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The U.S. Government's Global Hunger & Food Security Initiative

ASSESSMENT REPORT OF USAID/GHANA'S IMPROVING PRODUCTIVITY AND INCOMES OF MAIZE FARMERS IN THE SADA REGION (USAID- IPIMFS) ACTIVITY

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DISCLAIMER

This report covers the results of the final assessment of the USAID/Ghana's Improving Productivity and Incomes of Maize Farmers in the SADA Region (USAID-IPIMFS) Activity. The assessment should not be construed as evaluation of the activity. It is the final annual beneficiary-based survey of the activity. The report is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of the USAID-IPIMFS consultants and do not necessarily reflect the views of USAID or the United States Government.

EXECUTIVE SUMMARY

Background

The agricultural sector in Ghana continues to play a vital role in food security and national income. This is because the activities of farmers support the livelihoods of households who are engaged in the value-chain (production, processing, marketing and distribution of farm produce) and thus make profound contributions to their incomes. Nevertheless, various problems undermine the actualization of the sector's full potentials. For instance, the agricultural sector in Ghana relies on rudimentary techniques of farming leading to low yield and high post-harvest losses. In this regard, addressing some of these production bottlenecks will support poverty alleviation efforts of national and local government institutions. It is in this context that the USAID/Ghana Improving Productivity and Incomes of Maize Farmers in the Savannah Accelerated Development Area (IPIMFS) activity is situated. Sahel Grains Limited through the USAID-IPIMFS activity seeks to increase the productivity and incomes of maize farmers in the SADA zone by a) providing farm-level support; b) developing bulk handling of maize; c) improving the quantity, quality, and standards of maize markets and d) improving access to a broader range of market access opportunities.

After three years of implementation, the USAID-IPIMFS partners need insight into its performance, constraints and challenges. The final assessment, therefore, aims to provide feedback to the various partners on the performance, constraints and challenges of the activity. The assessment was designed to address the following specific questions:

- a) To what extent has the USAID-IPIMFS activity achieved its intended goals and objectives?
- b) What intended and unintended contributions, results, and/or impacts have the USAID-IPIMFS activity value-chain approach and associated interventions achieved relative to improving farmer access to inputs?
- c) What factors affected the achievements and results of the IPMFS activity?
- d) To what extent has Sahel Grains incorporated digital financial services into its programming, and how has that affected its goal and objectives?
- e) To what extent are the Sahel Grains interventions likely to continue after the support from USAID Ghana has ended?

Methodology

The team approached the assessment from a participatory and collaborative perspective. This approach leads to the inclusion of the views of all the stakeholders in the assessment; thus, helping to promote the ownership of the results. In compliance with the scope of work (SOW), and following the conventional literature, the team adopted the explanatory sequential mixed-methods approach¹ for the assessment. This approach allowed the team to triangulate both quantitative and qualitative data that were obtained from varied sources. Under this approach, the team first adopted the cross-sectional survey approach to determine the extent to which the USAID-IPIMFS has achieved its goal, objective(s) and key results. Some of the results of the quantitative analysis were investigated further through focus group discussion and key informant interviews (Management of Sahel Grains Limited). In this regard, the units of inquiry for the assessment were beneficiary

¹ Quantitative before qualitative analyses

small-holder maize farmers in the target districts and the Management of Sahel Grains Limited while the units of analysis were the beneficiary small-holder maize farmers.

The sampling frame for the cross-sectional survey was 5,210 beneficiary farmers, comprising 1,804 farmers (35%) who received 'training and mechanization support' and 3,356 farmers (65%) who received 'training support only'. Using a 95% confidence level and 5% margin of error, 317 farmers (i.e. males 131 and females 186) and 346 farmers (males 149 and females 197) were selected from the 'training and mechanization' group and 'training only group', respectively. The team adopted the simple proportion approach to allocate the sample size among the targeted districts. This means that the size of the sample for a district (male and female) was based on the number of beneficiaries in that district as a proportion of the total number of beneficiaries. The data from the selected small-holder maize farmers were obtained through face-to-face interviews with the aid of semi-structured interview schedule (also called researcher-administered questionnaires). The focus group discussions, on the other hand, were organized in eight communities, one each from the eight target districts². The average size of a focus group was eight members; four females and four males.

