project**

Farmer Category	Bong		Nimba		Montserrado		Total		%
	Linkages	Strengthened	Linkages	Strengthened	Linkages	Strengthened	Linkages	Strengthened	
A	4	3	4	0	16	8	24	11	46
B	7	2	1	0	15	0	23	2	9
C	3	0	1	0	12	0	16	0	0
<b>Total</b>	<b>14</b>	<b>5</b>	<b>6</b>	<b>0</b>	<b>43</b>	<b>8</b>	<b>63</b>	<b>13</b>	<b>21</b>
<b>%</b>	<b>36%</b>		<b>0%</b>		<b>19%</b>		<b>21%</b>		

### Diversity of Linkages

Analysis of the diversity of value chain linkages formed over the life of the project indicates differences across the three counties, as shown in Table 7. The greatest number of new linkages across all farmer categories was in linkages to buyers, increasing from 22 to 40 and accounting for 44% of all value chain linkages. Nimba County had the greatest change in linkages with buyers, with an increase from 3 to 17 linkages over the life of the project. A large part of the increase in buyer linkages was attributed to buyers looking for pre-harvest arrangements and the identification of new buyers for dried vegetables that were being produced by ACE farmers through solar dryer processing. Buyers in Nimba who traveled to Guinea and Ivory Coast to buydried peppers and bitter balls, were now buying from ACE farmers, as Nimba County borders Guinea and Ivory Coast. The second greatest number of new linkages across all farmer categories was in linkages to extension service providers led by Bong, with an increase from 3 to 9 linkages over the life of the project.

**Table 7. Vegetable Value Chain Actors Linked to ACE Farmers**

Value Chain Actor	Bong		Nimba		Montserrado		Total		Total Change
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	
Buyer	5	7	3	17	14	16	22	40	18
Input Supplier	5	7	1	7	13	14	19	28	9
Technical and Financial Extension Service Provider	3	9	2	3	16	10	21	22	1
<b>Total</b>	<b>13</b>	<b>23</b>	<b>6</b>	<b>27</b>	<b>43</b>	<b>40</b>	<b>62</b>	<b>90</b>	<b>28</b>
<b>Total Change</b>	<b>10</b>		<b>21</b>		<b>-3</b>		<b>28</b>		

In regards to diversity of value chain linkages formed over the life of the project and the different categories of farmers, analysis indicates the greatest number of new linkages across counties occurs for linkages to buyers in Category C farmers with an increase from 3 to 12, a total of 9 new linkages to buyers (Table 8). This is because many of the category C farmers had more immediate cash needs and preferred to sell directly through local markets rather than aggregate through category A or B farmers. They instead sold to many different buyers thereby having a greater number of buyer linkages than other farmer categories. The category C farmers' understanding of the VC approach was still in its nascent stage and needed much mentoring by Category A or B farmers. Category A farmers had an increase of 6 new linkages to input suppliers due to their improved understanding for the need for quality inputs to increase their production. They also spearheaded negotiations with input dealers during community base promotional events and bought inputs in bulk with discounts.

Table 8. Vegetable Value Chain Actors Linked to ACE Farmers

Value Chain Actor	A		B		C		Total		Change
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	
Buyer	13	17	6	11	3	12	22	40	18
Input Supplier	6	12	7	9	6	7	19	28	9
Technical and Financial Extension Service Provider	4	7	10	8	7	7	21	22	1
<b>Total</b>	<b>23</b>	<b>36</b>	<b>23</b>	<b>28</b>	<b>16</b>	<b>26</b>	<b>62</b>	<b>90</b>	<b>28</b>
<b>Change</b>	<b>13</b>		<b>5</b>		<b>10</b>		<b>28</b>		

### Sustainability of Linkages

Analysis of the participants' projections of their value chain linkages into the future indicates that 97% of linkages will be sustained post-ACE (Table 9), with Category C indicating 100% of their linkages being sustained. Montserrado County indicated the greatest percentage of linkages sustained across all farmer categories, projecting 100% of linkages sustained, followed by Nimba at 96%, and Bong County at 91%.

Table 9. Number of ALL VC linkages, current and future projections

Farmer Category	Bong		Nimba		Montserrado		Total		Percent
	Current	Future	Current	Future	Current	Future	Current	Future	
A	8	7	13	12	15	15	36	34	96%
B	9	8	5	5	14	14	28	27	96%
C	6	6	9	9	11	11	26	26	100%
<b>Total</b>	<b>23</b>	<b>21</b>	<b>27</b>	<b>26</b>	<b>40</b>	<b>40</b>	<b>90</b>	<b>87</b>	<b>97%</b>
<b>Percentage</b>	<b>91%</b>		<b>96%</b>		<b>100%</b>		<b>97%</b>		

Analysis of the breakdown of linkages to be sustained indicates that the number of preexisting linkages, meaning those linkages with actors which existed both before and after ACE intervention, have a 100% projected sustainability rate (Table 10),

Table 10. Number of Preexisting Linkages by County and Category, Current and Future Projections

Farmer Category	Bong		Nimba		Montserrado		Total		Percent
	Pre-existing	Future	Pre-existing	Future	Pre-existing	Future	Pre-existing	Future	
A	3	3	3	3	11	11	17	17	100%
B	6	6	0	0	10	10	16	16	100%
C	0	0	0	0	11	11	11	11	100%
<b>Total</b>	<b>9</b>	<b>9</b>	<b>3</b>	<b>3</b>	<b>32</b>	<b>32</b>	<b>44</b>	<b>44</b>	<b>100%</b>
<b>Percent</b>	<b>100%</b>		<b>100%</b>		<b>100%</b>		<b>100%</b>		

In contrast, newly formed linkages with actors new to the VC show a lower projected sustainability rate of 94% (Table 11). Montserrado County farmers project a 100% sustainability rate, followed by Nimba County with a 96% projected sustainability rate, and Bong with an 86% sustainability rate. Category C Farmers anticipated a 100% sustainability rate, with Category B and Category A projecting a 92% and 90% sustainability rate.

