Assist in the Management of Poultry and Layer Industries with Feed Improvements and Efficiency Strategies (AMPLIFIES Ghana)

BASELINE STUDY REPORT (2016)

American Soybean Association
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AMPLIFIES is a five-year project being implemented by the American Soybean Association's World Initiative for Soy in Human Health (ASA/WISHH) and funded by the United States Department of Agriculture (USDA) under cooperative agreement NO. FCC-641-2015/016-00

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ACRONYMS

ADVANCE	Agricultural Development and Value Chain Enhancement Project
ADRA	Adventist Development and Relief Agency
AMPLIFIES	Assisting Management in the Poultry and Layer Industries by Feed Improvement and Efficiency Strategies
ARI	Animal Research Institute
ASA	American Soybean Association
ASSESS	Analytical Support Services and Evaluations for Sustainable Systems
BA	Brong Ahafo
CAC	Crop Aggregation Centers
CSV	Comma Separated Values
DQA	Data Quality Audit
EAT	Enhancing Agricultural Trade
FAO	Food and Agriculture Organization of the United Nations
FASDEP	Food & Agricultural Services Development Policy
FBO	Farmer-based Organization
FCR	Feed Conversion Ratio
FCE	Feed Conversion Efficiency
FDA	Food and Drugs Authority
FFPr	Food for Progress
FinGAP	USAID Financing Ghanaian Agriculture Project
FGD	Focus Group Discussions
FRI	Food Research Institute
GAFCO	Ghana Agro Food Company
GAPFA	Greater Accra Poultry Farmers Association
GAR	Greater Accra
GFMA	Ghana Feed Millers Association
GGC	Ghana Grains Council
GHABROP	Ghana Broiler Revitalization Program
GNAPF	Ghana National Association of Poultry Farmers
GOG	Government of Ghana
GPP	Ghana Poultry Program
GSA	Ghana Standards Authority
ISU	Iowa State University
KG	Kilogram
KII	Key Informant Interview
KNUST	Kwame Nkrumah University of Science and Technology
KSU	Kansas State University
METSS	Monitoring, Evaluation and Technical Support Services
MiDA	Millennium Development Authority
MOFA	Ministry of Food and Agriculture
MT	Metric Tonne
NGO	Non-Governmental Organization
ODK	Open Data Kit
OSU	Oklahoma State University
PICS	Purdue Improved Crop Storage
PHL	Post-Harvest Loss
RING	Resiliency in Northern Ghana
SADA	Savannah Agricultural Development Authority

SO	Strategic Objective
SPSS	Statistical Package for Social Sciences
SRID	Statistical, Research and Information Department
UG	University of Ghana
UK	University of Kentucky
ZOI	Zone of influence

EXECUTIVE SUMMARY

This report presents the findings of the AMPLIFIES Ghana project's baseline study. Primary data collection efforts spanned the period of March to April 2016, with data verification and analysis culminating in the June 2016 submission of the report. Data was collected in the context of limited data availability from the Ghanaian poultry and agricultural sectors. It is our hope that the baseline study efforts of AMPLIFIES will address key data gaps, validate and verify assumptions, and shed new light on the challenges and opportunities of Ghana's poultry industry, and value chain generally, by providing empirical evidence and new knowledge against which the project's performance and results can be measured. The richness and uniqueness of the data collected, which involved a total of 1,624 respondents from 4 regions (Greater Accra, Brong Ahafo, Ashanti and the Northern Region) is evident.

The USDA funded AMPLIFIES project has the overall goal of developing a competitive Ghanaian poultry sector by lowering the cost and increasing the quality and quantity of feed. To this end, a series of activities aimed at strengthening the poultry feed supply chain and its many actors, and increasing the efficiency of feed ingredient growers and aggregators will be implemented. Feed is the single most important cost driver of poultry production, with costs typically representing 60-70% of broiler production.

This baseline study seeks to establish the existing conditions prior to the implementation of AMPLIFIES activities and to develop baseline values against which the project's performance and successes will be assessed. AMPLIFIES adopted a prospective, longitudinal design employing primary and secondary data collection that was primarily quantitative in nature. The study used a purposive non-probability sampling technique to select respondents who represented pre-identified, potential beneficiaries, based on set criteria. These included poultry farmers (600), soy and maize growers (1,000), crop aggregation centers/warehouses (8), feed/soy processors (12) and feed testing facilities (4).

It is important to note that the report does not present an exhaustive picture of the entire poultry value chain. As two other baseline studies were conducted in support of USDA's FFPr Poultry Value Chain investment, one by ACDI-VOCA's FFPR funded Ghana Poultry Project and another by USAID-ASSES (Evaluation baseline), AMPLIFIES' study is very much project-centric. This said, in an attempt to develop a comprehensive understanding of Ghana's poultry value chain environment, the study attempted to gather additional contextual information, which will benefit all FFPr project partners and stakeholders. Specifically, the study focused on a series of AMPLIFIES related outcome level indicators, which explains its targeted scope.

The report presents findings, data and current ground realities along 7 thematic areas, covering all project activities and related outcome indicators. The Background Section provides a concise snapshot of Ghana's poultry value chain as well as an in-depth presentation of baseline study methodology, sampling approach, as well as data capture and analytical processes. This is followed by a discussion on data limitations that the baseline study encountered. The report provides a detailed narrative highlighting key findings, data tables, analysis and other relevant qualitative or secondary information used in triangulation. It is also complemented by a bibliography and series of annexes in support of the findings.

Snapshot of key findings:
The study shows that Ghana's poultry industry is generally layer based with current layer populations standing at approximately 90% and broilers representing only 4.55% of the total flock population at the time of survey. Deep litter accounts for 90.5% of the type of production

system being used by poultry farmers surveyed while battery cage represents only 2%, showing that Ghana's poultry sector is largely cage-less. The Greater Accra region, once a thriving poultry hub, had 83.88% of poultry operations reported as small farms (less than 5,000 birds), which contrasts with the Brong Ahafo and Ashanti regions, homes to large and very large farms.

Over a third of poultry farmers surveyed (69%) prepare their own feed while 25% rely exclusively on commercial feed. Greater Accra presented a contrasting picture, with over 75% of poultry farmers depending on commercial feed. Interestingly, based on gross production numbers, the data shows that the productivity of farmers who prepared their own feed was generally higher than those who depend on commercial feed. This assumption however will be subjected to further investigation through feed related research to be conducted by the KSU team using scientific methods such as FCR.

Commercial feed mills surveyed were located in Ashanti and Greater Accra, with a combined total feed production of 77,639.73 MT, however the combined total feed demand of poultry farmers surveyed is in excess of 200,000 MT. Data on feed rations and formulations confirmed the importance of maize and soybean meal as key ingredients, with maize alone accounting for over 50% of most poultry feed rations. Routine feed testing is a means of ensuring feed quality and efficiency yet only 9.5% of poultry farmers who produce their own feed responded that they conduct feed testing. All commercial feed processors stated that they do feed testing on a regular basis. However, it is obvious that feed testing capacity in Ghana is very limited. The Brong Ahafo region with its huge concentration of poultry farms has no single feed testing facility. Only 4 laboratories were identified to be conducting feed testing in Ghana and all of them were surveyed as part of this baseline. Many commercial laboratories do not conduct feed testing because the patronage is low. Most of the feed testing facilities surveyed recorded unsatisfactory patronage (see Annex M).

Given its popularity with poultry farmers, yellow maize has been found to be an attractive crop for farmers and FBOs to pursue and increase its productivity. Though the middle belt of Ghana (including Ashanti and Brong Ahafo regions) produces higher volumes of maize than the north, the latter is known for better quality maize since they are drier and less likely to contain aflatoxins. The northern part of Ghana therefore serves as a hub for sourcing of quality feed ingredients particularly maize and soybean.

Crop aggregation centers (CACs), in addition to providing storage space, also serve as accumulation/transit points for these crops. Ensuring that these facilities are in a condition not to compromise the quality of these feed inputs is an important link in the value chain. As part of the baseline 8 CAC's/warehouses of varied types and sizes were assessed to further understand their operations. The study revealed that post-harvest loss (PHL) at these facilities was very minimal at approximately 1% unlike crop growers who recorded an average PHL storage loss of 5.57%. Of the 8 CACs surveyed, PHL was insignificant, as per figures provided. The total, combined economic value from post-harvest loss of FBO members surveyed (1,000 in total) equals 16,000 dollars. The quality of feed inputs has an impact on the efficiency of feed[1], and both maize and soy growers, via enhanced contract farming opportunities and direct linkages to processors, are well poised to support the poultry industry.

Ghana imports approximately half of its soy demand which is estimated at 150,000 metric tonnes. Maize imports are however relatively low with figures from the Ghana Statistical Service estimating 5,355 metric MT for 2014. Our report shows that, combined, six of the largest

[1] FAO Technical Guidelines for Responsible Fisheries, No 5, Suppl. 1. Rome, FAO. 2001.

commercial feed mills annually demand 41,656 MT of maize and 18,189 metric tonnes of yellow maize specifically, about half of which is imported.

Ghana's northern and maize belt farmers, based on the high demand for these crops, can play a key role in feeding and sustaining the feed supply chain. With appropriate harvesting, post-harvest handling and storage techniques, combined with access to proper warehouses/storage and lab testing facilities, local feed input quantity and quality can be greatly improved. With an efficient feed input supply chain the cost of feed could be reduced significantly leading to a reduction in production cost.

1. BACKGROUND

a. AMPLIFIES Ghana

This report presents the 2016 Baseline Study findings for the AMPLIFIES Ghana Project. AMPLIFIES GHANA is a five-year initiative funded under the United States Department of Agriculture (USDA) Food for Progress (FFPr) program, and aims to build poultry feed value chain capacity for Ghana's poultry industry, specifically strengthening market linkages for locally produced maize and soy commodities utilized in feed and poultry production.

Over its course, AMPLIFIES is expected to:

- Increase the quantity and lower the cost of poultry feed by reducing harvest and post-harvest losses and addressing procurement inefficiencies of primary feed ingredients;
- Improve the quality and consistency of poultry feed through enhanced feed testing capacity, controlled and practical feeding demonstrations, feed formulation training, and one-on-one technical assistance;
- Enhance feed processing efficiency through technology transfer and on-site training;
- Increase the trade of commercialized poultry feed through improved distribution networks and marketing;
- Increase trade of eggs through awareness campaigns and the trade of commercialized poultry feed through improved distribution networks and marketing.

ASA/WISHH has partnered with two primary sub-contractors, the Adventist Development and Relief Agency (ADRA) and Kansas State University (KSU)[2], to implement the bulk of its core activities. AMPLIFIES will also work closely with the USDA-funded ACDI/VOCA led Ghana Poultry Project (GPP), Ghana's Ministry of Food and Agriculture (MOFA) and other relevant Ghanaian entities to achieve these objectives. Project synergies and areas of collaboration between AMPLIFIES and GPP have articulated in an integrated activities map highlighting areas of work and opportunities for joint effort and impacts. This will ensure synchronization along value chain investments by both projects and the attribution of results against respective indicators.

b. Food for Progress Strategic Objectives

The AMPLIFIES project will contribute to the achievement of FFPr results indicators at the strategic objective, intermediate and immediate levels. The project has been designed to meet two major strategic objectives: a) Increased Poultry Productivity (in support of FFPr S01--Increased Agricultural Productivity) and b) Expanded trade of poultry products and by-products (in support of FFPr S02--Expanded Trade of Agricultural Products). The FFPr results framework for AMPLIFIES provides a detailed causal relationship of activities and intended outcome level results, a graphic representation of which is included in **ANNEX A**.

The above FFPr objectives will be achieved through a series of 10 activities covering multiple value chain links, as per below.

[2] While KSU is the prime "sub", Oklahoma State University, Iowa State University and the University of Kentucky form part of a highly technical USA-based university conglomerate of implementing partners managed under a contract between ASA/WISHH and KSU.

AMPLIFIES Activities list

Training: Harvesting, Post-harvest Handling and Storage of Feed Inputs
Infrastructure: Post-harvest Storage and Aggregation of Feed Inputs
Capacity Building: Increased Efficiency in the Procurement of Feed Ingredients
Adoption of Improved Poultry Feed
Capacity Building: Improvements in Quality and Consistency of Feed Formulations
Capacity Building: Increased Feed Testing Capacity
Capacity Building: Increased Efficiency in Feed Processing
Marketing: Expansion of Poultry Feed Distribution Network
Financial Services: Loans for Investments in Feed Processing
Organize National Awareness Campaign to Promote Egg Consumption

c. Baseline Study Objectives

The AMPLIFIES baseline study's objectives are to establish the existing conditions prior to the implementation of AMPLIFIES activities and to provide an information base against which to monitor and assess the progress and effectiveness of AMPLIFIES activities during implementation, and after the project is completed. In addition, the study consolidates assumptions, estimates, projections and targets, thereby providing a basis for their revision(s) and the update of AMPLIFIES' performance monitoring plan (PMP). As this is one of three baselines to be conducted at the onset of the USDA Poultry Value Chain FFPr program, and seeing as USAID-ASSESS is providing an overall poultry value chain backgrounder as part of its Inception Report, the focus of the baseline report is as such project-specific.

Data for this study has been collected as a means to create realistic baseline values for targets and indicators, and provide contextual information around the current environment for implementing AMPLIFIES activities. Indicators to be populated as a result of the baseline study are included in the current USDA-ASA/WISHH Agreement (Attachment E). The baseline has specifically focused on AMPLIFIES outcomes indicators (see **ANNEX B** for a summary of these) but also garnered important field-level information to be assessed against AMPLIFIES' PMP indicators and targets. The end result will be a set of baseline values incorporated into a final, jointly negotiated and approved PMP (between AMPLIFIES and USDA).

d. Methodology

Study Design: The baseline study adopted a prospective, longitudinal design employing primary and secondary data collection that is primarily quantitative in nature, but includes qualitative and mixed methods components. The study provides a pre-intervention analysis of beneficiaries and outcome variables, as well as a descriptive analysis of contextual data on beneficiaries. The study involved a 'census' approach of AMPLIFIES pre-identified beneficiary

populations, using Agreement E targets year one beneficiaries for all beneficiary groups (e.g. 600 poultry farmers, 1,000 crop growers, 8 crop aggregation centers, etc.).

The study followed a stepped-wedge approach in support of AMPLIFIES' "rolling beneficiary profiling" method, wherein beneficiaries are divided into groups (i.e. Year 1, Year 2 and Year 3) and enrolled longitudinally to each group. Beneficiaries/respondents could, as such, serve as an in-house "comparison group" within each year of the project. This will allow indicators to be tracked prospectively as beneficiaries are profiled and introduced to the project, and contribute to the monitoring of trends.