The team used complementary data from secondary sources such as the USAID-IPIMFS description document, baseline survey report and annual beneficiary-based survey reports to achieve the objectives of the assessment. These secondary sources provided the requisite data for the determination of the sample size. They also informed the choice of baseline and performance indicators against which progress under the USAID-IPIMFS was measured. Data on the current situation (using the performance indicators) was matched against the conditions that prevailed among the small-holder maize farmers' households prior to the implementation of the USAID-IPIMFS (i.e. the baseline situation) to determine activity's effects. The difference in the observed parameter (e.g. gross margin) before and after the USAID-IPIMFS was interpreted as the effects of the activity.

The data from the various sources (primary and secondary) were quantitative and qualitative. The quantitative data were analyzed using descriptive statistical methods such as mean, frequencies and percentages. The qualitative data were analyzed by using the content approach (i.e. analyzing statements from the respondents for patterns) and thematic approach.

Findings

The literature indicates that women provide approximately 52% of the agricultural labor force³ in Ghana and contribute 90% of the labor (both paid and unpaid) for post-harvest activities. However, in Northern Ghana, the data in the conventional literature indicate that women are less represented in the agricultural labor force. They account for only 44% of the total agricultural labor-force (farming, forestry, fishing and hunting), which is a deviation from the national average. However, women are dominant in crop farming; accounting for over 70% of the labor force. Therefore, improving crop farming, which is dominated by women, could have positive implications for the attainment of gender

² Gindabour from the Sawla-Tuna-Kalba District; Sakpa Dure from the Bole District; Yaala N^o 1 from the Wa East District; Gadi from the Wa West District; Bugubelle from the Sissala East Municipality; Jawia from the Sissala West District; Kaleo from the Nadowli-Kaleo District; and Yibilee from the Wa Municipality.

³ Including farming, forestry, fishing and hunting.

equity goals and ultimately support sustainable poverty reduction efforts. Accordingly, the USAID-IPIMFS activity sought to improve the participation of women in maize production in the zone of influence (ZOI). Improving their participation in maize production would support gender equity efforts of central and local government institutions. The assessment shows that the USAID-IPIMFS supported more females (56%) than males (44%) in all the target districts except the Bole District.

The results show that farm sizes Sissala East Municipality, Wa East, Wa West Districts and Wa Municipality had increased for the period under review. The farm sizes in the target districts were generally larger for males than females. The survey results revealed further that the mean farm size was smaller for farmers who received both 'training and mechanization support' (1.2 ha) from the USAID-IPIMFS than those who received only 'training support' (2.115 ha). Farmers who received training and mechanization support from the activity had intensified the use of the available lands. These farmers had eschewed the perception that cultivating large parcels of land and holding all other variables (e.g. agronomic practices, on-farm and post-harvest losses and cost of mechanization) constant leads to high crop yield. This voice was louder from the male participants than the female participants. Extracts from the focus group discussions confirm the point small-holder farmers' 'perceived' high cost of mechanization services partly informed their decision to adopt intensification rather than increase the farm sizes.

Generally, the size of the female maize farms in the target districts was smaller (1.08 ha) than that of the male farms (2.18 ha). The socioeconomic barriers against women's engagement in the productive sector⁴ could explain the observed disparities in the mean farm sizes between females and males. Comparatively, the mean farm size was smaller (1.2 ha) for farmers who received both 'training and mechanization support' from the activity than those who received only 'training support' (2.11 ha) across the ZOI. The 'perceived' high cost of the mechanization services' (ploughing and threshing)⁵ and higher yield (5.26 MT/ha) explain the smaller farmer sizes for the former (i.e. beneficiaries of training and mechanization services).