Table 11. Number of VC Linkages with NEW Actors, Current and Future Projections

Farmer Category	Bong		Nimba		Montserrado		Total		Percent
	New	Future	New	Future	New	Future	New	Future	
A	5	4	10	9	4	4	19	17	90%
B	3	2	5	5	4	4	12	11	92%
C	6	6	9	9	0	0	15	15	100%
<b>Total</b>	<b>14</b>	<b>12</b>	<b>24</b>	<b>23</b>	<b>8</b>	<b>8</b>	<b>46</b>	<b>43</b>	<b>94%</b>
<b>Percent</b>	<b>86%</b>		<b>96%</b>		<b>100.0</b>		<b>94%</b>		

Analysis of the relationship between strength and sustainability shows a slight increase in the number of very strong, and very weak relationships projected, with slight decreases or no change at all for strong, occasional, and weak relationships.

Table 12. Number of All VC linkages Current and Future Projections

Farmer Category	Bong		Nimba		Montserrado		Total		Percent
	Current	Future	Current	Future	Current	Future	Current	Future	
Very Strong	11	11	14	17	17	19	42	47	112%
Strong	6	1	8	4	6	6	20	11	55%
Occasional	6	8	4	3	5	4	15	15	100%
Weak	0	0	1	1	8	2	9	3	33%
Very Weak	0	1	0	1	4	9	4	11	275%
<b>Total</b>	<b>23</b>	<b>21</b>	<b>27</b>	<b>26</b>	<b>40</b>	<b>40</b>	<b>90</b>	<b>87</b>	<b>97%</b>
<b>Percent</b>	<b>91%</b>		<b>96%</b>		<b>100%</b>		<b>97%</b>		

## County Analysis

### Bong County

Bong County had the second greatest increase in linkages with a net increase of 9 linkages. Of the 23 post ACE linkages, 14 were with new actors in the VC (Table 13). Two thirds of the linkages created in Bong were with technical service providers. This could be attributed to the fact that Bong County has the Country’s agricultural research institute, Central Agricultural Research Institute (CARI), and one of the Agriculture Colleges. These two institutions have had a lot of impact in the county’s agriculture sector through technical support by training individuals, organizations, and students who then provide technical support to farmers. ACE staff also benefited from training from CARI, and students from the agriculture college also had internships through ACE. Additionally, Bong County is centrally located in the country making it one of the counties with the greatest presence of local and International NGOs as well as the Ministry of Agriculture. ACE farmers also received technical and material support from development partners such as CARE, FAO, and UNMIL. Category C farmers in Bong had the highest increase in linkages with buyers, while Category A farmers had the highest increase in linkages with input suppliers. The increase in linkages with input suppliers by Category A farmers could be attributed to their role they played as negotiators on behalf of other farmers with input dealers as explained earlier. They were also trusted with inputs because of their technical knowledge in the handling and application of these inputs on the farm.

Table 13. Bong—Vegetable Value Chain Actors Linked to ACE Farmers

VC Actor	A		B		C		Total		Change
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	
Input Supplier	1	3	4	3	1	1	6	7	1
Extension Service	0	2	1	4	2	3	3	9	6
Buyer	3	3	2	2	0	2	5	7	2
<b>Total</b>	<b>4</b>	<b>8</b>	<b>7</b>	<b>9</b>	<b>3</b>	<b>6</b>	<b>14</b>	<b>23</b>	<b>9</b>
<b>Change</b>	<b>4</b>		<b>2</b>		<b>3</b>		<b>9</b>		

**Pre-ACE.** Figure 4 to the right illustrates the 14 linkages reported by farmers in Bong County prior to ACE intervention. The network was composed of three clusters, with Farmer Category A and B connected by shared linkages to Green Farm, an input service dealer that worked with ACE in the beginning of the project to expand their services to ACE communities. The graph illustrates the majority of the connections were labeled as occasional or weak interactions. Additionally, there was a large number of value chain actors without any linkages to farmers in Bong. These were predominately donors and NGOs as well as a few buyers. Category B farmers had the largest network with input dealers, with four linkages.

Figure 4. Bong Farmer Networks Pre-ACE



**Post-ACE.** Figure 5 illustrates the linkages reported by farmers in Bong County after the ACE intervention. The network of value chain actors and farmers is clearly more connected, both in the number of linkages in each farmer category, as well as the linkages shared between farmer categories.

The total change in the number of linkages was a net increase of 23, while the number of value chain actors without any linkages to the network decreased to 4.

In addition, a number of new actors introduced in Bong came from donor projects. For instance, Farmer Category C formed a very strong linkage with FAO's seed distribution program and UNMIL's ex-combatant agriculture program targeting vulnerable households, while Farmer Category A and B shared linkages with CARE's conservation agriculture and village savings and loans programs. ACE's work supporting agriculture radio programs through Radio Gbarnga was also reported in FGDs among category A and B farmers. In addition, Farmer Category B showed a weakening of linkages with Community Mentors as B farmers became more self-sufficient over the life of the project.

The Category C Farmers saw an increase of diversity of value chain actors, including the introduction and strengthening of linkages with some smaller, local buyers and service providers, including Hannah Pay, Mamie Dixon, and Moses Gben. Hannah Pay and Mamie Dixon were entrepreneurs that started trading in vegetables in Bong and selling to markets in Monrovia. The two women frequently visited the weekly markets and bought peppers and bitter-balls and other vegetables from farmers. Since they were local traders, they were trusted by farmers to buy vegetables on credit and pay the following weekly market day. In addition, a weak input supply linkage with George Kussa was replaced with a strong linkage with J Miller Bee Agribusiness Center, who is now Farmer Category C's only linkage for inputs. George Kussa was little known by ACE. ACE's staff were informed by farmers that Mr. Kussa sold inputs only on weekly market days in Palala Bong County, but was inconsistent. Over time, he did not show up when he was needed most for his inputs. At the time, John Millar Bee was a farmer who lived in Palala in Bong and decided to venture into the agro input business. Realizing the gap for the lack of consistent sales of agro inputs in his community, he established a small shop in Palala and named his business J. Millar Bee Agribusiness Center. ACE worked to link many farmers in Bong to his store.