Sampling Framework/Study Population: The study used a purposive non-probability sampling technique to select samples of beneficiaries/respondents for Year 1 based on set criteria. The baseline study is as such limited to this population, as opposed to a random sample derived from other populations falling outside of the project. There was no counterfactual or control group established by AMPLIFIES for this study as the impact level evaluation of this project will be conducted by a third party (USAID-ASSESS), who will introduce a counterfactual or control group to their evaluation process.

Baseline study respondents had previously been identified through multi-stakeholder exercises during which lists of crop growers, poultry farmers, feed millers, soy processors, crop aggregation centers and feed testing laboratories within the project's zone of influence (ZOI). Some names were received from associations, MOFA and various partners/stakeholders, including national regional and district and community level poultry farmer associations, farmer-based organizations, implementing partners, project stakeholders and other donor programs. These lists were adjusted where needed and throughout data collection.

It is expected that subsequently enrolled project beneficiaries will be selected according to these same criteria in order to ensure homogeneity and also assure that baseline results are representative and relevant to later enrolled beneficiaries. In total, 1,624 responses were collected in the study, as shown below:

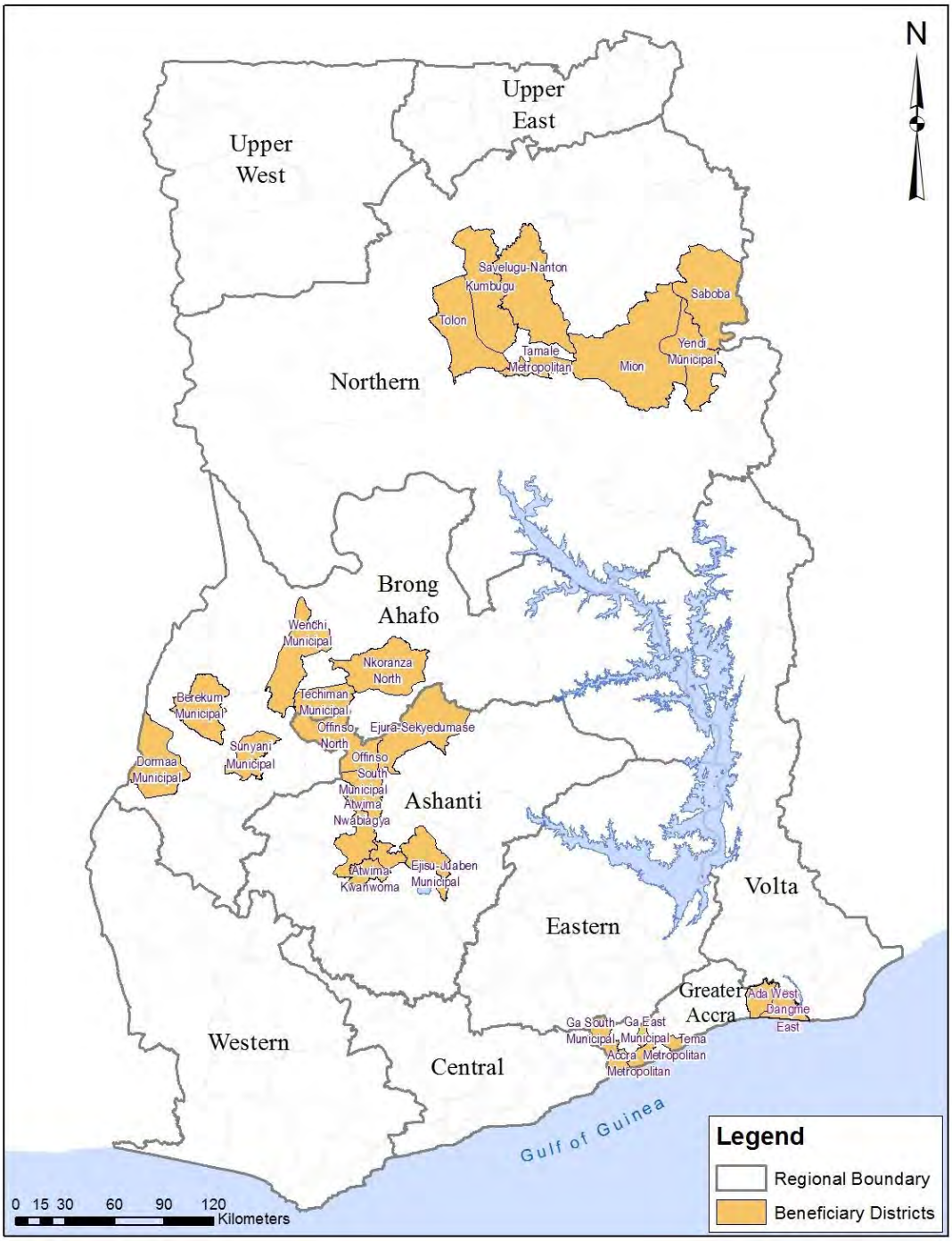
TABLE 1: Breakdown of number of respondents

Beneficiary category	# interviewed
Crop growers	1,000
Poultry farmers	600
Crop Aggregation Centres (CAC's)	8
Feed Millers	6
Soy processors	6
Feed testing facilities	4

In all, 22.7% of crop grower respondents were female, as were 12.8% of the poultry farmer respondents. It is important to note that the gender disaggregation of respondents may not adequately reflect the actual male/female beneficiary split (given that not all female farmer-based organization members might have participated in interviews and those instances of household male leaders having acted as respondents on behalf of their wives have been recorded).

Map: Geographic Scope of Study

The study covered 26 districts in four regions namely: Ashanti, Brong Ahafo, Greater Accra and Northern regions.



Survey Instruments: The main instruments used in this study are surveys, questionnaires, focus group discussions (FGDs) and key-informant interviews (KIIs), mostly administered independently or in some cases as a combination of both as shown below. **ANNEXES C-H** contains all questionnaires and surveys used the study.

TABLE 2: Types of survey tool used for the study

Group of Respondents	Survey Tool
Farmer Based Organizations	Focus Group Discussion
Crop Growers	Questionnaires
Poultry Producers	Questionnaires
Crop Aggregation Centers	KIIs and Questionnaires
Commercial Feed Millers	KIIs and Questionnaires
Soy Processors	KIIs and Questionnaires
Feed Testing Laboratories	Guided Key-informant interviews

Both poultry producer and crop farmer questionnaires were pre-tested, coded into electronic format and deployed on tablets for use in data collection. Electronic data collection tools were used for these categories of respondents. *SurveyCTO*, an ODK-based electronic data collection tool was used to manage the data collection process. Paper questionnaires were also used to collect data from other beneficiaries such as soy processors, feed millers and feed testing laboratories, and conducted alongside key-informant interviews. KIIs were also held with some individuals/firms to gather important qualitative data and contextual information.

A focus group discussion (FGD) was also held in Tamale with over 80 representatives of FBOs and Ministry of Food and Agriculture (MOFA) Extension Officers from the Northern Region, in conjunction with implementing partner ADRA. Topics examined included harvest, post-harvest and storage techniques and practices, on-farm management, and market linkages. Information gathered from this FGD was instrumental in understanding the local realities and operational context, although it did not yield quantifiable data for establishing baseline values (it did however generate pre-implementation knowledge on AMPLIFIES output indicators). MOFA Extension Officers and farmers enjoy a positive, mutually benefiting relationship. Having Extension Officers present at the FGD, as active participants, reinforced the project's inclusive/participatory approach to community entry and allowed for verification and validation of assumptions by Government Officials and their farmer counterparts. In addition, a number stakeholder meetings and beneficiary selection workshops were held in Brong Ahafo, Ashanti and Greater Accra, capturing much needed qualitative information against AMPLIFIES intended results/outputs.

Data Collection: Date collection was initiated in January 2016 with pre-baseline assessments and filed reconnaissance missions. The bulk of the primary field data collected from poultry farmers and crop growers was conducted during the first 2-3 weeks of March, 2016. A field team of 40 consisting of 30 enumerators (MOFA staff) and 10 supervisors were recruited and trained on community entry skills; poultry feed value chain, data collection protocols and finally the use of the *SurveyCTO* software and tablets in general. Data collection for crop growers, poultry producers and some CAC's took place simultaneously in 24 districts in the Northern, Ashanti, Brong Ahafo and Greater Accra region over a 12-day period.

Electronic and paper-based questionnaires were administered face-to-face, with consent provided by all respondents. Data collected onto Android tablets was stored into a cloud-server and accessed through the *SurveyCTO* self-managed dashboard. Data was then exported as CSV files and analyzed using SPSS Software version 24. Paper questionnaires were entered into specially designed spreadsheets and uploaded into the main survey database. Results were quantitatively presented in the form of tables and charts.

Data Quality Assurance (DQA) was conducted during and after the data collection period through spot checks and verification mainly via telephone and personal visits for clarification and investigating questionable figures. Identified data gaps were covered through mop-up data collection exercises, including additional questions for respondents and data triangulation involving follow-up interviews and secondary comparisons.

e. COVERAGE

Poultry farmer data: The data on poultry stocks/populations and production is intended to cover all layers and birds, irrespective of their age and the place or purpose of their breeding. The data for layers and broilers represents the total number of these birds. Information on cockerels was gathered for contextual purposes only as AMPLIFIES activities are primarily layer-centric, also including broilers as a secondary focus (cockerel data is not presented in the report but can be made available to USDA). Broiler data relates to birds bred to an ideal weight for consumption or slaughter. The survey does not include information on total meat production from either commercial or farm slaughter. Broiler data is presented in terms of the live weight at which time the bird was sold (or taken to market), and not as dressed carcass weight, this weight being established as 1.5kg. Egg production estimates were derived from total poultry numbers and/or reported rates of egg laying. For survey purposes, egg production volumes are reported in terms of number of eggs, as opposed to weight (approximated weight of 6.5 grams per table egg), as egg volumes are typically reported as a value of quantity versus weight. For contextual purposes, data on egg numbers have been converted into weight. Data for broilers and eggs refer to total production in a calendar year, as reported by respondents. In order to make the coverage of this data collection as comprehensive as possible, primary and secondary data have sometimes been supplemented with data from unofficial sources.

Crop grower data: This data domain contains production data for two primary products: soybean and maize. The compilation of the data was derived primarily through field research. Where recent (within 3 years) official statistics were available from the Government of Ghana, relevant data was included as secondary sources. The time reference for statistics on area and crop production is based on a calendar year (January to December). As such, the data for maize and soy crops are reported under the calendar year in which the entire harvest took place. The volume and value of sales data was however not compiled and aggregated month by month from January to December. Figures for crop areas refer to harvested areas. Volume of commodities, are computed from area and production data expressed in hectares and metric tonnes (MTs). Production is expressed as value of volume of commodities sold and value of sales. Due to the seasonality of crops, it was not possible to measure yields as per standard “crop cut” calculation. Yields are as such estimated as MT/ha.

f. Data Limitations

Despite concerted efforts by the AMPLIFIES team to adopt and promote a robust and diligent approach to data collection, literature review and data analysis, several limitations impacted the study.

The baseline study has captured data only for pre-identified AMPLIFIES poultry and crop grower beneficiaries. Consequently, results/findings neither necessarily reflect, nor can be compared to, the national conditions or environment for sectors/sub-sectors examined. As the

study was limited to potential AMPLIFIES beneficiaries, findings may also not reflect trends or areas outside of or adjacent to the project's ZOI. The data/findings also present an inherent bias due to the disadvantages of purposive sampling. A weighting of survey populations through a conscious effort was made to include respondents in all poultry farmer districts, from multiple communities.

While the study was both grounded in, and embraced principles of, evidence-based research, the capacity of respondents to provide demonstrable, fact-checked, vetted or recorded data was much lower than anticipated. For example, many of the crop growers surveyed are illiterate and do not proper records or in some cases no records at all. This factor alone has the potential to affect the accuracy of responses since farmers' answers are being based on recollections and estimates which could be very discretionary. Moreover, the inability by baseline enumerators/supervisors and AMPLIFIES staff to access or review financial transactions of poultry farmers, crop growers, aggregators, and feed and soy processors (which is understandable, from a proprietary standpoint, particularly at the infancy of the project, and as further trust and relationship building is needed between AMPLIFIES and respondents) rendered triangulation and on-the-spot verification challenging.

In addition, while comprehensive and substantive, data on value and volume of sales, flocks/populations and capacity, farm sizes (incl. land under cultivation), and storage capacity (for poultry farms, CACs, warehouses) was verbally provided by respondents, meaning that no physical measurements or headcounts were undertaken.

Given the above (and other) limitations, the study needed to consult/review multiple secondary sources for both analytical and comparative exercises. Reliance on such data, however, provides an uncomfortable convenience due to the inconsistency and unreliability of data in the poultry sector. A study by Sumberg[3] confirms the relatively small body of literature on Ghana's poultry industry, and the unreliability and challenges of data collection within this sector. For example, in Ghana, "where broiler producers are said to target their production to coincide with peak consumption periods around Christmas, Easter and the end of the Ramadan fasting period, broiler houses may be empty for a considerable period between production cycles "[4]. In this case, additional information, such as the number of production cycles per year, needed to also be considered so as to provide meaningful context for production estimates.

Data limitations were also experienced on soy production and industry demand figures. There has been no public in-depth analysis of the cost of production for the Ghanaian chicken industry[5] making it difficult to compare poultry and feed production related information arising from the baseline study with other reliable sources. These limitations, in Sumberg's view, are "so serious as to undermine any meaningful and reliable analysis," even though several reports and policy documents from or on Ghana's poultry sector refer to this data.

Several concerns arose regarding the availability, reliability and quality of baseline information and evidenced-based knowledge related to agriculture as researchers, donors, multi-lateral institutions and the Government of Ghana rely on this information as the best data available and the only data available for Ghana's poultry sector[5]. Moreover, poultry-specific studies and academic sources reviewed for data cross-referencing cover very few or specific poultry operations in different parts of the country (including outside the AMPLIFIES ZOI), different birds, varying production systems, etc., making cross-comparisons or referencing difficult.