The results of the assessment further indicate a mean yield of 3.9 MT/ha, which represents a 22% increase in the 2016 maize yield of 3.20 MT/ha. Yield across the ZOI had increased despite the reduction in the farm sizes between the 2016 and 2018 farm seasons. This is a further confirmation of the positive effect of small-holder maize farmers' intensification of the use of their farmlands. However, the observed stark difference in the yields of male and female farmers could have adverse implications for the attainment of the gender equity goals of the USAID-IPIMFS. The differences in the yield for males and females could be associated with the socio-economic barriers against women's engagement in the productive sector (refer to footnote 3). The USAID-IPIMFS worked to suppress these barriers by ensuring the participation of more females than males in maize farming. The activity partners recruited and trained more females than males in maize production. However, gender equality may be attained in the intermediate to long terms. Another plausible reason for the difference was the lower amount of investment by females (ranging from GHS 752.97 in the Nadowli-Kaleo District to GHS 1,419.48 in the Sissala East District) than males (ranging from GHS 740.77 in the Nadowli-

⁴ Barriers against their access to productive land and accessing input markets (particularly markets for labor and non-labor inputs)

⁵ The mechanisation services accounted for 17% of the total cost of maize production

Kaleo District to GHS 1,830.65 in the Sissala West District). Generally, the maize investment cost in the ZOI was higher for male farmers than the female farmers, which could explain the observed difference in yield between the males and females. Higher investments by the males meant they used more inputs for farming, which explain the higher yields. The adoption of sound agronomic practices (such as planting in rows, use of improved crop varieties and observance of cultural practices) could be the explanatory factors for the observed improvement in productivity.

The results of the assessment further indicate that the maize farmers sold an average of 3.32 MT of maize in 2018. It is instructive to note that the quantity of maize sold was directly proportional to the total yield. The male farmers sold higher quantities of maize than the female farmers across the ZOI. A typical explanation for the difference is that females tended to store more maize for direct household consumption than males. A pattern observed from the focus group discussion was the need for males to sell more maize to meet the expenses of their households. The male farmers sold approximately 70% of the total harvest.

A mean gross margin per hectare of GHS 2,256.05 was obtained, which was generally higher among the male maize farmers than the female maize farmers covered in the survey. The sex-aggregated gross margin was highest in the Sissala East Municipality (GHS 569,052.65), which is the hub of the USAID-IPIMFs interventions, and lowest in the Bole District (GHS 42,516.70). Gross margins were highest for males in the Sissala East and Wa East Districts, which is directly proportional with the data on 'yield' and 'volume of maize sold'. The mean gross margin was approximately 24% higher for farmers who received only training and mechanization support (GHS 2,541.58) than those who received both training support (GHS 2,050.84) from the activity. This underscores the importance of farm mechanization in increased incomes for smallholder farmers.

Recommendations

The under listed recommendations are made to contribute to the sustenance of the benefits of the USAID-IPIMFS activity.

i) Continuous Training and Mechanization Activities

Continuous training of the farmers would be essential to addressing the adverse effects of the farmers' low English language comprehension on their productive systems. Training in the use of agro-chemicals, observance of agronomic practices and post-harvest management using audio-visual materials is recommended. Using audio-visual materials will offer the participants graphic memory of recommended practices. The Agricultural Extension Agents at the various District Assemblies present vital potentials for implementing the training recommendations.

ii) Promoting Sustainable Agricultural Practices

Promotion of sustainable agricultural practices in the activity districts will not only strengthen community resilience to the environmental risks but also minimize the impacts on the environment. These sustainable practices are intended to enable farmers to incorporate into their farming practices systems that help maintain the soil fertility and texture as well as conserve water. The team recommends the incorporation of two mutually exclusive and harmonious packages: a) economically viable, ecologically sound, and socially compatible farming technologies, and b) services and inputs to help farmers.