Also apparent is the increase in the strength of linkages, particularly for Farmer Category A, where the linkages to the agro-input store including Two Brothers and J Miller Bee Agribusiness Center went from occasional to very strong. Two Brothers is an input business in Gbarnga; Bong County capital. They were linked to ACE farmers, and also visited the weekly markets in ACE communities which resulted in the increased and strengthened relationships with farmers. However, there was also a loss of the input supplier Green Farm, which had been an "occasional" relationship pre-ACE with both Farmer Category A and B. As stated above, Green Farm experienced competition from free distribution of inputs resulting in low inventories and eventually closing their branch in Bong.

Figure 5. Bong Farmer Networks Post-ACE

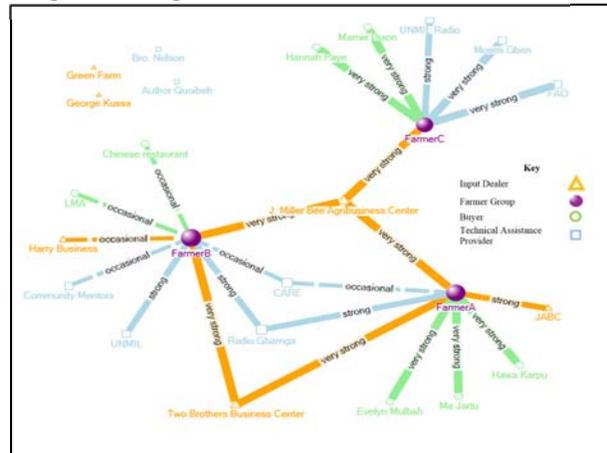
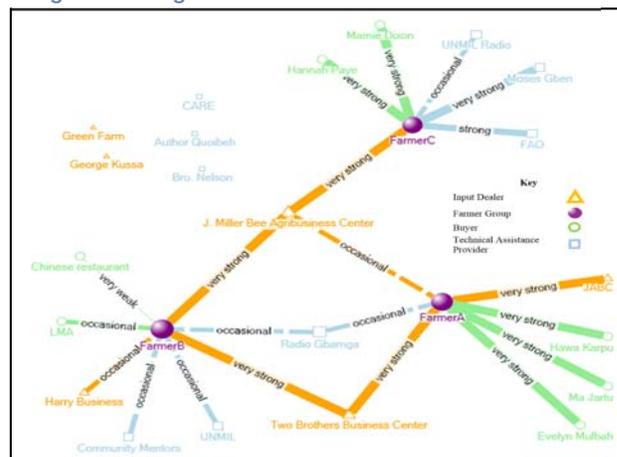


Figure 6. Bong Farmer Networks Future



**Future Projections.** Future projections indicate the continuation of almost all linkages with the exception of CARE as seen in Figure 6. The strength of the linkages also appears to continue, meaning the relationships are likely to continue at high levels, pointing to perceptions from the farmers of the likelihood of sustainable impact.

**Nimba**

The Nimba County graphs showed the greatest changes of each of the counties. The graphs show a significant increase in the number of linkages between actor’s pre and post-ACE, increasing from 6 to 27. 67% of this increase was in linkages with buyers alone, with 29% increased linkages to input suppliers. Farmer Category A saw the greatest net increase in new linkages with 9 new linkages across input suppliers, extension service, and buyers, while Category C had the single most increase in linkages to buyers from 1 to 9 linkages.

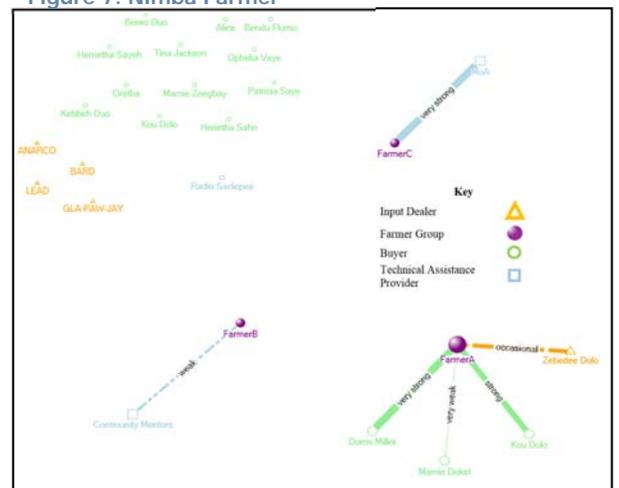
Table 15. Nimba—Vegetable Value Chain Actors Linked to ACE Farmers

VC Actor	A		B		C		Total		Change
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	
Input Supplier	1	5	0	1	0	1	1	7	6
Extension Service	0	1	1	1	1	1	2	3	1
Buyer	3	7	0	3	0	7	3	17	14
<b>Total</b>	<b>4</b>	<b>13</b>	<b>1</b>	<b>5</b>	<b>1</b>	<b>9</b>	<b>6</b>	<b>27</b>	<b>21</b>
<b>Change</b>	<b>9</b>		<b>4</b>		<b>8</b>		<b>21</b>		

**Pre-ACE.** Figure 7 to the right illustrates that the Nimba network was very weak, with Farmer Categories A, B, and C having very few linkages with value chain actors. In addition, the Nimba network was the most fragmented of each of the counties, having no shared connections between farmer categories and value chain actors.

There was a high number of value chain actors without any linkages to farmers in Nimba. These were predominantly buyers, with some input dealers of which most were donors and NGOs. Of the 6 reported linkages, Farmer Category A reported more linkages and a more diverse network (consisting of three buyers and an input dealer) than Farmer Categories B and C.