[3] Sumberg et al, 2013
[4] Rondon and Ashitey 2011
[5] Sumberg et al, 2013

2. GHANA'S POULTRY VALUE CHAIN CONTEXT

Ghana's poultry value chain is characterized by multiple actors and players (ranging in sizes or capacity of operations) interacting in a complex web of supply and demand linkages. Ghana's poultry value chain is segmented into upstream and downstream markets involving feed ingredients suppliers (both local and imported), maize and soy producers, commercial feed millers, regulators (e.g. Food and Drug Administration and the Ghana Standard Authority), soy processors, aggregators (warehouses/storage facilities), live bird and egg sellers, traders, importers, various consumers (from individuals, households and retailers/wholesalers) and Government of Ghana Ministries, to name a few. The AMPLIFIES project will interact with these actors towards enhancing capacities and efficiencies along the poultry feed links of the value chain, with a strong focus on the layer industry.

Poultry production: Field research conducted by ASA/WISHH in February 2014, towards the formulation of AMPLIFIES' FFPr proposal, found multiple constraints to growth in the poultry industry in Ghana. These include the high cost of feed ingredients, limited availability and poor/inconsistent quality of feed inputs, poor enforcements of feed standards, outdated production and management practices, few commercial feed processing facilities, the absence of marketing and branding practices, the utilization of poor feed formulations, and others, which the project seeks to address, and the baseline comment on.

According to a study by Flake and Ashitey (2008), "the poultry industry in Ghana grew rapidly during the 1980's to 1990's, developing into a vibrant agricultural sector and supplying about 95% of chicken meat and eggs in the country."[6] Ghana was deemed self-sufficient in poultry production until the late 1980's when the country adopted a free Trade Policy without any protective measures for domestic industry. As a result, the industry began to lose significant market share to imported frozen chicken at an alarming rate.[7] This led to Ghana losing over 70% of its domestic chicken meat market to imports in the late 1990's, increasing to an estimated 90% by the year 2013.[8] Since 2000, however, Ghana's poultry sector has been experiencing a steep decline. Many, if not all, of the commercial poultry farms including those established in the late 1960s and early 1970s have collapsed and/or are on the verge of collapsing and/or operating far below full capacity.[9]

As of 2010 estimates (Veterinary Services Directorate), the Greater Accra, Ashanti, and Brong Ahafo regions (the latter two representing the country's "poultry belt"), had the greatest numbers of layer flocks among all regions, with Brong Ahafo accounting for 29.6% of the total poultry population in Ghana.[10] According to USDA,[11] approximately 90% of poultry production in Ghana is centered on layers. This is largely due to the seasonal demand for broilers, combined with high production costs, making it difficult for Ghanaian broiler producers to compete with the

[6] Flake, L. and E. Ashitey., 2008. Ghana's poultry and products Annual Report. USDA Foreign Agriculture Services GAIN Report

[7] (FAO, 2008)

[8] Speech by Mr. Victor Oppong Adjei, Chairman of GNAPF (Source: http://www.ghanaweb.com/GhanaHomePage/NewsArchive/Poultry-farmers-to-benefit-from-modern-facility-351972)

[9] Kusi et al, 2015. The Challenges and Prospects of the Commercial Poultry Industry in Ghana: A Synthesis of Literature. International Journal of Management Sciences

[10] (FAO, 2014)

[11] 2013 Ghana Poultry Report Annual: USDA GAIN Report No 1304

inflow of imported chicken. Despite its prominence, the layer industry's performance is characterized by very low per capita consumption of eggs, with the FAO having estimated egg per capita consumption at 12 eggs[12] in 2007, compared to that of the USA (250 eggs in 2015)[13]. Preliminary data from the baseline conducted by ASSESS estimates per capita egg consumption at an average of 72 eggs per household member. This data is however limited to only four regions which are the AMPLIFIES/GPP ZOI and high poultry/egg producing regions. Even that, egg consumption is stiff far below world average.

It is within this context that the AMPLIFIES project will support poultry farmers with strategic interventions at multiple levels, and all sizes of operations, from very small farms to vertically integrated extra-large operations. Ghana's poultry sector is categorized into backyard and commercial production operations, with commercial farms classified into small-scale (50-5,000 birds), medium-scale (5,000–10,000 birds) and large-scale (>10,000 birds) operations.[14]

Feed processing: Feed is the single most important cost driver of poultry production, with costs typically representing 60-70% of broiler production. Feed formulation and the management of utilization efficiencies are critical for the growth rate of broilers, yet poultry farmers lack critical capacity on these fronts.[15]

According to Kasi et al, Ghana has approximately "10 commercial feed mills with a total installed operating capacity of 1,000 MT per day. Most feed millers are only producing at about 40-50 percent of their capacity due to the low demand from the local poultry industry."[16] The bulk medium and large commercial feed mills are located in regional capital cities and, with distribution outlets in towns and villages, enabling easier access for feed customers. As per ACDI-VOCA's "Assessment of the Feed Sector" report, large mills are considered as having a capacity of 6 MT/hr. or more, medium mills of 2 MT/hr., and small mills of less than 2MT/hr.[17] Ghana's commercial feed mills have a basic level of milling technology and equipment, in various states, and use a combination of mechanical and manual operations.

Feed ingredients: The AMPLIFIES project will partner with Farmer-Based Organizations (FBOs), and their members, in an effort to increase the volume and value sales of soy and maize into Ghana's poultry value chain, by reducing harvest, post-harvest and storage inefficiencies.

Maize and soybean production: Maize and soybean crops are essential ingredients for the formulation of poultry feed. While Ghana has the potential to supply and sustain its poultry industry with homegrown ingredients, the poultry sector is heavily dependent on imports. According to MOFA statistics, total maize production for the whole of Ghana in 2014 was 1,761,834 MT while that of soybean stood at 141,469 MT for the same year. Table 3 below

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[12] Killebrew, K. & Plotnick, R. 2010. Poultry Markets in West Africa Ghana. Evans School of Policy Analysis and Research. Prepared for the Market Access Team of the Bill & Melinda Gates Foundation. EPAR Brief 83.

[13] http://www.statista.com/statistics/183678/per-capita-consumption-of-eggs-in-the-us-since-2000/

[14] (USDA-GAIN). The FAO also recognizes the same categorization (www.fao.org).

[15] (Sources: Animal Nutrition handbook, Jurgens 2002 & NRC 1994 quotes 60-75% of feed cost in poultry production, FAO, Animal health & Production Division quotes 60-70% Interview with Mr. Tetteh, Executive Secretary of GNAPF, quotes figures at 60-70%).

[16] Kusi et al, The Challenges and Prospects of the Commercial Poultry Industry in Ghana: A Synthesis of Literature, International Journal of Management Sciences. Vol. 5, No. 6, 2015, 476-489

[17] USAID EAT Market Assessment Report.

provides a breakdown of maize and soybean production within the AMPLIFIES ZOI based on MOFA figures.

TABLE 3: Maize and soy production in AMPLIFIES Districts

Region	Districts	Cropped Area (Ha)		Yield (Mt/Ha)		Production (Mt)	
		Maize	Soybean	Maize	Soybean	Maize	Soybean
Brong Ahafo	Sunyani	15,511		1.74		26,965	
	Techiman	12,677		2.24		28,420	
	Wenchi	16,235		1.93		31,350	
	Nkoranza	17,120		1.82		31,100	
	Dormaa Ahenkro	19,129		1.79		34,320	
Ashanti	Ejura Sekyidumasi	21,228		1.40		29,719	
Northern	Savelugu/Nantong	9,452	4,864	1.28	2.24	12,098	10,895
	Tolon/ Kumbungu	9,064	1,709	1.58	2.0	17,329	3,418
	Tamale	9064	1,477	1.21	1.86	10,945	2,747
	Yendi	8,671	11,051	1.45	2.43	12,573	26,854
	Saboba	1,799	1,237	1.45	1.66	2,609	2,053

Source: SRID, MOFA 2014

Generally, maize yields and productivity in the southern part of Ghana are relatively higher than in the North of the country. While the Northern Region has one rainy season, the "middle belt" (consisting of Ashanti, Brong Ahafo, Eastern and some parts of the Volta region) has two. Northern Region farmers harvest their crops after the rains have ceased, allowing maize to dry in the field prior to harvest. Maize harvested in this manner has been shown to be cleaner, contain lower moisture, and be of higher quality than maize grown in the maize belt, which harvests into a second rainy season.[18] The potential for Northern Region and maize belt inputs to supply the poultry feed value chain is immense, and presents an opportunity for increased market linkages between poultry farmers, aggregators, crop growers and feed millers, and the establishment of contract farming arrangements.

The FAO reports an annual figure of 250,000 MT of maize consumed by the poultry sector,[19] with roughly 150,000 MT of which produced in Ghana, primarily in the Northern Region. Imports represent the balance of about 50,000 MT.

As per USAID's Enabling Agricultural Trade (EAT) Ghana Market Assessment report, "there are many unknowns about the commercial Ghanaian poultry market, the size and dynamics of

[18] USAID EAT Market Assessment Ghana, 2012.

[19] (www.fao.ort/3/b)

which have a direct and critical impact on current and potential demand for soy." Accurate data on Ghana's poultry production is therefore essential in order to accurately assess the volumes of both locally produced and imported soybean meals. In 2014, MOFA reported 86,867 hectares of soybean production with more than 70% coming from the Northern Region,[20] representing a potential significant contribution to the poultry feed sector.

The vast majority of soybeans produced in Ghana are processed into soybean meal (or cake) and soybean oil. Ghana's soybean processing capacity is largely located in the center of the country, with limited capacity in the south. The country's largest processor, Ghana Nuts, is the only one to utilize solvent extraction.[21] According to Paul Kweku Dorgbefu (Plant Manager and Poultry Master of Ghana Nuts Limited), the imported soybean (e.g. from the USA, Argentina) is highly nutritious with high oil content but expensive compared to the local but it is still preferred. This said, local soybean is considered by many to have more advantageous economies of scale over imported soybeans, as the country's smaller processors are practically unable to import beans for their facilities.

Warehousing/Storage: Efforts to increase local soy and maize production in support of Ghana's value chain must take into consideration access to proper warehousing and storage so as to minimize post-harvest losses. The 2012 USAID Enhancing Agricultural Trade (EAT) Market Assessment Report provides an in-depth look into storage facilities/warehousing particularly in the northern part of Ghana. The report demonstrates that storage capacity within country's SADA[22] region (which covers almost all of the crop growing districts within AMPLIFIES' ZOI) is adequate, although there is unmet demand for large-scale and bulk facilities situated near processing and market hubs such as Tamale. The demand for such warehousing comes from processors and large grain/cereal traders or brokers. Warehouse management in community warehouses and large-scale government facilities has been assessed as extremely poor, resulting in inefficiencies, wastage, and physical asset deterioration.

As per the same report, there are over 300 purpose-built warehouses of different shapes and sizes across the SADA zone. Their general sizes range from below 100 MT to over 1,000 MT and are in varying states of use. Most of these warehouses have been built by the Government of Ghana or by non-governmental organizations, and are typically located in farming communities where they were meant to serve as agricultural input/output storage points. The warehouse facilities described can be placed into three categories (small, medium, and large), by both size and holding capacity.[23]

In the Northern Region, any maize that is to be stored is usually cleaned, dried well, bagged, fumigated, and packed flat in warehouses. Maize is usually kept in poly-woven sacks and weighs between 100kg and 150kg (although some traders pack maize in 50kg bags for industrial processing customers). However, project partners recognize that some farmers do not appropriately treat and store maize yields, potentially leading to postharvest losses.

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[20] Statistical, Research and Information Department (SRID), MOFA

[21] Which yields 17 to 18 percent oil and high-quality, low-fat,(approximately 47 percent) protein meal (a higher protein preferred by poultry industry).

[22] Savannah Accelerated Development Authority (SADA) is a Government of Ghana agency responsible for coordinating a comprehensive development agenda for the savanna ecological zones comprising the three northernmost regions and stretches of Brong Ahafo and Volta Regions that are contiguous to the Northern region of

[23] Large (more 1000 MT), Medium (101 to 1000 MT), Small (less than 100 MT)

Financial Services: According to the literature, there are no precise numbers in Ghana on the demand for agricultural finance. A very rough estimate by Dalberg Development Advisors (2012) suggests that demand may be as high as $450 billion in financial services ($225 billion in short term finance and $225 billion in long-term finance). Moreover, the percentage of smallholders with access to finance is equally difficult to quantify. Based on these estimates, even promising approaches to expanding smallholder lending, such as value chain finance, are reaching fewer than 10 percent of smallholders, primarily those in well-established value chains dedicated to higher value cash crops.[24]

In Ghana, financial services to the agricultural sector fall outside the domain of the Ministry of Food and Agriculture and access to finance is viewed as a major constraint to the growth of the sector. The diverse operators in the agriculture sector including input dealers and suppliers, primary producers, processors, transporters, storage operators and distributors all need financial assistance.

Many financial institutions are of the view that agriculture (particularly poultry production) is a high risk area. Some of the reasons cited by these financial service providers for low investment in agriculture include a history of default on subsidized loans, issues of land tenure, weather risks, and a lack of knowledge on how to appropriately finance this sector.[25] Though some donor-funded projects such as FinGAP provide access to credit to the agriculture sector, they are not able to meet the demand from the poultry and crop sector.

3. BASELINE STUDY FINDINGS

This section provides an overview of key findings and observations garnered as a result of this baseline study which was primarily designed around AMPLIFIES programming areas or respondent/beneficiary types. These are 1) Poultry Farmers, 2) Crop (maize and soy) Growers, 3) Feed and Soy Processing, 4) Feed Testing, 5) Warehousing/Storage and 6) Financial Services and Labor Force. Given the interconnectedness of various respondents and themes, some respondent-specific data may be presented in a cross-cutting fashion such as feed processing, which speaks to both commercial and on-farm feed practices, trends, etc.

As previously stated, the primary purpose of the baseline study was to capture data for populating baseline values against a series of indicators. Given that the baseline was conducted months prior to actual project implementation, with some core activities not anticipated to be implemented until 2017-18, AMPLIFIES will have an opportunity, at activity start, to collect additional information for programmatic purposes (by way of pre-training questionnaires, future beneficiary profiling and pre-activity data collection).

3.1 POULTRY FARMERS

The study surveyed 600 poultry farmers covering 15 districts in 3 regions. The table below provides a breakdown of respondents by region/districts. The poultry farmers surveyed are largely members of 3 regional poultry associations (Ashanti, Brong Ahafo and Greater

[24] The Consultative Group to Assist the Poor (CGAP). 2013

[25] World Bank. 2012. Agribusiness Indicators: Ghana.

Accra) and the various sub-groupings within each Region (i.e. district or municipal level associations/groups).