The following strategies could be intensified by Sahel Grains Limited:

- Promoting minimal tillage in all districts (through the ripping service).
- Training tractor operators on environment-friendly tilling practices (e.g. ripping across the slope and protecting small trees during tilling).
- Sensitize farmers and agrochemical vendors on the appropriate use and disposal of agrochemicals. The Departments of Agriculture can be encouraged to recover the agrochemical waste from the farmers for safe disposal.
- Promoting an integrated pest and disease management system e.g. pesticides risk reduction and integrated pest management.
- Promoting the improved land management practices. Establishing demonstration farms on which all the improved land management practices can be practiced. This will help the farmers appreciate not only the significance of these recommended practices but also their feasibility.

iii) Intensifying Capacity Building

For Sahel Grains Limited to fully benefit from its staff strengths, there is the need for management to put in measures to ensure the retention of skilled labor force and their continuous skills upgrading. The assessment proposes bi-annual training in the form of capacity building program and workshop to its staff to equip them with the needed skills and tools. Clear policies are required on rewards for achieving targets, performance contracts, annual leave and maternity leaves. Policies on staff progression is another important requirement for the sustenance of the Company and by extension the sustenance of the benefits of the USAID-IPIMFS.

iv) Improved Data Management System

Sahel Grains Limited is encouraged to develop systems to collect pristine data that can be used for future assessments. Field Officers should be resourced to continuously gather data from the smallholder farmers instead of relying on their recollection of past events for data. Doing this could guarantee the integrity of the data and its utility for decision-making.

v) Intensifying Gender Training and Mainstreaming Strategies

There should be regular (specifically, annual) training of groups (both men and women) on basic laws that protect the rights of women as well as issues pertaining to violence against women, female farmers are mostly marginalized in most farming communities. It will be important to include men and community leaders in gender equality and women empowerment sensitization activities in order to develop their knowledge base and gain their cooperation. Females should be supported to have agreements (in the forms of Memorandum of Understanding) with landowners to forestall the possibility of forceful eviction from lands.

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LIST OF ABBREVIATIONS

BBS	Beneficiary-Based Survey
CAPI	Computer-Assisted Personal Interview
FTF	Feed the Future
GHS	Ghana Cedis
IPIMFS	Improving Productivity and Incomes of Maize Farmers in the SADA Region
KI	Key Informants
KNUST	Kwame Nkrumah University of Science and Technology
METSS II	Monitoring, Evaluation and Technical Support Services II
MT	Metric Tons
PAPI	Paper and Pencil Personal Interview
PSG	Pediatric Society of Ghana
SADA	Savannah Accelerated Development Authority
SDGs	Sustainable Development Goals
SOW	Scope of Work
UDS	University for Development Studies
USAID	United States Agency for International Development
YADIS	Youth Agripreneurship Development in the SADA Zone
ZOI	Zone of Influence

1. INTRODUCTION

1.1 USAID-IPIMFS Background

Smallholder farming makes profound contributions to the attainment of the Sustainable Development Goals (SDGs); more especially goals one⁶, two⁷ and twelve⁸. In the global south for example, smallholder farming plays a vital role in reducing poverty and hunger. These farming activities support the livelihoods of the households who are engaged in the value-chain (production, processing, marketing and distribution of farm produce) and thus make significant contributions to the incomes of many countries across the globe. Nevertheless, the households of many smallholder farmers are food insecure and acutely poor (World Bank, 2015; GSS, 2002; 2008). Data from northern Ghana, a region whose agricultural system is dominated by smallholder farmers, accentuate this claim (see Figure 1).