Figure 7. Nimba Farmer





As a whole, the network is beginning to become less fragmented, with Farmer Categories A, B, and C linked through joint relationships with buyers, input dealers, and technical assistance providers.

**Future Projections.** Future projections illustrated in Figure 9 demonstrate the continuation of almost all of the post-ACE linkages with the exception of ANARCO. ANARCO was one of the input service providers that had earlier closed its operation in Nimba and moved to Monrovia. It did not have any future plan to return to Nimba. The other service providers were solidifying their linkages with the farmers. The Nimba farmer networks' projections do not show an increase of access to new input suppliers or technical assistance providers, indicating that while the established network will stay stable and strengthen, it will not expand or become more diversified.

**Montserrado County**

The Montserrado County network was the strongest network of the three counties pre-ACE. The Montserrado network had fairly equally distributed networks across each of the Farmer Categories in terms of number of linkages with VC actors. Pre and post-ACE graphs show greater changes in strength than number of linkages in comparison to the other counties. Montserrado also saw a greater loss of linkages than the other two counties.

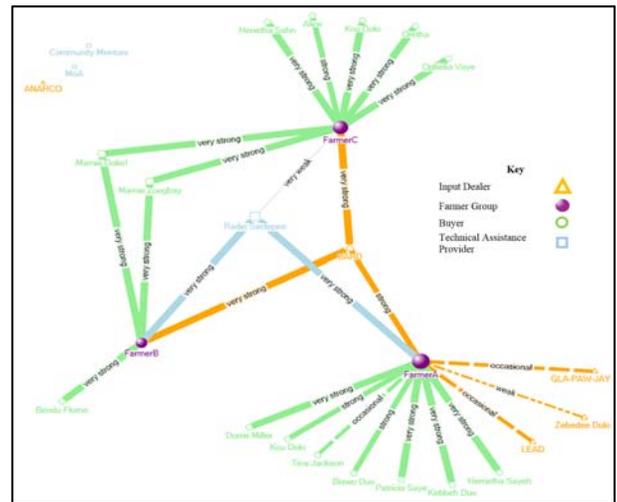


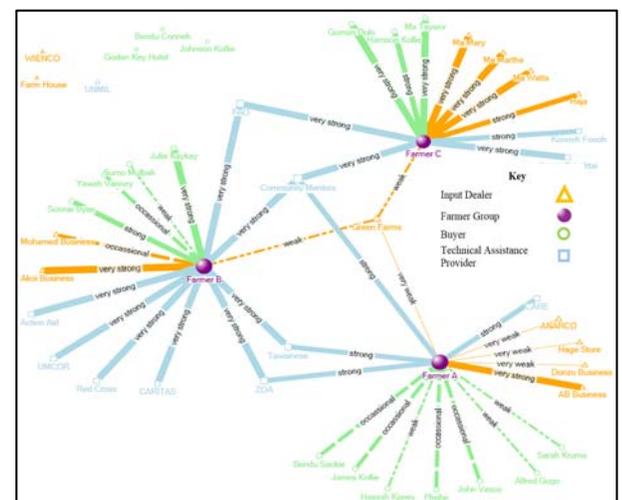
Table 16. Montserrado—Vegetable Value Chain Actors Linked to ACE Farmers

VC Actor	A		B		C		Total		Change
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	
Input Supplier	5	4	3	5	5	5	13	14	1
Extension Service	4	4	8	3	4	3	16	10	-6
Buyer	7	7	4	6	3	3	14	16	2
<b>Total</b>	<b>16</b>	<b>15</b>	<b>15</b>	<b>14</b>	<b>12</b>	<b>11</b>	<b>43</b>	<b>40</b>	<b>-3</b>
<b>Change</b>	<b>-1</b>		<b>-1</b>		<b>-1</b>		<b>-3</b>		

**Pre-ACE.** Figure 10 to the right illustrates the value chain network prior to ACE. Each farmer category has diversified linkages to various value chain actors, including buyers, extension service providers, and input dealers. The network is the least fragmented network of the three counties, with Farmer Categories A, B, and C connected through joint linkages with other VC actors, all except one service providers.

Farmer Category A has the greatest percentage of linkages to buyers, with Farmer Category B having the greatest percentage of its linkages to extension services, and Farmer Category C with the greatest percentage of its linkages with input suppliers.

Figure 10. Montserrado Farmer



**Post-ACE.** Figure 11 to the right illustrates the Montserrado value chain network post-ACE. In contrast to Nimba and Bong counties, Montserrado County shows a strengthening of linkages over an increase in number of linkages. Seven of Farmer Category A ties which had been characterized as very weak, weak, or occasional, increased in strength, mostly to occasional and very strong.

Farmer Category B and C lost a number of linkages to public sector and development actors, the vast majority being linkages to technical / financial service providers including CARITAS, CARE, FAO, Red Cross, and UMCOR. CARITAS, which is a Catholic organization based in Gbarnga, Bong County provided relief items including farming tools to farmers before ACE began. Red Cross also provided relief items before ACE. Similarly, FAO distributed free inputs such as seeds and tools. At the time of the FGDs, these donor programs had scaled down their agriculture activities. Therefore, farmers had lost their linkages with these organizations.

All of the Farmers' Categories show a high degree of redundancy among the buyer and input supplier networks, indicating a more resilient network against shocks or stresses.

**Future Projections.** Future projections for the Montserrado network show little projected change as illustrated in Figure 12. The strength of the ties appears likely to be sustained in most cases, while in a few cases, the strength is predicted to shift to a lesser strength. Ties predicted to strengthen are largely strong ties increasing to very strong ties, while ties predicted to weaken are weak ties weakening to very weak ties.