TABLE 4: NUMBER OF POULTRY FARMERS INTERVIEWED BY REGION/DISTRICT

Region	District	# interviewed	Total
Ashanti	Atwima Kwanwoma	25	240
	Atwima_Nwabiagya	73	
	Ejisu_Juabeng	53	
	Ejura_Sekyeduamse	9	
	Kumasi_Metro	61	
	Offinso_North	6	
	Offinso_South	13	
Brong Ahafo	Berekum	21	180
	Dorma_Ahenkro	58	
	Sunyani	65	
	Techiman	14	
	Wenchi	22	
Greater Accra	Accra Metro	103	180
	Ada_West	3	
	Dangbe_East	5	
	Ga_South	30	
	Ga East	20	
	Tema	19	
Total			**600**

Farmers interviewed ranged from very small poultry farms to the very large vertically integrated poultry farms. The classification system used throughout the study was agreed upon by partners of the USDA FFPr 2015 Evaluation Working Group (consisting primarily of AMPLIFIES, USAID-ASSESS, GPP and USDA), with installed capacity used by AMPLIFIES as a primary determinant of size.[26] It is important to note that no backyard farmers were interviewed for this study.

TABLE 5: CLASSIFICATION OF POULTRY FARMERS INTERVIEWED BY REGION

	Very large (>50,000)	Large (10,000-50,000)	Medium (5000-10,000)	Small (1000-5000)	Very small (50-1000)
Ashanti	17	60	62	94	6
Brong Ahafo	15	52	34	73	7
Greater Accra	3	9	17	96	55
Total	35	121	113	263	68

[26] Though actual capacity was used, the following current bird population and previous year's total production were also given consideration)

Of the regions surveyed, Greater Accra had a high number of very small poultry farms (less than 1,000 birds) representing 37.8% (of total broiler/layer production), with only 3 of the 180 poultry farms surveyed having more than 50,000 bird capacity (very large). This contrasts with the Ashanti and Brong Ahafo regions which have 17 and 15 very large farms, respectively.

The most common farm size category was small (1,000-5,000), with a share of 43.8% of all farms surveyed. Given the disproportionate representation of very small and small farmers in GAR, in comparison to Brong Ahafo and Ashanti, further inquiry into this trend is required. Based on conversations with GNAPF and regional poultry farmer association representatives, it was revealed that over the past years, many large-scale farmers moved their operations to the middle belt of the country for various reasons including access to space/land and proximity to bulk feed sources. These assertions still require additional research/triangulation for them to be substantiated.

Poultry production systems: The study shows that deep litter accounts for 90.5% of poultry production systems used by farmers interviewed (see table below), and confirms literature reviewed, which attests to deep litter production's prevalence in the country. Deep litter is an animal housing system based on the repeated spreading of straw or saw dust material in indoor booths. The deep litter system is the most commonly used globally mainly because it is simple and economical, though has the potential to lead to overcrowding.[27]

In contrast, only 8 out of the 600 poultry farmers interviewed practice the free range system. This low percentage (1.3%) was expected as profiled AMPLIFIES beneficiaries/respondents selected for the study excluded backyard farmers, who typically and primarily use this system.

It is estimated that over 60% of the world's eggs are produced by using battery cages.[28] However, only 2% of farmers surveyed under this study use this system of production. This confirms common literature on poultry systems in Ghana, including Anang et al. (2013) who also report that few farmers in the country use batter cage system (imported or locally made). Although battery cages are subject of controversy, they are still recognized as an efficient and productive method for egg production.[29] Battery cage systems do come with a high initial cost, which may be prohibitive for new or smaller farmers. Challenges encountered with this system may also include poor ventilation which leads to obnoxious gases in the house/pen, and leg problems as a result of inadequate mobility by the birds. Its benefits include greater number of birds reared per unit area, accurate records, clean egg production and reduced feed wastage. Based on the study findings, however, it is therefore conclusive that Ghana's poultry layer industry is largely cage-less.

[27] AMPLIFIES, by design, will work with small scale farmers (of >1,000) and bigger, except in the first year where 10% of the 600 beneficiaries are likely to have <1,000 birds, though operating as a business unit.
[28] http://www.ciwf.org.uk/farm_animals/poultry/egg_laying_hens/welfare_issues.aspx).
[29] (Ian J.H Duncan, World's Poultry Science Journal / Volume 57 / Issue 04 / December 2001, pp 381-390).

TABLE 6: POULTRY PRODUCTION SYSTEMS USED BY POULTRY FARMER

Production system	Frequency	Percent
Battery[30]	12	2.0
Free Range[31]	8	1.3
Semi-Intensive[32]	40	6.7
Deep litter	540	90.0

Poultry farm production and capacity: The combined total installed capacity of all poultry farmers surveyed is 8,309,473 birds, with capacities ranging from 300 to 300,000. The average capacity for respondent farms is 13,849. This, however, is slightly misleading given the number of small and very small farms surveyed, as the large capacity is widespread. The top 20 poultry farms alone appropriate 45.2% of the total capacity of poultry farmers surveyed. The table below provides a regional breakdown of both farms' installed capacities and bird populations at the time of enumeration.

TABLE 7: BIRD POPULATION AT THE TIME OF SURVEY BY REGION

Region	Total Capacity	Broilers[33]	Layers
Ashanti	3,022,600	130,230	2,677,905
Brong Ahafo	4,404,873	61,610	1,693,856
Greater Accra	882,000	33,929	364,112
Total	**8,309,473**	**225,769**	**4,735,873**

As the data suggests, broiler populations as a percentage of layer populations is low, with a total share of 4.55%for three target regions. Based on data collected, layers represent the bulk of the industry within targeted districts, with 95.36% layer production for Ashanti, 96.49% for Brong Ahafo and 91.47% for Greater Accra. Though it has comparatively low overall bird numbers compared to BA and Ashanti, Greater Accra has a higher broiler to layer ratio than the two other regions. This is understandable, as GAR used to be a leading producer of broilers in the past decade (FAOSTAT, VSD).

A 2009 poultry census by MOFA's Veterinary Services Directorate showed that broiler production in Ghana was declining as a result of rising production costs and poor marketing

[30] Battery cages are a housing system used for various animal production methods, but primarily for egg-laying hens. The name arises from the arrangement of rows and columns of identical cages connected, sharing common divider walls, as in the cells of a battery.

[31] Free-range poultry farming allows chickens to roam freely for a period of the day, although they are usually confined in sheds at night to protect them from predators or kept indoors if the weather is particularly bad.

[32] Semi-intensive: This refers to a system, where the birds are kept in permanent housing with access to a surrounding yard or pasture.

[33] It is worth noting that bird numbers (particularly broilers) are fluid and not representational of total production (2015) and of maximum potential. As such, current broiler population figures may not be useful for analytical purposes as these are very fluid. Annual broiler production estimates are however possible to calculate, using the number of production cycles.

(VSD, FAO, 2014). In a study by Banson et al (2014), Ghana's poultry farmer associations reported that approximately 75% of broiler poultry farms have closed and producers have been looking for alternate investment opportunities, following a prolonged period of low profitability in the broiler sector.

It is worth noting that, in Ghana, many broiler producers are said to target their production to coincide with peak consumption periods around Christmas, Easter and Eid. Broiler farms/pens may as such be empty for considerable periods in between production cycles (Rondon and Ashitey 2011). If the livestock head count takes place at a time when most farms either have or do not have birds, population, production and flock estimates might be significantly skewed.[34]

TABLE 8: PRODUCTIVITY OF SURVEYED POULTRY FARMERS (2015)

Variables[35]	Brong Ahafo	Ashanti	Gt Accra	Total
Annual total production volume (Table eggs): Number of eggs	660,404,299	626,732,758	48,468,044	1,335,605,101
Annual total value of sales (Table eggs) in Cedis	299,134,095	278,917,098	22,394,570	445,763
Annual total volume of sales (Broilers): Number of chicken	1,695,395	2,174,485	303,583	4,173,463
Annual total value of sales (Broilers) in Cedis	39,396,020	33,727,426	8,927,305	82,050,751
Average eggs per hen per lifecycle	271	309	267	282
Average true cost of producing an egg	0.32	0.33	0.43	0.36
Average maturity weight in Kg	2.19	2.07	2.24	2.17
Average maturity time in weeks	7.91	8.74	9.51	8.72

According to USDA's average industry figures, egg production is 230-250 eggs/layer/year. The study results show that the average egg production per hen per life cycle is 282. This figure is understandably higher as most layers are reportedly kept for more than a typical year cycle (sometimes up to 80 weeks), stretching egg production to meet seasonal demands for spent layers. (USDA GAIN Report number 1304)

The average true cost of producing an egg, which is defined as total cost of feed per hen divided by total eggs produced per hen (as per AMPLIFIES's Attachment E) is 0.36 Cedis

[34] Sumberg, J., Awo, M., Fiankor, D-D. D., Kwadzo, G.T-M. and Thompson, J. (2013) *Ghana's Poultry Sector: Limited Data, Conflicting Narratives, Competing Visions*, STEPS Working Paper 56, Brighton: STEPS Centre

[35] Variables are calculated as per below:

Volume of sales: the total quantity of eggs that was produced and sold to end markets within the past year
Value of sales: The total amount that was accrued from the sale of produce within the past year.
Average hen per egg per life cycle: The total number of eggs produced per layer thought out its life time.
True cost of an egg: total cost of feed per hen / total eggs produced per hen
Average maturity weight: The weight at which farmers send their broilers to end markets.
Average maturity time: The time the broiler takes to reach the maturity weight.

(approx. 9 US cents). The average maturity weight for broiler to be taken to market is 2.17 kg, with an average period of 8.72 weeks to reach desired weight. According the USDA 2013 Ghana Poultry Sector Report, broiler birds attain 2-2.5 kg live-weight at 6-7 weeks. Comparing these two data points shows that farmers surveyed were keeping birds longer. This trend may be due to several issues, including feed efficiency, market prices, and consumption patterns. These numbers require further investigation to inform AMPLIFIES project interventions, including feed formulation research/trials to be conducted by AMPLIFIES University partners.[36]

TABLE 9: FEED PRODUCTION BY POULTRY FARMERS

Region	All the time	Not at all	Sometimes
Ashanti	94.58%	1.67%	3.75%
Greater Accra	13.33%	75.00%	11.67%
Brong Ahafo	90.56%	7.78%	1.67%
Overall	69.00%	25.50%	5.50%

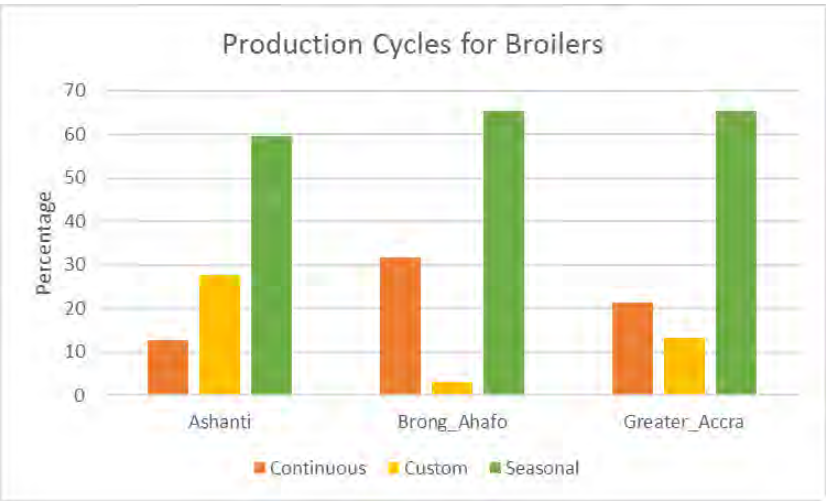
Understanding local capacity and trends related to on-farm feed production/mixing/use is critical for the design and refinement of project sub-activities. To this end, poultry farmers were asked whether they produce their own feed "all of the time," "sometimes" or "not at all" (with the assumption verified during survey implementation that "not at all" respondents relied on commercial feed). In the "Sometimes" category, respondents stated market prices, availability of either feed ingredients or access to commercial feed as factors for switching between self-mixing and commercial feed use to the other. Based on the survey responses disaggregated in the above table, over 90% (approximately) of Brong Ahafo and Ashanti poultry farms surveyed produce their own feed. Greater Accra respondents, however, relied more on commercial feed, with 75% of farms confirming so.

An assumption for this trend might be the proximity of GAR farmers to local, large commercial feed mills such as Flour Mills formerly known as GAFCO, Kosher and the Greater Accra Poultry Farmers Association –GAPFA, which, as a small-medium enterprise, runs a large feed milling operation. Another, more plausible deduction might be the fact that the majority of GAR respondents happen to be GAPFA members (157 out of 180) and, as such, benefit from subsidized feed via their membership.

The information that farmers in Ashanti and Brong Ahafo mostly produce their own feed while those in Greater Accra heavily depended on commercial feed can be utilized programmatically. AMPLIFIES may target BA and Ashanti for on-farm feed formulation technical assistance and GAR for commercial feed support.

[36] As feed efficiency measurement is a science, it was not covered as part of this study. Under the AMPLIFIES project, Scientific trials will be undertaken on feed compositions and nutrition, and feed formulation will be performed by University partners, in controlled environments, which will provide key data on bird performance (layers and broilers) feed self-hand mixed feed, commercial feed, and improved feed formulation.

FIGURE 1: PRODUCTION CYCLES FOR BROILERS



The results indicate and confirm the generally accepted notion that almost all poultry farmers who produce layers do so continuously throughout the year. However, 64.4% of broiler producers seasonally, with the view to meet demands during festive occasions. Of broiler producers surveyed, 12.2% also stated (in follow-up phone interviews) that they produce broilers for custom orders, these emanating mainly from restaurants, hotels and other corporate entities.

Only 12.7% of respondents continuously produce broilers in the Ashanti region as compared to 31.6% and 21.3% for Brong Ahafo and Greater Accra respectively. Poultry farmers in Brong Ahafo received the least custom orders (averaging 3.2%). While production cycle for layers span the whole year (and usually more), poultry farmers surveyed produce between 1 to 4 cycles of broilers annually.