Figure 11. Montserrado Farmer Networks Post ACE

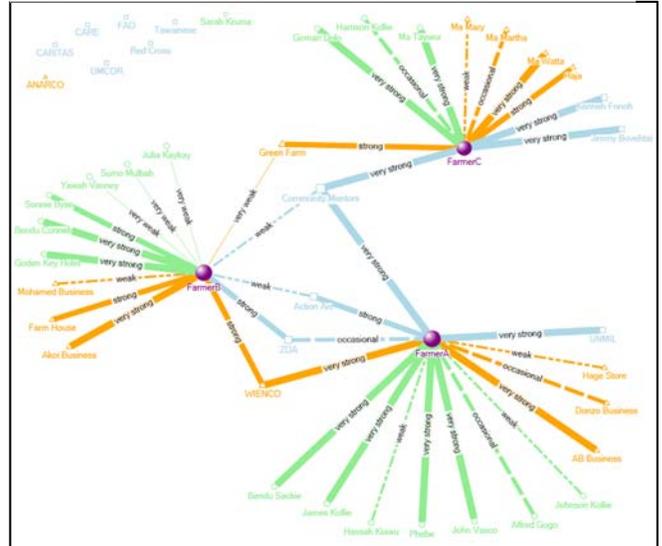
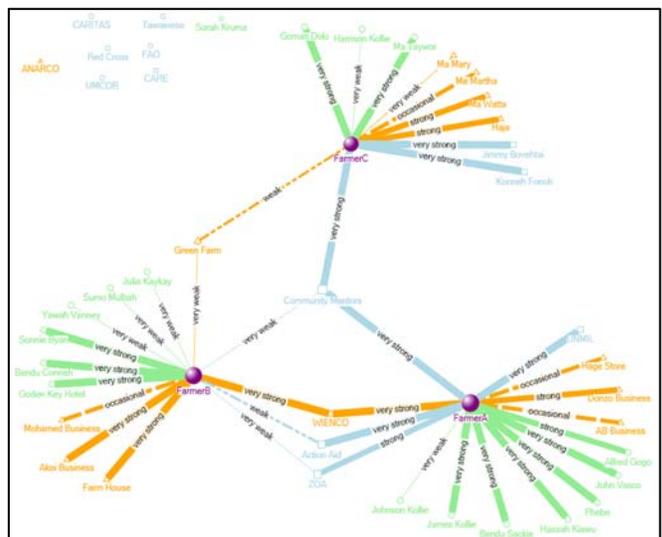


Figure 12. Montserrado Farmer Networks Future Projections



### 3. Discussion and Recommendations

#### Value Chain Development

Network analysis of linkages between farmers and other VC actors in Nimba, Bong, and Montserrado Counties reveals that the ACE project contributed to the successful strengthening and expanding of farmer networks. As a whole, ACE farmers increased their number of linkages to buyers, input suppliers, and technical/financial services from 63 linkages pre-ACE to 90 linkages post-ACE, a 43% increase. In addition, the number of very strong and strong relationships increased by 81%, whereas the number of occasional, weak, and very weak decreased by 19% over the life of the project.

The network analysis showed varied changes among each of the different geographical value chains. The greatest change in network growth was observed in the two more rural counties, Nimba and Bong, which

also had the weakest value chains at the start of the project. Nimba had the most dramatic change in the expansion and strengthening of linkages with VC actors, of which the greatest proportion was to buyers and input suppliers. This change is likely due in part to the greater opportunity for change: Nimba had the weakest, least diversified, and most fragmented network, and thus the greatest opportunity for expansion, diversification, and strengthening. The finding that the greatest change in Nimba was characterized by increased linkages to buyers and input suppliers, not to technical and financial service providers, indicates that investment in technical and financial services may be premature and underutilized without first investing in the diversification and strengthening of linkages to input suppliers and buyers. That there is only a single technical service provider serving farmers in Nimba, Radio Saclepea, however, is a clear weakness in the Nimba network. If production and sales from farmers increases due to access to inputs and buyers, the lack of access to technical / financial services in Nimba to improve the quality and quantity of product could eventually constrain the value chain growth. In addition, Nimba farmers reported purchasing inputs from only a single input supplier—BARD, for both Farmer Categories A and B—a sign that the input-supply market in Nimba is still not very developed.

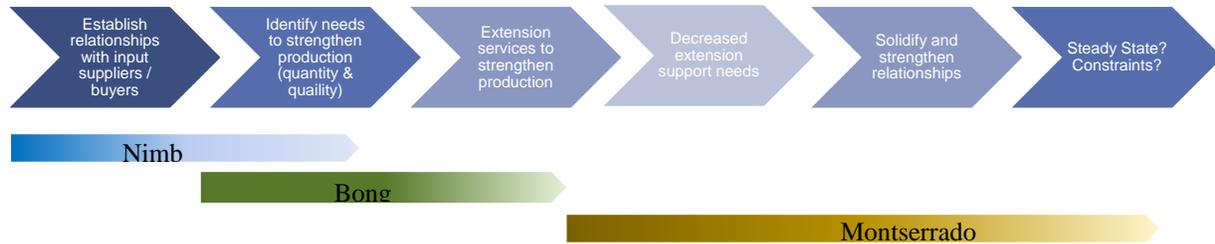
Bong County, also rural and with the second least number of linkages, had a stronger value chain network pre-ACE than Nimba, with a number of established linkages to buyers and input suppliers. In contrast to Nimba, the increase in linkages in Bong was characterized by more linkages to technical service providers. This may support the hypothesis that the demand for technical and financial services are driven by the establishment of relationships with buyers and input suppliers. However, Farmer Categories A, B, and C do not have much redundancy in their input supply and buyer networks, indicating that Bong input supply and buyer networks post-ACE are still somewhat weak and susceptible to external shocks and stresses. In addition, Bong farmers in Category C indicated linkages with only a single input supplier, BARD, which could make Category C farmers vulnerable to input supply shortages or price fluctuations.

In contrast, the value chain in Montserrado County, which had the strongest farmer network pre- and post-ACE, seems to be in a relative state of equilibrium; the number of new linkages formed over the life of the project was the same as the number of relationships lost. A large number of these relationships lost were to international NGOs and other public sector actors. This could indicate a maturing value chain with less dependency on public sector support. That there was no net change in the number of relationships in the Montserrado network raises a number of interesting questions about the maturation of value chains, such as: Is there an equilibrium point in value chain development where an increase or decrease in number of linkages result in a weakening of the system? What are the constraints which hold a value chain in equilibrium? Has productive capacity been maximized? Has demand been satisfied? Do actors not have the absorptive capacity to manage additional relationships? Is this an enabling environment challenge? Would new partnerships be required if producers decided to upgrade their production to reach new markets? Are there policies or market conditions in place which limit continued growth for smallholders?

Analysis of the number of existing relationships which were “strengthened” revealed Montserrado and Bong to be the leaders. This may be a result of the fact that Nimba simply did not have as many linkages pre-ACE to be strengthened. It also reflects the fact that Nimba is farther away from the capital Monrovia, which hampers the movement of buyers and input dealers due to bad roads and high transportation costs. However, it may also reflect the behavior of actors within a value chain as it matures, focusing more on strengthening existing relationships than on replacing / expanding relationships. This follows network theory, in which the inherent qualities of a better connected network incentivizes consistent, predictable behavior of actors, as there is greater visibility of actors and their behaviors in regards to their management of relationships within better connected networks.

These findings together seem to point to a growth pathway outlined in Figure 3 below. Initially, an increased number of relationships are established with buyers and input suppliers. Through these linkages, the farmers are exposed to farmer-buyer expectations in regards to quantity and quality (Nimba). In response, farmers need for technical and financial support from extension services increases (Bong). As production strengthens, demand for technical and extension support services decreases. Farmers solidify value chain relationships, strengthening strong relationships while de-investing in weak relationships (Montserrado). The value chain begins to reach a steady state (Montserrado).

Figure 13. Hypothesized growth pathway



The finding that Category A farmers formed and strengthened the greatest number of linkages over the course of the project is to be expected given their increased production capacity, willingness to adopt new practices, and serve as leaders in their communities. Category A farmers provided critical linkages to B and C farmers through demonstration of production practices and aggregating produce and identifying buyers.

Analysis of the number of preexisting linkages, strengthened over the course of the project (21%), in comparison to the number of linkages with new actors formed (51% of all linkages), reveals that more new linkages were formed than preexisting linkages strengthened. This seems to indicate the project was more successful in the introduction of new actors and the building of new relationships than the strengthening of existing relationships. This finding raises questions about differing effects of a value chain development approach which focuses more on the creation of new opportunities for partnership over the strengthening of existing relationships, such as: Does one approach show more impact on the productive capacity and competitiveness of the value chain? What is the long term sustainability of such impact? Does a value chain development approach which seems to result in the cessation or weakening of preexisting relationships have any negative impacts on social order, social networks, and social cohesion? Does one approach over another have greater impact on the overall economic security of households dependent on the value chain?

### Network Sustainability

Farmers projected that 94% of the linkages would continue into the future. Analysis of the types of linkages projected to be sustained revealed that the relationships which existed pre-ACE, versus those which were formed with new actors during ACE, are projected to have a slightly higher likelihood to endure than those newly formed relationships. It also showed that the number of strong linkages decreased, while the number of very strong linkages increased, and that the likelihood of very strong linkages lasting into the future was higher than the number of strong, occasional, and weak linkages. This finding highlights the importance that a value chain approach, which focuses as much on strengthening existing relationships, has on maintaining stability and consistency in the network as opposed to facilitating the formation of new relationships.

## Recommendations

Based on the findings of the network analysis study, the following recommendations have been identified as relevant to Nimba, Bong, and Montserrado value chains in Liberia:

### Nimba:

- 1) Value chain strengthening activities in Nimba should focus on introduction and formation of new relationships to diversify partnerships with input suppliers and buyers.
- 2) Value chain development activities should consider strengthening sustainable sources of agricultural extension services and information.
- 3) Value chain strengthening activities should consider promoting value addition through drying and preservation of traditional vegetables. This would create new market opportunities and linkages with buyers who rely on sourcing vegetables from neighboring countries such as Guinea during the dry season.

### Bong:

- 1) Expand relationships with existing buyers and input suppliers. Currently ACE farmers only have two relationships with buyers, and one relationship with a single input supplier, linked only to Category A farmers.
- 2) Provide incentives for new buyers and input suppliers to enter the market in Bong as Farmer Categories A, B, and C do not have many input suppliers / different buyers from which to choose.
- 3) Link more farmers to community mentors, such as Category A farmers, to provide sustainable sources of information and opportunities to link through the VC.

### Montserrado:

- 1) Value chain strengthening activities particularly in Montserrado might consider focusing on solidifying and strengthening the productivity of existing relationships where social capital and market linkages are strong.
- 2) Additional follow-up research should be done with farmers in Montserrado to better understand the constraints limiting continued expansion of VC linkages.
- 3) Facilitate aggregation and bulk purchasing between Categories A, B, and C farmers to improve economies of scale and access new markets. Currently there are very few shared linkages between the three categories.

## Annex A. Study Tools

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### Farmers

Each facilitator started with a map of the respective county and asked the group of farmers to put their point on the board around the city where they are located. The second facilitator then created 6 similar points on paper while the lead facilitator explains the next step.

### Input Dealers

*PRE-ACE:* We would like to form a picture of the situation before the project started. Before the project, where did you buy your inputs (prompt by explaining fertilizer, seed, pesticides, tools, bags), anything you needed for farming vegetables.

[Mark on the map where they purchased items.]

How much did you purchase for vegetables in a season? This is a volume question. How many kg of seed, or fertilizer, how many tools, bags, etc.?

[Indicate the strength of the lines between the farms and the dealers on the map.]

How much does 1 unit of item A cost, item B, etc.?

(This gives us the strength of the lines. How much commercial activities was occurring prior to the project and between whom?)