TABLE 10: SOURCE OF POULTRY FEED VS. PRODUCTIVITY

Productivity/Feed Production	Self-Feed	Commercial Feed
Average eggs per hen per lifecycle	292	273
Average true cost of producing an egg	0.33	0.40
Average maturity weight in Kg	2.14	2.24
Average maturity time in weeks	8.1	9.61

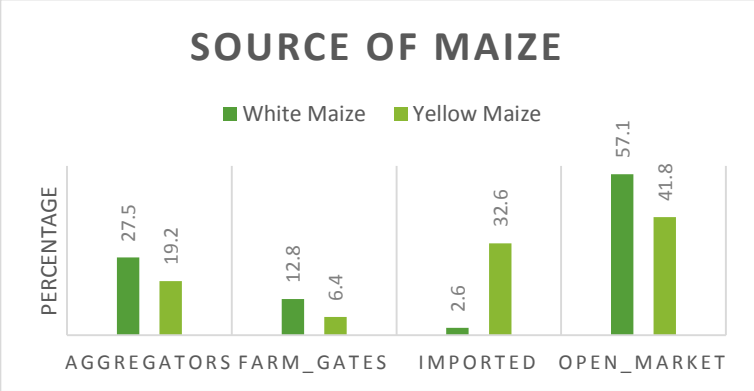
Results showed that productivity is higher with poultry farmers who responded that they prepare their own feed “all the time”, which seems counterintuitive. Theoretically, or as logic would apply, a commercial feed mill should have a better quality/price formula given the amounts/tonnes produced (and the fairer/better market prices it can obtain for bulk ingredient purchases). The comparison was done based on gross production numbers and not on FCR. FCR calculations were not possible to measure as farmers could not provide the scientific/robust data to tabulate these. These findings are however subject to further investigations (beyond the baseline) which AMPLIFIES and its University partners will conduct during FY2016-17.If the above data stands, the question arises as to why small or medium sized farms (or any size, for that matter) making their own feed would be getting the same (or similar) bird performance results as those farms using complete/finished feed from large commercial feed mills.

As a rule, smaller farm operations are not managed with the same level of resources and management expertise as larger ones. Anecdotal evidence from multiple poultry industry experts suggest that smaller farm operators do not understand their own profitability, nor are they well versed in least cost feed formulations or feed conversion ratio calculations. If one of AMPLIFIES' aims is to encourage farmers to switch to commercially blended feeds with increased conversion rates and testing, then the above trend must be further unpacked.

For purposes of feed formulation training activities, the project attempted to collect data on feed conversion ratio (FCR), or feed conversion efficiency (FCE) from its respondents (although the primary data collection for this focus will be done on a research/experimental basis, and in controlled environments). The end result will be to educate poultry farmers on how to measure a bird's efficiency in converting feed mass into increases of desired end outputs (meat or eggs).[37] FCR represents the proportion of food that is converted into meat and is a challenging figure to calculate accurately, particularly if an operation is characterized by continuous flow, with bins feeding into several pens, or if on-farm management capacity is low.

As per the study, almost all poultry farmers surveyed were not cognizant of FCR, or even attempted to measure it, with the exception of a few vertically-integrated large scale poultry farmers. Even large-scale poultry farmers Asamoah & Yamoah and Genesis farms claimed to have measured it in the past, but no longer do so. Since FCR is one practical means of measuring feed efficiency, it is important for poultry farmers to be taught simple approaches to measuring this indicator. In discussions with Agricare's Nutritionist, a simple way to estimate FCS would be the amount of feed purchased in relation to the number of live weight (kgs) sold.

FIGURE 2: SOURCE OF MAJOR FEED INGREDIENTS BY POULTRY FARMERS



According to the study, 75.8% of soybean meal used by poultry farmers is imported while the remainder is sourced from local soy processors. In all, 76.34% of farmers indicated that they depend on imported soybean meal to prepare their feed. While some believe it to be of a higher quality, others were indifferent as to the source of the soybean meal, stating prices and availability as key determinants of sourcing. The table below provides the annual sums of demand for both yellow and white maize, as well as soybean meal.

[37] Simple Calculations: Feed Conversion, Daily Gain and Mortality, 03 April 2014. http://www.thepigsite.com/articles/4694/simple-calculations-feed-conversion-daily-gain-and-mortality/

TABLE 11: ANNUAL DEMAND FOR MAIZE AND SOYBEAN MEAL BY POULTRY FARMERS

Region	Sum of Annual Demand for White Maize (MT)	Sum of Annual Demand for Yellow Maize (MT)	Sum of Annual Demand for Soybean Meal (MT)
Ashanti	30,507.18	23,829.69	17,430.28
Greater Accra	9,537.66	4,009.31	2,836.65
Brong Ahafo	49,031.63	43,463.88	14,414.59
Overall	**89,076.47**	**71,302.89**	**34,681.52**

Given the sizeable maize and soy requirements for only a portion of the country's total poultry farmer population, the potential for establishing end markets for locally produced maize and soy presents a tremendous opportunity, but also a challenge for multiple value chain actors.

As AMPLIFIES endeavors to build the capacity of farmers on improving the efficiency of feed, the study aimed to generate information on current feed formulations, and composition thereof, used by farmers. The table below provides a breakdown of typical feed ingredients, and their % use in feed formulation. While cost is an important factor in feed production, specific questions related to on-farm costing of feed rations were not asked of respondents (though a full costing table for various mashes was derived for commercial feed mills, and presented further below)[38].

TABLE 12: AVERAGE PERCENTAGE INCLUSION OF INGREDIENTS

	%
Maize	53.6
Maize bran	0.89
Wheat bran	13.54
Soybean meal	12.15
Fish meal	4.31
Concentrates	5.76
Premix	1.79
Oyster	7.09
Essential amino acids	0.09

Feed compositions of poultry respondents differ greatly from farmer to farmer, with maize ration ranging from 40% to as high as 70% while soybean meal component ranges from 10-20%. A study[39] by Bassam Al-Deseit published in the Journal of Animal and Veterinary Advances, showed that the least cost ration for starter broilers produced consisted of 68.0% corn and 25.07% soybean, while that of broiler finisher feed contained 67.5% yellow corn and 20.45%

[38] Rather, and given the price fluctuations for various feed elements, this information was amassed from recent literature, and will be supplemented during AMPLIFIES implementation, via pre-activity questionnaires at the time of activity implementation.

[39] Bassam Al-Deseit (2009). Least-Cost Broiler Ration Formulation Using Linear Programming Technique. Journal of Animal and Veterinary Advances. Volume 8, Issue 7

soybean. Asamoah and Yamoah farms record its rations to include 25% of soybean in layer feed and 25-35% in broiler feed. In other feed preparation, soya inclusion rates are starter (20-30%), Grower (15-28%), and layer (19-22%).[40]

Comparing these two resources with the results from this baseline study shows that, while maize ration of feed prepared by the poultry farmers surveyed is within industry standard (practice) levels, the ratio of soybean meal is relatively lower, though still significant.

It has been suggested that, while white maize remains more widely produced and thus more available in the market, the poultry industry prefers yellow maize, as the poultry industry is dominated by layers, and yellow maize contributes to a more pronounced yolk color. In conversations with Asamoah and Yamoah Farms, it was suggested that customers preferred eggs with yellow yolk to the white yolk because they are more appealing. Yellow maize in fact contributes to a more pronounced yellow yolk because of the presence of carotenes (Xanthophyll's).

It is important to note that two key finished feed elements, concentrates and premixes, are generally thought not to be produced in Ghana, but rather imported and sold by commercial distributors.[41] This was confirmed by the six commercial feed millers interviewed for the study.

3.2 CROP GROWERS DATA

One thousand (1,000) crop farmers representing 31 FBOs were surveyed as part of this baseline study. The average membership size of FBO respondents was between 20 to 30 farmers, though some were listed as having over 50 members. Table 13 provides a breakdown of FBOs and the number of members interviewed. During the author's (and enumerators') interactions with FBO leaders at a beneficiary selection workshop and focus group discussion in Tamale, AMPLIFIES was informed that FBO membership was very dynamic as farmers have a tendency to join and leave at will, with membership size changing from season to season.

[40] Agristats Oct'12; unitedsoybean.org.
[41] According Mr. Edward Parko, of Frankaston limited, a leading feed input distributor in Ghana.

TABLE 13: FBO MEMBERS INTERVIEWED

Region	District	Name of FBO	# members interviewed
Ashanti	Ejura-Sekyedumase	The Lord is my Shepherd	48
Brong Ahafo	Dormaa	Nsuhia ado naye cooperative and farmers marketing Ass.	49
	Sunyani	Abesim Maize Growers Association	8
		Kantro Maize Farmers Group	22
	Wenchi	Sungzele maize farmers	20
	Nkoranza	Nyame na aye	52
		Nyamebekyere farmers Association	35
	Techiman	Adom Farmers Association	23
		Suntaa Nuntaa	28
Northern	Tamale	Tugu Farmers Group	30
		Gubdanda farmers group	22
	Yendi	Suglokonbo	22
		Anzansi	58
		Bontimani	40
		Belannabra	26
	Mion	Tabra nye dura	25
		Wunzooya	41
		Suglo mbori buni	30
		Farajemaham	53
	Savelugu Nantong	Ti yumbataba	30
		Bunglung Soybean Farmers Asss	32
		M mali Tahama	31
	Tolon Kumbungu	Zisun Ni tie Nabli	29
		Kpasolgu Soybean Farmers	30
		Berisung	29
		Gbanjogla Soybean Farmers	30
		Koomoayili Soybean Farmers	30
		Tungteeya	25
	Saboba	Wuntizoriba	29
		Pukuaba Farmers Group	27
		Tilikpotob Farmers Group	46

Crop production data: Of respondents, 29.5% reported to own the land they cultivate, while 11.5% used leased land, 29.8% family lands, and 27.5% community land. The average land holding size of individual farms surveyed is estimated at 2.51 hectares. This estimation does not indicate averagely large land size per farmer, but rather the significant difference between farmland sizes (up to 20 hectares). A cumulative land size of 2,513.99 hectares was recorded for the respondent crop farmer population. Again, farmland sizes only refer to land used or available for maize and soybean production.

TABLE 14: LAND SIZE CULTIVATED, VALUE AND VOLUME OF PRODUCTION OF MAIZE AND SOYBEAN BY RESPONDENT IN 2015[42]

Crop	Average land size cultivated (hectares)	Total average production (metric tons)	Average Yield (Mt/Ha)	Total average value of sales (in Cedis)
White maize	1,688.64	3,933.68	2.33	2,089,256
Yellow maize	213.65	374.56	1.75	195,801
Soybean	546.71	574.3	0.95	385,465
Total	**2,449**	**4,882.54**		2,670,522

Yields as presented in the table above were calculated as MT produced/hectare using verbal estimates of farmland sizes and crops harvested by farmers, which represents an estimation. AMPLIFIES will however adopt scientific approaches (such as crop cuts) to measure this indicator during program implementation. As per the above table, the yields for maize (both white and yellow) are higher than average national estimates except for soybean[43] which are below the national average.

According to AMPLIFIES partner ADRA,[44] FBO members generally have higher yields than non-member farmer population because they have access to improved seed and farming techniques and sometimes receive farm input subsidies. This includes training on three modules centered on agriculture sector productivity, agronomy of crops, business development and group dynamics, providing respondents with a base of knowledge of governance, finance, administration, and specific techniques. Such exposure provides a competitive edge to FBO members over farmers not belonging to an FBO, cooperative or other such group.

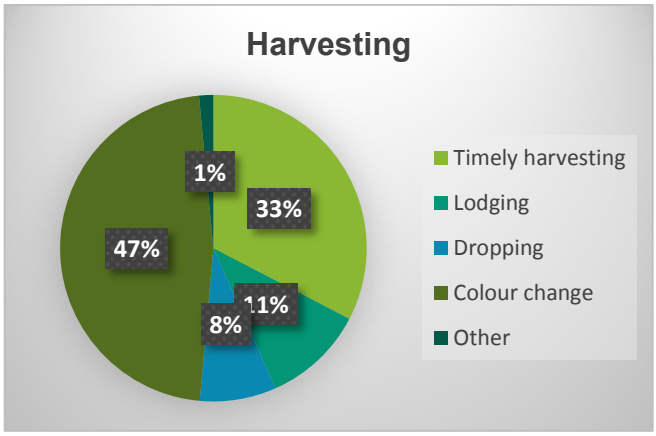
Harvesting, Post-harvesting and Storage data: As the AMPLIFIES project will provide capacity building to farmers on post-harvest loss (PHL). Data was collected on current farming practices to inform programming, contribute to training curricula development, and provide contextual understanding of the current capacity of respondent farmers. Findings show that harvesting is almost exclusively done manually (99.6%) and color change is the most commonly used determinant of optimum harvesting time, although some farmers use lodging and dropping as means of determining harvesting time, as per the figure below.

[42] According to ADRA (and Agriculture Extension Officers), in Ghana, land is often measured in "acres" for which two dimension/estimations are typically provided. One of them consists of 6ft x 24ft (using outstretched hands as a ballpark measure) which provides an estimation of less than one acre, and 6ft x 36f, providing a slightly more than a one-acre dimension. The "size of a football field" is also used locally to describe land holdings representing one-care. Despite the inconsistencies that this might bring to data collection, the reliability of the above AMPLIFIES gathered data is solid, given Agriculture Extension officers' involvement in the survey, which assisted with proper calculations and estimations.

[43] The highest average yield for soybean is found in the Northern Region of Ghana. As at 2014 MOFA statistics, it stood at 1.88

[44] According to discussions with Mr. Samuel Mensah, Agricultural Programs Director, ADRA Ghana.

FIGURE 3: HARVESTING TECHNIQUES USED BY CROP FARMERS



Stalk lodging, by definition, constitutes the breakage of the stalk below the ear. Severely lodged corn leads to increased harvest losses, increased harvest time, increased drying cost and reduces grain quality.[45] Dropping occurs when the ear of the maize falls to the ground, which has similar consequences to lodging. Farmers use several post-harvest handling techniques such as shelling, threshing, de-husking, winnowing and cleaning, all of which are almost entirely done manually.

TABLE 15: COMMON POST-HARVEST HANDLING TECHNIQUES

Post-harvest handling technique	#	%
Shelling	781	27.34
Threshing	596	20.86
Dehusking	557	19.49
Winnowing	626	21.91
Cleaning	245	8.58
Other	52	1.82

A majority of farmers interviewed store their produce in sacks whilst a moderate number store in barns. Only a handful of farmers use methods such as hermetic storage bags and vacuum packages (including PICS bags).[46] The use of chemicals such as Phostoxin is also practiced. The table below gives a figurative breakdown of the various storage techniques being used by the farmers.

[45] https://www.extension.purdue.edu/extmedia/AY/AY-262.html

[46] Purdue Improved Crop Storage (PICS) bags provide a simple, low-cost method of reducing post-harvest losses

TABLE 16: STORAGE TECHNIQUES USED BY FARMERS

Storage techniques	#	%
Barn storage	213	17.85
Vacuum packages	3	0.25
Zero fly bags/Hermetic bags	29	2.43
Chemicals eg. Phoxtosin	80	6.71
Sack	841	70.50
Clay pot	3	0.25
Other	24	2.01

At the February 2016 AMPLIFIES-ADRA Tamale focus group, 80 representatives of FBOs and Agricultural extension officers were asked to come up with challenges and solutions to maize and soybean production, including storage issues. All farmers indicated that the Northern Region's climate is favorable to dryness, making moisture/molding less of a problem. Main storage concerns shared related to the lack of access to Zero Fly or PICS bags, and the dangers of exposure to Phoxtosin, for farmers storing some of their grains at home.

According to the 2012 USAID EAT Market Assessment Report, farmers sell off approximately 75% of their maize harvest to defray production cost and any debts that they may have incurred towards crop production. The remaining 25% is usually kept by the farmer as a store of wealth to be sold in times of shortages (or when prices are favorable), and also for feeding their household. The 75% sold may pass through a form of transient storage at the community, where buyers and creditors purchase or retrieve their in-kind (maize) payments. Maize producers may store for short periods and then transport the stock out for sale.

As per Table 17, 890 of farmers interviewed were found to store all or at least some part of their produce at home. The use of earthen silos is moderately common (14.5%) among Northern Region farmers. Earthen silos are typically made of clay, with some having a mixed-cement and clay/earth base. The ones encountered during enumeration were of a 1MT capacity. These structures are reported by ADRA as being highly efficient; with only 2% storage loss reported for ADRA supported ones.

Results showed that only 1.9% of farmers surveyed used community warehouses and/or crop aggregation centers. The low patronage of community warehouses/crop aggregation centers could be due to several factors. For example, according to the ACDI/VOCA 2012 EAT Report, feed processors are operating significantly under-capacity and even with working capital constraints at harvest, soy is quickly moved out of production areas within a couple of months of harvest. This situation eliminates the need for any significant storage outside of the processors' inventory warehousing and, coupled with the fact that soy is an eyeless bean, which protects it against infections, fumigation is hardly needed. Additionally, small-scale farmers with less than 1 hectare of farmland hardly have enough excess maize to put into speculative storage (as they reserve maize for household consumption).

TABLE 17: PLACE OF STORAGE FOR FARM PRODUCE

Place of Storage	#	%
At Home (shed, bedroom, etc.)	890	83.57
Silos (clay/earthen storage)	145	13.62
Community warehouse	28	2.62
Aggregation Centre	2	0.19

Asked where they store their produce, over 83.57% of farmers responded at home. The "home" category refers to the use of regular rooms for storage, while silos refer to a local storage facility which uses earthen material such clay and mix with cement. Community warehouses are owned by the community which all farmers tap into. Aggregation centers are the conventional means of storing grains, but these were not found to be common or widespread within surveyed communities. In all, crop farmers interviewed had access to a total on-farm or household storage capacity of 8,914.99 metric tons, with an average storage capacity of 9.35 metric tons.

Almost half (46.8%) of farmers cited the need for additional space while 37.5% were not satisfied with the sanitation of their storage facilities, with rodent and insect sanitation listed as typical (though infrequent) problems. Improvements stated as needed were infrastructure related and included additional storage space, roofing and flooring enhancements. The need for additional space as reported by respondents, even in the light of adequate storage space, may be due to the peak demand for storage space during harvesting time.[47]

In terms of post-harvest loss, while farmers interviewed recorded PHL of 5.57%, CACs surveyed recorded minimal PHL of only approximately 1%. Though questionable, this may be attributable to the fact that a majority of the farmers store their produce at home. Generally, poorer farmers may not appropriately treat and store, leading to increased losses.[48] Analysis of the regional data reveals that, while the Northern Region has PHL value of 3.71%, the combined average for Ashanti and Brong Ahafo Regions was 8.01%.

3.3 FEED AND SOY PRODUCTION

As both the literature review and baseline interviews reveal, information pertaining to the quantity of feed supplied to the poultry industry via commercial feed millers, compared to feed produced by large/very large poultry farms with feed milling capacity and small farmers who mix their own feed, is very limited. The AMPLIFIES baseline has attempted to shed some light on the above, with findings highlighting differences between commercial and on-farm feed production. In order to assess the current performance of the feed sector, AMPLIFIES felt it necessary to interview companies/enterprises representing both the soy and feed processing elements of the poultry feed industry.

The Ghana Feed Millers Association (GFAM) has 12 members, of which only 4 are currently in operation. Mr. Martin Kwabena Tawiah, Executive Secretary of GFAM, confirmed the existence of 12 commercial feed millers, with 4 in operation currently but producing below capacity or struggling to sustain production. The Table below provides the list of GFAM members as of June 2016 (as provided by GFAM).

[47] According Samuel Mensah, Agricultural Program Director of ADRA
[48] USAID EAT Market Assessment Report Ghana

Table 18: Members of the Ghana Feed Millers Association

#	NAME	LOCATION	STATUS
1	Greater Accra Poultry Farmers Association	Nima- Accra	Active
2	ASAS Farms Ltd	Accra	*Active
3	Agricare Ltd	Kumasi	Active
4	Darko Farms & Co. Ltd	Kumasi	Inactive
5	Flour Mills of Ghana Ltd	Tema	Active
6	Solar Farms Ltd	Tema	Inactive
7	Hirigifred Farms Ltd	Accra	Inactive
8	Central Feed Mill Ltd	Accra	Inactive
9	Kosher Feed Mill Ltd	Osu-Accra	Active
10	Agro-Projects Ltd	Airport –Accra	Inactive
11	Presby-Agric Station	Legon –Accra	*Active
12	Rapp & Co. Feed Mill	Tarkoradi	*Active
13	Tantra Company Ltd	Accra-North	*Active
14	Divine Feed Mill Ltd	Accra	Inactive

*Feed mills are active but not in commercial operation.

Feed milling capacity: Although not members of GFAM, Akate and Jokas farms also produce feed commercially. In total, the baseline study covered 6 feed processors. All feed processing facilities surveyed are mechanized, with the hammer mill being the most commonly used milling equipment. Mixing capacities range between 1 and 2 tons. Jokas farms have a 3-ton capacity mixer, which is manufactured locally and the largest in the country. Reported production capacity per hour ranges for the 6 respondents was 5-14 metric tons per hour. Table 19 provides a list of the feed milling companies/enterprises that were interviewed, categorized by type and size.

TABLE 19: FEED MILLS EQUIPMENT AND PRODUCTION DETAILS

	GAPFA Feed Mills	KOSHER Feed Mills	Flour Mills of Ghana (GAFCO)	AGRICARE	JOKAS Farms	AKATE FARMS
Type of facility	Mechanized mill + mixing	Mechanized mill + mixing	Mechanized mill + mixing	Mechanized mill + mixing	Mechanized	Mechanized
Size of Facility	Large	Small	Large	Medium	Medium	Large
Production & Equipment details	**Milling equipment:** hammer mill **Mixers:** 1 tonne horizontal mixer **Weighing system:** Manual bulk weigh **Installed capacity:** 13MT **Actual capacity:** 11MT **Production:** 11mt/hour **Pelleting capacity:** None	**Milling equipment:** hammer mill (2 tons per hour) **Mixers:** Two. 2-tonne mixer **Weighing system:** Manual weigh **Installed capacity:** 20MT/day **Actual capacity:** 15 MT/day **Production:** 2 tons/day **Pelleting capacity:** None	**Milling equipment:** Throw sifter, gravity separator, hammer mill, **Mixers:** 2 tonner Buhler mixer **Weighing system**: Automatic bulk weigh **Installed capacity:** 5MT **Production:** 5mt/hour **Pelleting capacity:** None	**Milling equipment:** Vertical hammer, DFZK-1, Pellet mill DFCA 2005 **Mixers:** 2 tonner Buhler rotor horizontal/paddle mixer **Weighing system**: Manual bulk weigh **Installed capacity:** 5MT/Hour **Actual capacity:** 11MT/Hour **Production:** 10mt/hour **Pelleting capacity:** 3mt/hour	**Milling equipment:** Hammer mill **Mixers:** Both 3 & 2 tonne Capacity mixer (locally produced) **Weighing system**: Manual weigh **Installed capacity:** 5MT/Hour, 100MT/Week **Actual capacity:** 20MT/Day **Pelleting capacity:** None	**Milling equipment:** Complete mill **Mixers:** 1 tonner Horizontal mixer **Weighing system**: Automatic bulk weigh **Installed capacity:** 14MT/Hour **Actual capacity:** 14MT/Hour **Pelleting capacity:** 10mt/hour

In Ghana, the most common feed ingredients used by feed millers include white/yellow maize, soybean meal, wheat bran, fish meal and cotton seed. Maize alone accounts for about 60% of the average poultry feed ration (EAT Market Assessment). While a majority of the feed millers rely on local markets for supply of major ingredients, some feed millers such as GAPFA, Agricare and GAFCO also import ingredients. Primary imports are soybean meal and premixes. AMPLIFIES found that information was very limited in terms of local production of mixes and concentrates.

Via KIIs with various feed millers and the Ghana Feed Millers Association it was clear that both the number and output of larger feed mills have declined over the recent years. While some of the medium mills are still operational though functioning at a reduced/limited capacity. According to GFMA, these still continue to act as important suppliers to those poultry producers having small to medium-sized poultry farms.

There has been a significant increase in the number of poultry (small to large) operations producing their own feed. This has resulted in large part due to a breakdown of trust between these farmers and the feed mills, as well as issues related to availability, quality and pricing of manufactured feed. Most of the larger poultry farms (e.g. Asamoah and Yamoah, VOA Farms, Unity Farms, Darko Farms, to name a few) have their own feed mills primarily producing feed for their own poultry operation. A smaller number are also selling feed on a commercial basis to other small and medium-sized poultry farmers in proximity to their operations (Eg. Akate and JOKAS farms).

TABLE 20: FEED INPUT DEMANDS BY FEED MILLERS

	GAPFA Feed Mills	KOSHER Feed Mills	Flour Mills of Ghana (GAFCO)	AGRICARE	JOKAS Farms	AKATE FARMS
Major feed ingredients	White/yellow maize Soya bean meal Wheat bran Fish meal Palm kennel cake	White/yellow maize Soya bean Wheat bran Concentrates Fish meal	Yellow maize Soya bean meal Wheat bran	White maize Yellow maize Soya bean meal Wheat bran Fish meal Oyster shell	White maize Yellow maize Soybean Wheat bran Concentrates Feed additives	White maize Yellow maize Soybean Wheat bran Concentrates Cotton seed
Source of major feed ingredients	Maize: *Aggregators (Wienco), imported (yellow maize)* Soybean meal: *Imported + local processors (Vestor oil mills)*	White maize: Local Yellow maize Import Soybean: Local/import White bran: Local	All imported	Yellow maize: Local/imported White maize: Local Fish meal: Local/imported Soybean meal: Local processors/imported Wheat bran: Local Oyster shell: Local	Yellow maize: open market White maize: open market Soybean: Local Wheat bran: Tema Flour Mills	Yellow maize: local market White maize: local market Soybean: imported Wheat bran: local Concentrates: imported Cotton seed: imported
Annual commodities demand	Maize: 9,600 MT Soybean meal: 3,600 MT	White maize: 775 MT Yellow maize: 775 MT	Yellow maize: 11,000 MT Soybean meal: 7,000 MT	Yellow maize: 1064MT White maize: 3192MT Soybean meal: 2520	Yellow maize: 5350 MT Soybean meal/cake: 2675 MT	White maize: 9,900 MT Soybean meal/cake: 2,900 MT

		Soybean meal/cake: 500 MT		MT		
Cost of main feed ingredients per 50kg bag in Cedis	Maize: 60.00 Soybean meal: 108.00	Maize: 60.00 Soybean/meal cake: 100.00	Yellow maize: 56.00 Soybean meal: 108.00	White maize: 65.00 Yellow maize: 67.00 Soybean meal: 110.00	Yellow maize: 60 Soybean meal/cake: 110.00	Soybean meal/cake: 105.00 Maize: 65

Feed Ingredient demand: The combined, cumulative demand for white and yellow maize by Ghana's feed processors and on-farm feed-producing poultry farmers who participated in the survey totals 198,019 MT (at 110,616.5 for white and 87,402.9 for yellow maize). The demand for maize and soybean by the poultry industry exceeds current supply. A comparison of the total demand for maize and soybean, as well as production by potential AMPLIFIES beneficiaries interviewed, is presented in the table below. For example, total white maize production for the 1,000 crop growers interviewed could only satisfy 3.4% of maize demanded by the poultry farmers who produce their own feed. This will assist AMPLIFIES in programmatic planning and, where possible, target adjustment, as farmers with greater production capacity must be enrolled into the project in subsequent years in order for their production to meet the demand of their counterpart poultry farmer beneficiaries.

TABLE 21: DEMAND AND SUPPLY OF MAIZE AND SOYBEAN

Annual Demand (MT)	White Maize	Yellow Maize	Soybean
Poultry producers	89,076.5	71,302.9	34,681.5
Feed millers	21,540	16,100	-
Soy processors	-	-	35,470.3
Total	**110,616.5**	**87,402.9**	**70,151.8**
Annual Production			
FBOs/Crop growers	**3,993.68**	**374.56**	**574.25**

Feed mash production: As reported in Table 23, the total annual combined feed production of the 6 commercial feed processors surveyed selected for this study is 82,495.02 MT. As the AMPLIFIES and its partners require a thorough understanding of production volumes and sales of all broiler and layer mashes towards the design of specific interventions with feed millers and their suppliers/clients, the study compiled a thorough survey to this effect.