Using this system, what was your greatest risk? How did this way of purchasing inputs address that risk?

*NOW:* Has anything changed? Where did you buy your inputs (prompt by explaining fertilizer, seed, pesticides, tools, bags), anything you needed for farming vegetables.

[Mark on the map where they purchased items.]

How much of each type of inputs did you purchase for vegetables in a season? This is a volume question. How many kg of seed, or fertilizer, how many tools, bags, etc.? [Mark on the map the strength of the lines.]

(Assuming there is change) What caused this change?

What risk was associated with making this change to a new system of purchasing inputs? How did you mitigate that risk?

Did the ACE program do any activities with you related to inputs? What were those activities?

Do any of these activities relate to this change? If yes, how? If no, to what do they relate?

If there was no change, why do you think there has been no change?

*POST-ACE* If you look at the current situation with your access to inputs, how could the situation improve?

From where would you buy inputs? (Facilitator #2 puts this on the map) How would you buy inputs? What would change?

What would you have to do to make this change happen?

What risk would be associated with making this change? What could you do to mitigate this risk? What could other value chain actors do? Why would they do that?

How could a program such as ACE assist you in making the change happen?

### **Buyers**

*PRE-ACE:* Let us look at who you sold your vegetables to. Before you started working with ACE, to whom did you sell vegetables? [Using the already prepared map of farm locations, indicate the location of buyers on all 3 maps].

What vegetables did you sell? How much in a season did you sell [choose 1 unit—bag, kg—and stick with it; indicate the strength of the lines.]

Using this system, what was your greatest risk? How did this way of selling vegetables address that risk?

*NOW:* Has anything changed? To whom do you sell now? How does the price compare between the price you received from these buyers, and current buyers?

What products? Same products, fewer, or new products?

What volume for each product? How does this compare to the period before ACE?

[Mark on the map to whom they sold and the strength of the lines.]

(Assuming there is change) What caused this change?

Did the ACE program do any activities with you related to selling your vegetables? What were those activities?

Do any of these activities relate to this change? If yes, how? If no, to what do they relate?

What risk was associated with making this change to a new system of selling vegetables? How did you mitigate that risk?

If there was no change, why do you think there has been no change?

*POST-ACE:* If you look at the current situation with sales, how could the situation improve?

Where would you sell your vegetables? (Facilitator #2 puts this on the map) How would you sell your vegetables? What would change?

What would you have to do to make this change happen?

What risk would be associated with making this change? What could you do to mitigate this risk? What could other VC actors do? Why would they do that?

How could a project, such as ACE assist you in making the change happen?

## Input Dealers

### Farmers

*PRE-ACE:* We'd like to get a picture of the situation before the project started. Before the project, to whom did you sell your inputs (prompt by explaining fertilizer, seed, pesticides, tools, bags). Anything related to farming vegetables. From where did you sell? Where were your customers from?

[Mark on the map where they sold, location of customers.]

How much did you sell related to vegetables in a season?(This is a volume question. How many kg of seed, or fertilizer, how many tools, bags, etc.)

[indicate the strength of the lines between the farms and the dealers on the map]

How much does 1 unit of item A cost, item B, etc.

(This gives us the strength of the lines. How much commercial activities was occurring on prior to the project and between whom.)

Using this system, what was your greatest risk? How did this way of selling inputs address that risk?

*NOW:* Has anything changed? To whom now do you sell your inputs (prompt by explaining fertilizer, seed, pesticides, tools, bags). Anything for farming vegetables.

[Mark on the map from where they sell and to whom.]

How much of each type of inputs did you sell for vegetables in a season? This is a volume question. How many kg of seed, or fertilizer, how many tools, bags, etc. [mark on the map the strength of the lines]

(Assuming there is change) What caused this change?

Did the ACE program do any activities with you related to inputs? What were those activities?

Do any of these activities relate to this change? If yes, how. If no, to what do they relate?

What risk was associated with making this change to a new system of selling inputs? How did you mitigate that risk?

If there was no change, why do you think there has been no change?

*POST-ACE:* If you look at the current situation with your sale of inputs, how could the situation improve?

From where would you sell inputs? (Facilitator #2 puts this on the map) How would you sell inputs? To whom would you sell inputs? What would change?

What would you have to do to make this change happen?

What risk would be associated with making this change? What could you do to mitigate this risk? What could other value chain actors do? Why would they do that?

How could a program, such as ACE assist you in making the change happen?

### **Extension Services**

*PRE-ACE:* We'd like to get a picture of the situation before the project started. Before the project, where did you go for technical information?

[Mark on the map where they went for technical information.]

How often did you need technical support for vegetables in a season?

[Indicate the strength of the lines between the farms and the sources of technical information on the map.]

Why would this source provide you with technical information?

(This gives us the strength of the lines. How much extension activity was occurring prior to the project and between whom?)

Using this system, what was your greatest risk? How did this way of accessing needed technical information address that risk?

*NOW*: Has anything changed? Where did you get technical information now?

[Mark on the map where they purchased items.]

How often do you receive technical information? Why do these sources provide you with technical information?

(Assuming there is change) What caused this change?

Did the ACE program do any activities with you related to extension? What were those activities?

Do any of these activities relate to this change? If yes, how? If no, to what do they relate?

What risk was associated with making this change to a new source of technical information? How did you mitigate that risk?

If there was no change, why do you think there has been no change?

*POST-ACE*: If you look at the current situation with your access to technical information, how could the situation improve?

From where would you receive technical information? (Facilitator #2 puts this on the map) Why would they provide you with technical information? What would change?

What would you have to do to make this change happen?

What risk would be associated with making this change? What could you do to mitigate this risk? What could other value chain actors do? Why would they do that?

How could a program such as ACE assist you in making the change happen?

## Buyers

*PRE-ACE*: From who did you buy vegetables? Before you started working with ACE, from whom did you buy vegetables? Where were your suppliers located? Where did you buy (at their farm, at your business, other location) [using the already prepared map of farm locations, indicate the location of supplying farms]

What vegetables did you buy? How much in a season did you buy? [Choose 1 unit—bag, kg—and stick with it; indicate the strength of the lines.]

Using this system, what was your greatest risk? How did this way of purchasing vegetables address that risk?

*NOW*: Has anything changed? From whom do you buy now? How does the price you pay now compare with the price you paid before? Volume? Quality?

What products? Same products, fewer, or new products?

What volume for each product? How does this compare to the period before ACE?

[Mark on the map to whom they sold and the strength of the lines.]

(Assuming there is change) What caused this change?

Did the ACE program do any activities with you related to buying vegetables? What were those activities?

Do any of these activities relate to this change? If yes, how? If no, to what do they relate?

What risk was associated with making this change to a new system of purchasing vegetables? How did you mitigate that risk?

If there was no change, why do you think there has been no change?

*POST-ACE*: If you look at the current situation with vegetable supply, how could the situation improve?

From whom would you buy your vegetables? (Facilitator #2 puts this on the map) How would you buy? What would your terms be? What would change?

What would you have to do to make this change happen?

What risk would be associated with making this change? What could you do to mitigate this risk? What could other value chain actors do? Why would they do that?

How could a project such as ACE assist you in making the change happen?

## Finance

*PRE-ACE*: Let us look at agriculture credit. Before you started working with ACE, what financial products did you have related to agriculture? To whom did you lend and their location? Terms? Number of loans? Average size? From where did you lend?

Using this system, what was your greatest risk? How did this way of working with agriculture address that risk?

*NOW*: Has anything changed? What agriculture finance products do you have? What are the terms? Clients and locations? Number? Average size?

How does this compare to the period before ACE?

[Mark on the map any financing information.]

(Assuming there is change) What caused this change?

Did the ACE program do any activities with you related to credit? What were those activities?

Do any of these activities relate to this change? If yes, how? If no, to what do they relate?

What risk was associated with making this change to a new financial product for agriculture? How did you mitigate that risk?

If there was no change, why do you think there has been no change?

*POST-ACE:* If you look at the current situation with agriculture financing, how could the situation improve?

What clients would you like to have? What percentage of your portfolio would you like to have in agriculture? What financial products? What terms are realistic? How are these terms different than current market terms? (Facilitator #2 puts this on the map) What would have to change to make such a change possible?

What would you have to do to make this change happen?

What risk would be associated with making this change? What could you do to mitigate this risk? What could other value chain actors do? Why would they do that?

How could a program such as ACE assist you in making the change happen?

### Extension Services

(Government Office and Radio Stations)

*PRE-ACE:* We would like to form a picture of the situation before the project started. Before the project, did you provide extension services to farmers? If so, where were you based? With what farmers did you interact? How did you interact with these farmers?

[Mark on the map where they went for technical information.]

How often did you provide technical support for vegetables in a season? How did you provide technical support? Where? To how many farmers?

[Indicate the strength of the lines between the farms and the sources of technical information on the map.]

Why did you provide technical information? How did you identify farmers in need?

(This gives us the strength of the lines. How much extension activity was occurring prior to the project and between whom?)

Using this system, what was your greatest risk? How did this way of providing extension services address that risk?

*NOW:* Has anything changed? Do you provide technical information now?

[Mark on the map where they purchased items.]

How often do you provide? Why do you provide? To Whom?

(Assuming there is change) What caused this change?

Did the ACE program do any activities with you related to extension? What were those activities?

Do any of these activities relate to this change? If yes, how? If no, to what do they relate?

What risk was associated with making this change to a new system of providing extension services? How did you mitigate that risk?

If there was no change, why do you think there has been no change?

*POST-ACE:* If you look at the current situation with your provision of technical information, how could the situation improve?

How could you receive support to provide technical information? (Facilitator #2 puts this on the map) To whom? How often? What would change?

What would you have to do to make this change happen?

Using this system, what was your greatest risk? How did this way of purchasing inputs address that risk?

What risk was associated with making this change to a new system of purchasing inputs? How did you mitigate that risk?

What risk would be associated with making this change? What could you do to mitigate this risk? What could other value chain actors do? Why would they do that?

How could a program such as ACE assist you in making the change happen?

## Annex B. Category Definitions of ACE farmers

We have classified farmers participating in vegetable production and those doing both vegetables and rice (overlapped) into three categories or classes, A, B, and C. There are about 335 farmers that are both vegetables and overlapped farmers. The percentage of A, B, and C farmers are approximately 21, 44, and 35% respectively.

The following are the criteria for the three farmer groups:

### Category A farmers:

- Production capacity is at least one acre or more
- A farmer has applied mostly the training that he/she participated
- Be an aggregator of at least five other farmers or more
- Have direct buyer
- Fast adopter of best agronomic practices and Farming as a Business concepts
- Lead farmer and willing to serve as demonstration farmer, etc.

### Category B farmers:

- Production capacity is at least half (0.5) to about an acre
- Aggregator of at least four or less other farmers
- Sometimes has a direct buyer
- They applied the training, but not as A's
- They also applied FaaB concepts but not as A's, etc.

### Category C farmers:

- Production capacity is usually one lot (1/4 of an acre) or less
- Most vulnerable farmers, especially female single parents and widows
- Slow adopters of agronomic practices
- Trade labor for inputs (seeds, fertilizers, etc.)
- Usually "waiting to see what happens," etc.
- Mostly sell locally and sometime in regional markets

From the above, it is important to categorize the farmers to allow field staff to plan their extension outreach and market linkages accordingly, and to identify the needs of the farmers.

Table 17. Quantitative Summary of Farmer Categories (To be filled out)

	Category A	Category B	Category C	Total
Vegetable Only	46	93	109	248
Rice and Vegetable (overlapped)	29	60	213	302
<b>Total</b>	<b>75</b>	<b>153</b>	<b>322</b>	<b>550</b>