TABLE 22: FEED PRODUCTION BY COMMERCIAL FEED PROCESSORS

	GAPFA Feed Mills	KOSHER Feed Mills	Flour Mills of Ghana (GAFCO)	AGRICARE	JOKAS Farms	AKATE FARMS
Annual feed production	22,255.02 MT	2,436.71 MT	20,000 MT	7,248 MT	10,700 MT	15,000 MT
Annual volume of feed produced per type	**Chick Mask:** 939.15 **Grower Mash**: 3,298.45	**Chick Mask:** 135 **Grower Mash:** 446.94 **Layer**	N/A	**Chick Mask:** 1242 **Grower**	**Chick Mask:** 500 **Grower**	N/A

(MT)	**Layer Mash:** 16,967.7 **Broiler (Starter):** 577.575 **Broiler (Grower):** 472.14	**Mash:**1319.67 **Broiler (Starter):** 347.99 **Broiler (Grower):** 187.11		**Mash:** 1067 **Layer Mash:** 2999 **Broiler (Starter):** 1293 **Broiler (Grower):**647	**Mash:** 2000 **Layer Mash:** 5200 **Broiler (Starter):** 600 **Broiler (Grower):** 2400	
Price of feed per kg in Cedis	**Layer mash**: 1.62 **Broiler:** 1.93 (starter), 1.80 (finisher)	**Chick Mask:** 1.73 **Grower Mash:** 1.51 **Layer Mash:** 1.71 **Broiler (Starter):** 2.00 **Broiler (Grower):** 1.88	**Layer mash:** 1.68 **Broiler:** 2.00	**Chick Mask:** 2.0 **Grower Mash:** 1.70 **Layer Mash:** 1.80 **Broiler (Starter):** 2.12 **Broiler (Grower):** 2.04	**Chick Mask:** 1.84 **Grower Mash:** 1.6 **Layer Mash:** 1.7 **Broiler (Starter):** 2.2 **Broiler (Grower):** 2.1	N/A
Total value of sales in Cedis	34,727,450	3,878,771.00	N/A	4,000,000	3,171,476.00	N/A

However, the total demand for feed by the 600 poultry farmer respondents exceeds 200,000 MT. Given that regions outside the AMPLIFIES ZOI also depend on these feed millers, it is conclusive that commercial feed has a potential market that can be tapped into (though this would have to be balanced by AMPLIFIES efforts to improve on-farm feed formulation and processing, which could negatively impact commercial feed mills, as demand for their product might diminish over time). Coincidentally, about two-thirds (69%) of poultry farmers surveyed exclusively produce their own feed, while 5.5% depend on both commercial and self-mix feed. The table below provides a comparison of on-farm feed production costs averaged from all feed-producing poultry farmer respondents, and for all feed types (2 for broilers, and 3 for layers) with average wholesale prices from commercial feed mills.

TABLE 23: COST OF PRODUCING FEED (On-farm vs. commercial)

Cost of producing a Kg of feed in Cedis by Poultry Farmers		Average Wholesale prices of Commercial Feed per Kg in Cedis
Chick mash	2.00	1.84
Layer mash	1.83	1.75
Grower mash	1.94	1.60
Broiler starter	2.23	2.10
Broiler grower	1.90	1.89

Soy Processing: The poultry sector represents a significant market for soybean processors as these provide an important source of soybean meal/cake for poultry feed production. In discussion with operational soybean processors, it was revealed that almost all of them are operating under capacity with reasons cited being the unstable availability and quality of raw soybeans, as well as the occasional low patronage of products.

Local soy processors are key suppliers of soybean meal for most large/medium feed processors. However, local supply is unable to meet the demand of feed processors in terms of the quality and quantity of beans. This is evidenced by the total soybean production of 1,000 farmers representing less than 1% of the overall demand by the poultry farmers and feed/soy processors surveyed. During interactions with FBO representatives, and at the Tamale FGD, farmers intimated that they had the capacity to produce enough soy to meet the demands of the poultry farmers if end markets were guaranteed for them.

Flour Mills (formerly known as GAFCO) is currently the largest feed producer in Ghana and imports 7,000 MT of soybean meal annually. Reasons cited by the company for the reliance on imported feed ingredients (particularly soybean and yellow maize) are the relatively lower quality of locally produced feed inputs and the almost insignificant cost variation. During a key informant interview with Mr. Yaw Adu Poku, the Executive Director of 3K and A Ventures Limited[49] in Kumasi, AMPLIFIES was informed that locally produced soy usually contain unacceptable levels of debris (foreign matter). This, he said "increases labor hours as further cleaning is required before processing which impacts production costs." He also cited the seasonal availability and irregular supply of soybean, stating that the import market was more reliable and consistent

TABLE 24: MAJOR SOYBEAN PROCESSORS WITHIN AMPLIFIES ZOI

	ROYAL DANEMAC	3K AND A INDUSTRIES	GHANA NUTS	VESTOR OILS	YEDENT	INTERGROW
Location	Kumasi	Kumasi	Techiman	Kumasi	Sunyani	Tema
Type of facility	Mechanized + Manual	Mechanized + Manual	Mechanized + Manual	Mechanized + Manual	Mechanized + Manual	Mechanized
Size of facility*	Medium	Medium	Large scale	Medium	Medium	Small
Type of equipment	3 Expellers from China	Expeller (From India)	Expeller	Expeller Kumar (5 in number) 5 ton	Extruder (INSTA-PRO 2000) Expeller	TBD
Estimated daily production	22MTt/day	50 MT/day	200 MT/day	40 MT/day	10 MT/day	

[49] 3K and A is a soy processing company based in Kumasi in the Ashanti Region.

Volume of soybean processes last year (MT)	10,800	4,000	30,000	3,270.3	2500	TBD
Value of soybean processed last year (in Cedis)	16, 200,000	6,000,000	42,000,000	4,251,390	3,750,000	TBD
Volume of soybean meal/cake produced annually (MT)	9720	3000	25,000	3405.95	1,500	TBD
Total value of sales for soybean meal/cake (in Cedis)	19,440,000	3,000,000	51,000,000	6,811,980.00	4,608,000	TBD
Price of per 100kg in Cedis	100	110	110	100	130	90

*Size is self-reported (no scale was available to assess these responses) and some data is missing for Integrow.

3.4 STORAGE/WAREHOUSING

Crop growers, poultry producers, crop aggregation centers (CAC's), feed/soybean processors all need an effective storage system in order to function efficiently. The storage/warehousing needs of all these categories of beneficiaries differ moderately, as per the table below.

TABLE 25: STORAGE CAPACITIES OF RESPONDENTS

Beneficiary categories	Size (MT)
Crop growers	8,914.99
Poultry producers	4,2898.2
CAC's	2,945
Feed processors	21,250
Soy processors	16,600
Total	**92,608.19**

CACs differ in types, sizes and management and ownership. As AMPLIFIES will be interacting with various CACs for multiple/different purposes, the study obtained information on predominant types of ownerships of storage facilities including MOFA, Ghana Grains Council (GGC), NAFCO, NGO and Community CACs. The study looked into 16 facilities, including 8 CACs below 100MT, reflecting a broad range of storage off-site opportunities/options for

farmers and programming, linkages and networking opportunities.[50] Eight of these were above 100MT, and considered medium to large. The table provides a mix representation of potential CACs that AMPLIFIES may partner with. ANNEX K includes a full list of 16 Warehouses/CACs profiled.

TABLE 26: CACs/Warehouses/Storage Facilities surveyed

Name of CAC	Location	Ownership/Management	Capacity(MT)	Average Usage (MT)	Number of Users	Percentage PHL
MiDa Warehouse	Worribogu Kukuo, Tolon	MOFA-MIDA, SADA	520	480	500	1%
Busaka Agric. Business Co. Ltd	Savelugu	Company/Aggregators owned	1000	850	1,330	1%
MOFA Warehouse	Sang, Yendi	MOFA	1000	600	50	1%
Grain leaders Co. Ltd	Nkoranza South	Company/Aggregators Owned	3000	200	500	1%
WFP Warehouse	Gingani, Mion	Management Committee	25	22		0
Tiyumtaba Farmers Group	Diare, Savelugu	FBO owned	80	70	500	0
Subinso Area Warehouse	Subinso, Wenchi	Community/FBO Owned	200	150	Unavailable	2%
Sakpe Silo	Sakpe, Yendi	Community/FBO Owned	70	65	20	3%

The small (usually less than 100MT) community warehouses have been largely built by donors or community members themselves, with support from NGOs or Government. Privately owned warehouses are exclusively used for aggregation and sometimes provide storage and other services to farmers. MOFA-run warehouses open their doors to farmers and the community.

All CACs charge a fee for their services ranging from 20 pesewas to 1.0 Cedis, with an average fee of 0.6 pesewas per bag. The average usage of the CAC's surveyed was 77.3% of total capacity. Post-harvest loss was very minimal at 0.6%. It can therefore be assumed that most post-harvest losses, at least within the above CACs, occurred outside of the storage facilities, though further investigation into storage related PHL in various storage settings is required.

It should be noted that, for maize, crops harvested are first sun dried on-farm and subsequently stored on-farm or at home, in different types of storage facilities available to farmers, prior to being moved to these may be traditional silos built with wood or mud or in rooms and sheds. For soy, however, as yields are quickly moved within a couple of months of harvest, the need for

[50] It was necessary to broaden the enumeration to cast a wide of net of warehouses for different/varied project interactions under AMPLIFIES activities.

any significant storage outside of the processors' inventory warehousing is eliminated. Coupled with the fact that soy is an eyeless bean, which protects it against infections, fumigation is also hardly needed. The CACs/Warehouses surveyed indicated very low storage figures for soybeans (Storage figures by crop are included in **ANNEX K**).

As the project intends to provide investment to enhance post-harvest infrastructure, in storage facilities for maize and soy, additional data on actual costs for renovations/constructions will be obtained in real time, as the project rolls out. Current estimates provided by ACDI-VOCA (EAT Report 2012) establish construction of a 2,000 MT warehouse in the SADA area at approximately US$150,000. The highest estimates that the study came across for the construction of a 1,000MT warehouse, which can hold 10,000 bags of maize, were US$100,000. It would cost about US$15,000 to construct a 50 MT warehouse. These figures are important for planning purposes, particularly around future loan/grant support related to PHL and warehousing/storage for processors.

3.5 LAB TESTING FACILITIES

As part of its activities, AMPLIFIES will provide capacity building and operational support to laboratory testing facilities that conduct feed testing. In an attempt to establish the types of feed related services that these labs provide, and understand their usage by poultry value chain clients, four lab testing facilities were surveyed/profiled using a standard questionnaire developed in conjunction with Kansas State University and Iowa State University. The questionnaires were administered either in person or via email, and follow-ups were conducted by AMPLIFIES staff to verify and expand on information provided. While the few project indicators associated with feed testing are tied to number of individuals trained and costs for complete feed tests, AMPLIFIES felt it important to nonetheless gather information on the services provided by all four labs, and produce an inventory of equipment used at each facility (for use by AMPLIFIES University partners in activity design).

Facilities surveyed included the University of Ghana, East Lagon; Kwame Nkrumah University of Science and technology (KNUST), Kumasi; and both the Food Research and Animal Research Institutes of the Council for Scientific and Industrial Research (CSIR), respectively located in Greater Accra. The Greater Accra Poultry Farmers Association (GAPFA), having acquired an NIR machine, is also poised to provide a range of testing services for both members and non-members, once calibrations are developed for feeds or ingredients.

University of Ghana

The University of Ghana's lab testing facility is housed with the Department of Animal Science, in East Lagon, Greater Accra Region. The lab provides proximate analysis of finished feed and feed ingredients, including phosphorous and calcium. The average length to conduct feed analysis is 4 working days, with a complete feed test costing Ghs 150.00 (including phosphorous). The lab is equipped for multiple services/tests including extraction (Soxhlet Method /Apparatus), and protein determination (Kjeldahl method/apparatus), among others. Lab services are available for both students (for research purposes) as well as outside clients. The university conducts 4-5 full proximate analyses per month for regular clients, averaging 48-60 per year. Many poultry farm operations use the University's services including small scale (20%), medium scale (60%) and large scale (20%) poultry farmers. Regular clients include independent importers and suppliers of fishmeal/SBM TO feed, as well as multiple enterprises,

institutes and farms. The laboratory has a working protein analyzer but most of the other equipment needs repair and/or replacement.

Kwame Nkrumah University of Science and Technology

KNUST, in Kumasi, Ahsanti Region, houses a laboratory providing Pproximate analysis (DM, CP, CF, Ash, EE as well as NFE determination). It uses the Van Soest method of feed analysis (NDF, ADF, calculation of Hemicellulose and ADL determination). Depending on current (power) stability, a complete analysis normally takes two days, at a cost of 300 Cedis. KNUST's lab is equipped with an oven, muffle furnace, condenser, digest flash, air-tight sample container, electric furnace, and other equipment. Several poultry farms, from small to large, patron the University for its services.

Center for Scientific and Industrial Research (CSIR): Animal Research Institute

Located in Fafraha, Greater Accra, the Animal Research Institute provides a series of tests including moisture, mineral ash, fiber, protein, energy, Ca, P, Fe, Free fatty acid, available lysine, hydro organic, acid and tannin. The cost of a complete feed analysis test is 180 Cedis (including proximate) and 40 Cedis (including mineral). CSIR's Animal Research Institute is equipped with an oven, fiber cap, muffle furnace, hydrotech fat extractor, macro Kjeldahe analyzer, fume hood and spectrophotometer. Test completion requires "at least 3 days." The facility has conducted 177 tests since 2008. Users include small, medium and large poultry farmers.

Center for Scientific and Industrial Research (CSIR): Food Research Institute

The Food Research Institute's Analytical laboratory is located in Greater Accra. Tests conducted at the facility include Proximate analyses and mycotoxin analyses (Aflatoxin and Ochratoxin A). Test completion takes approximately 3 days, with costs of testing as follows: Proximate: 215.00 Cedis; Mycotoxin: 140.00 Cedis; Aflotoxin: 140 Cedis; Ochratoxin: 140.00 Cedis; and crude fiber: 65.00 Cedis. The lab is furnished with Flat Analyzer (Solet extraction) Kjeldahl systems for protein analyses. The Food Research Institute conducts approximately 20 feed related tests per year. Users include a range of poultry farms including small. Customers also include some of Ghana's largest feed millers, namely Agricare Ltd, GAPFA and Kosher Feed Mills.

3.6 EGG CONSUMTPION

Eggs are a major source of protein for human's nutritional intake. Eggs are among the few foods that can be considered as 'superfoods', and the consumption of eggs is also particularly important for pregnant women and children. This said the intake of poultry meat and egg is quite low in Ghana, especially in rural areas. Chronic hunger and malnutrition rates are very high in the Northern Regions, and other parts of the country. (RING presentation USAID's Implementing Partners' meeting –March 2016). In a recent study conducted by Blackie (2014), poultry (chicken) eggs and meat were reported to account for only 3% of household animal protein intake.

Over the life of the project, AMPLIFIES will dedicate important resources towards the promotion of egg consumption, a core multi-year activity. While the only outcome indicator related to Egg Campaign programming related to per capita egg consumption, which will be measured at the evaluation level, it was important for AMPLIFIES to obtain secondary data towards the future shaping and design of egg campaign context.

As reported in the Poultry Value Chain Context Section of the study, per capita egg consumption estimates have ranged from 12-20 in the past decade, based on FAO sources. As

revealed by a multitude of respondents in informal discussions, low egg consumption tends to be associated with negative perceptions or persistent misperceptions regarding cholesterol/fat levels in eggs. These are exacerbated by local myths and legends around the evils of egg recounted by traditional healers and shaman. Moreover, GNAPF Executives have also conveyed that health professionals/officials have regularly and publicly discouraged the consumption of eggs and red meat.

The challenges to promoting egg consumption are therefore many, and results from the Ghana Poultry Project's baseline study (in which the perceptions of egg consumption were studied), prove to be very useful for egg campaign design.

Egg consumption and cultural perceptions:

Different sources reviewed or consulted (incl. FAO reports and conversations with industry leaders) have estimated per capita consumption of eggs in Ghana as ranging from 12 to 20 eggs per annum. In contrast, as per the USAID-ASSESS baseline report, which involved 308 households, 18% of their sampled respondents indicated that egg is consumed daily in their meals. At least, 45% of households in all three target regions consume egg once a week; and about 9% consume eggs once a month. The results indicated that the frequency of egg consumption was generally much higher in the project regions as originally assumed, based on our literature review.[51]

The ASSESS report also showed that, on average, a typical household spends GHC16.76 on eggs every month, which is equivalent to approximately one crate of eggs (containing 30 eggs). The daily per capita egg consumption was found to be less than one half of an egg. It implies that on per capita basis, each household member will consume six (6) eggs in a month, giving an average, annual per capita egg consumption of 72 eggs. This can still be described as very low compared to other countries, though it is higher than previously recorded figures reviewed. It should be noted that the ASSESS study focused on three poultry producing regions, which could have higher egg consumption rates that the rest of the country.

As pertains to egg consumption perceptions, myths and misconceptions in Ghana, according to the ASSESS study, 38% of respondents agreed that egg has high cholesterol level while 31% had a strong perception that eating more than one egg per week is not good for human health. The study also revealed that at least 40% of consumers think that egg is not good for people who are above 40 years, and 5-9% believed the myth that children who are fed with eggs will grow to become thieves. Combatting these myths perceptions, and the persistent anti-egg lobby surfing radio and TV waves, will require strategic engagement with the Ministry of Health's Department of Health Services and the Food and Drug Authority, to develop a series of key messages and interventions on promoting egg as a superfood. To this end, desk research was undertaken by AMPLIFIES to identify the benefits of egg (and cracking myths), ranging from the impacts of protein, choline, amino acids, folic acid, antioxidants, vitamin D, to name a few. This resulted in the production of a brochure on Eggs as a superfood to be used for awareness raising.

As part of its national egg consumption campaign efforts, AMPLIFIES is partnering with the University of Ghana's Animal Science Department to conduct a mini study to determine egg and other protein source consumption trends, as well as consumer behaviors, with the view to design appropriately targeted, meaningful and relevant messaging and activities. This research, identified as work plan activity, will bring additional context to both the ASSESS baseline report, and other information gathered by Food for Progress implementing agencies, and existing

[51] ASSESS-USDA, FPPr Ghana PVC Projects Baseline Report 2016

literature. Results of this study, to be conducted in January 2017, will be shared with USDA, ASSESS and GPP, and others partners.

3.7 FINANCIAL SERVICES AND JOB CREATION

In order to inform the design and focus of AMPLIFIES' modest investment support under two activities, the study has captured information pertaining to the use of financial services (e.g. access to loans) by project respondents. It has also compiled employment figures for various respondent groups in an attempt to provide much needed context around USDA standard indicators related to job creation as a result of USDA assistance.

While indicators for these two thematic areas are captured separately in the ASA/WISHH-USDA Attachment E, they have been merged into this section. The reasoning for this is that investments supported under various AMPLIFIES activities could, in turn, stir job creation among beneficiary populations. However, the authors recognize that job creation will not solely be tied to impacts resulting from loans/grants provided to the project, as the reduction of post-harvest losses, increases in volumes and values of sales as well as multiple capacity building efforts could also all lead to job creation, be it indirectly or directly.

Financial Services: Very limited information exists on the financial viability of Ghana's poultry sector. High capital costs, high risks, perceptions of risk, exorbitant interest rates, high insurance premiums, and other factors are known to impede poultry producers' ability to establish investment confidence with lending institutions, banks, micro-loan providers, etc. Financial service providers have cited reasons for low investment in agriculture as including a history of default on subsidized loans, land tenure/land grab risks, weather risks, and a lack of knowledge by farm owners on how to appropriately finance their operations.

Specific to AMPLIFIES respondents, a compounding factor hindering the ability of crop growers to access credit also relates to low literacy rates, with illiterate farmers mostly being unable to keep records, or even have bank accounts. According to the Ghana Statistical Service 2010 census, only 8.2% of agricultural household members had secondary school education or higher. These and other issues, such as a lack of collateral, make it difficult for crop growers and poultry farmers to access credit from formal financial institutions.

The registration status of businesses is also deemed an enabler for farmers to access loans as, without this, it is very difficult for an individual to open a business bank account. Napoleon Agyemang Oduro, Vice-Chairman of GNAPF, in discussions with AMPLIFIES, revealed that the banks' refusal to support the poultry industry is also a result of the unavailability of credible documentations from farmers to use as collateral. Bankers including Kwame Baffo-Emmin (Fiagya Rural Bank-Nkoranza) bemoan farmers for not paying back their loans on schedule, which invariably affects them for further support and also would be farmers who may need some support.[52]

As part of its baseline efforts, AMPLIFIES asked respondents to share their experience in obtaining loans. Out of 600 respondents, 54.5% of poultry farmers did not have registered businesses. For crop growers, while the large majority of FBOs were registered with MOFA or

[52] www.modernghana.com

the Department of Cooperatives, individual farms themselves were not registered as legal entities. When asked whether they had ever accessed a loan, 2/3 (or 66%) of poultry farmers and 3/4 (or 73.4%) of crop growers responded that they had never received a loan or grant. Of those that did receive a loan, only 13.2% of poultry farmers interviewed had ever been rejected for a loan application, as compared to 9% by crop growers.

For both respondent groups, the lack of collateral and inability to provide credible documentation were the main reasons cited for loan application rejections. This speaks to a need for both GPP and AMPLIFIES to work closely together to ensure that associations, FBOs, poultry farmers, and crop growers receive training and capacity building support to increase their business and financial acumen. Both project will also work together to identify opportunities to strengthen the credit viability and credibility of project beneficiaries.

Finance Institutions Perceptions of Lending:

Our research and inquiries reveal that financial institutions do not generally favor poultry farmers in terms of credit. For example, the Agricultural Development Bank (ADB) which was established specifically to provide credit and other financial services to the agricultural sector has faced difficulty in recovering agricultural loans compared with loans for personal and non-Agric purposes. As per an ADB study by Nimoh et al, some farmers feel that loans made available to them are from government sources and therefore are not under any compulsion to pay back. Other reasons given for this include inadequate logistics to monitor farmers, unreliable locations and other risks associated with the enterprise with regards to production and marketing. The ADB also face many challenges when evaluating the credit worthiness of agricultural borrowers.[53]

In order to help address this challenge of access to credit by the Agriculture sector, the Government, in June 2011 established the Agriculture and Export Development Fund to help provide affordable financial and credit facilities to farmers and revamp the poultry industry with favorable interventions such as job creation citizens, especially the youth, with an overarching goal to sustain the poultry industry and push for the patronage of made-in-Ghana goods, to name a few.[54]

Despite such efforts, studies have shown that most banks in Ghana are unwilling to provide credit to small business enterprises especially the poultry sub-sector. The situation is attributed to the unusually high risks associated with financing such businesses (Tham-AGyekum and Appiah, 2011). Another study by Awunyo-Victor and Abankwa (2012) revealed that 64% of formal financial institution operating in Brong Ahafo Region do not offer credit to farmers due to poor repayment by the beneficiaries.[55] Despite these efforts to make credit accessible to farmers, the majority of our baseline respondents stated that they have never received a loan (between 66-73.4 %) while a significant number have had their loan application rejected.

[53]Fred Nimoh et al. Factors Influencing Access of Poultry Farmers to Credit: The Case of the Agricultural Development Bank (ADB) in Ga East Municipality, Ghana, Management 2013, 3 (1): 54-58)

[54] Lawrence Yaw Kusi et al. The Challenges and Prospects of the Commercial Poultry Industry in Ghana: A Synthesis of Literature, International Journal of Management Sciences Vol. 5, No. 6, 2015

[55] Awunyo-vitor D, Abankwa V (2012). Substitutes or Complements: Farmers demand for formal and informal credit in Ashanti and Brong Ahafo Regions of Ghana. J. Agric. Sci. 7(1):1-13.

As part of the Ghana Poultry Project's own baseline study efforts, 14 financial institutions were interviewed across the shared zone of influence, with 9 representing having credit/loan facilities for the agricultural sector. According to GPP, "most financial institutions are of the view that there is much risk associated with agricultural production in general and this could account for the high interest rate for the sector" (with these ranging in average, for agricultural lending, from 32.3% for Brong Ahafo to 37.7% for Ashanti, according to their findings). Their study also reveals that the bulk of these institutions consider agricultural production as a risky venture and that "farmers lack proper financial management, [the] farming populace is characterized by high illiteracy rate and they lack the proper documentation for collateral." GPP's assessment also concludes that "the financial institutions somewhat agree that farmers misappropriate funds, have high loan default rate, have low trust issues and they have bad loan track record but disagree that farming is not profitable enough to repay loans received."[56]

The USAID-ASSESS Poultry Value Chain baseline report purports that both access to and availability of farm finance is a major challenge facing poultry producer. According to their findings, financial institutions offer/provide very limited and/or no financial support, in the form of loans, to poultry farmers. As reported by ASSESS, "discussions with some rural banks indicated that poultry farming is considered a high-risk venture and this deters most financial institutions from providing financial assistance to the sector." Their conclusion, therefore, is that poultry farmers mostly depend on their own, limited financial resources for farm operations.[57]

Through a mini survey of four major financial institutions namely Barclays Bank, Ghana Commercial Bank, Agricultural Development Bank and AG Microfinance (a Financial NGO run by ADRA Ghana), AMPLIFIES has attempted to cross reference the above information. While the banks for forthcoming with perceptions, three of the respondents opted to have their responses treated confidentially. According to one of the interviewees, poultry farmers are considered a high risk and have hardly been considered for loans. As such, the Bank had no records on loans granted to poultry farmers against which to discuss specific challenges related to recovery, default, etc.

In an interview with a second Bank, however, AMPLIFIES was informed they have generally had very positive and high recovery rates with borrowing poultry farmers. The very strict loan requirements employed by the bank, and scrutiny used in approving recipients, make credit assessable only to a select few poultry operations who are deemed credit worthy, and the experience does pay off. Through a key-informant interview with AG Microfinance (an ADRA-established financial institution), which has been lending to farmers for several years, it was revealed that it is safer, in their perception, to lend to farmers as a group and start initially with small amounts, which generates a high(er) degree of lending confidence.

Based on the above findings, the project will work closely with AG Microfinance, and look into other partnership/linkage opportunities with others having expressed a greater degree of success and confidence with poultry farmer lending, towards meeting intended feed-processing financial support activities. Based on their experiences and input, poultry farms with a solid track record and risk mitigation strategies will be identified as loan recipients, with proper training being granted to ensure loan maximization and loan repayment.

[56] ACDI-VOCA. Ghana Poultry Project (GPP) Draft Baseline Report 2016.
[57] ASSESS-USDA FPPr Ghana PVC Projects Baseline Report 2016

Labor force data: AMPLIFIES collected information on the farm labor structure and size of its two main respondent groups. The data captures both household members working on the farm and employees or farm hands (the distinction of which is often grey). Data is disaggregated by gender and presented in two tables below. As per survey results, 85% of crop growers employ at least some form of labor (mostly casual or 'farm hand') on their farms, both for soy and maize cultivation and harvesting. It is worth noting that 46.6% of crop farm hands were female compared to 14.8% for poultry farms.

TABLE 27: CROP FARMERS LABOUR FORCE

	Male	Female	Total
Total # of household members (including children)	5064	5043	10,107
Total # of household members who work on farm	2,533	2,466	4,999
Percentage of farmers who employ farm hands/employees			85%
Total number of employed farm hands	4,510	3,936	8,446

TABLE 28: POULTRY FARMERS LABOUR FORCE

	Male	Female	Total
Total # of household members (including children)	2,165	1,828	39,93
Total # of household members who work on farm	973	422	1,395
Percentage of farmers who employ farm hands/employees			77.2%
Total number of employed farm hands/employees	2,989	518	3,507

Soy processors surveyed, combined employ 600 people whilst the feed processors employ a total of 234. The average workforce of the feed processors ranged between 40-50 people. For the soy processors, Ghana Nuts alone employs 500 people whilst the rest ranges between 10-70.

Although farm hands and employees are not necessarily synonymous, this data will prove to be instrumental in assessing the impact that AMPLIFIES activities might have on the current labor force of those two sectors. Additional information was also collected pertaining to the number of employees working for commercial soy and feed processors to understand operational and management requirements for these respondents.

4. CONCLUSION

The poultry industry and the crops sector are inter-related. The poultry sector is however a specialized field with feed input demands coming with some quality requirements. As AMPLIFIES seek to improve and expand the poultry feed sub-sector, efforts are being made to ensure that all actors particularly maize and soy growers are equipped and supported to meet the anticipated demand that may arise as a result of an expansion of the poultry sector.

AMMPLIFIES' hope is that this baseline study, apart from ascertaining the current conditions of key value chain sectors, will also provide a contextual framework for a clearer understanding of how the poultry sector and feed input supply chain interact in order to identify opportunities to maximize efficiencies and outputs. It is believed that, to a reasonable extent, this study will create a clearer path for a better understanding of Ghana's poultry feed value chain linkages, many of which are broken, or highly inefficient.

A special lens was shined unto commercial feed operations, given that the industry has been shrinking, slowly, for the past decade. The enormous information provided on poultry and crop growing operations within AMPLIFIES' zone of influence will not only be useful in guiding the project's programming but also a useful source of new information for all interested stakeholders.

The quality of feed inputs has an impact on the efficiency of feed, and these can be sourced in-country, and fed directly into the value chain. With the appropriate harvesting, post-harvest handling and storage techniques, feed input quantity and quality can be greatly improved. With an efficient feed input supply chain the cost of feed could be reduced significantly leading to a reduction in production cost. It is the hope of this project that, with baseline information at hand, and a greater understanding that this provides, AMPLIFIES will be equipped to achieve its intended results, both at the output and outcome level, in turn reinvigorating a critical sector to Ghana's sustainable economic growth.

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ANNEXES SUBMITTED AS A SEPARATE DOCUMENT