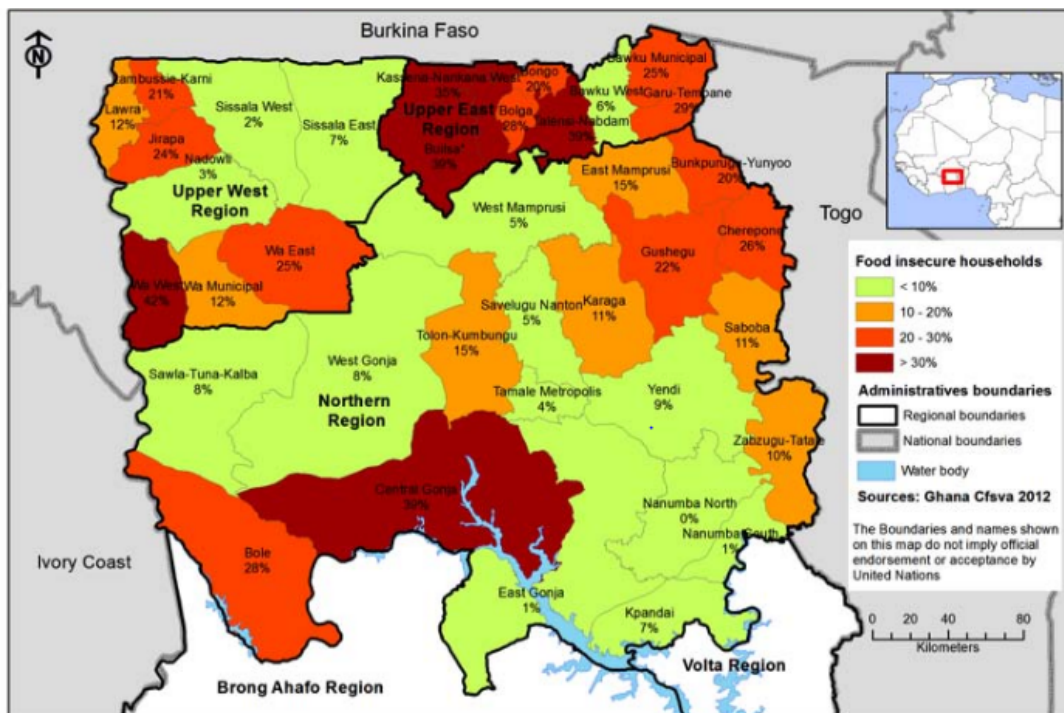


Figure 1: Distribution of Severe and Moderately Food Insecure Districts
Source: World Food Programme (2012)

Efforts to improve livelihoods in the poverty-stricken rural areas in Ghana have focused on the agricultural value-chain (Enu-Kwesi et al 2013) due to the area's comparative advantage in the agricultural sector. For instance, in Northern Ghana, household livelihood improvement interventions aim, among others, to promote and improve maize production. This is because maize is the most important cereal crop in Ghana, and accounts for approximately 55% of total grain production (International Food Policy Research Institute, 2014). The Ghana Statistical Service (2008) had earlier indicated that maize accounts for over half (about 58%) of the value of total crop harvests in the savannah zone (which comprises the Upper West Region, Upper East Region, Savannah

⁶ SDG 1: No Poverty: End poverty in all its forms everywhere by 2030.

⁷ SDG 2: Zero Hunger: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture by 2030

⁸ Responsible consumption and production: Ensure sustainable consumption and production patterns

Region, Northern Region, Northeast Region and the northern parts of the Brong Ahafo Region, Bono East Region and Oti region). These statistics underscore the integral role of maize production in sustainable poverty reduction efforts (FAO, 2012; 2008).

Nevertheless, maize production in Ghana has been undermined by the smallholder farmers' limited access to improved technologies, unreliable markets, and low knowledge of good agronomic practices (MoFA, 2012; Chapoto and Ragasa, 2013). Due to these production bottlenecks, there was a domestic maize supply shortfall of about 12% between 2010 and 2015, whilst demand increased at a compound rate of 2.6% per annum (MoFA, 2015). To meet the increasing domestic demand for maize within the period (2010 – 2019), Ghana imported maize that was valued at approximately USD 69 million (Trade Statistics, 2018)⁹. This may have contributed to Ghana's negative trade deficits ranging from USD 4.4 billion in 2010 through USD 6.29 billion in 2013 to USD 4.31 in 2015. In this regard, addressing the maize production bottlenecks could support the efforts to promote sustainable development. It is in this context that the USAID/Ghana Improving Productivity and Incomes of Maize Farmers in the SADA Region (USAID-IPIMFS) activity (hereafter referred to as the activity) is situated.

The activity's aim is to increase the productivity and incomes of maize farmers in the SADA zone by:

- i. Providing farm-level support and aggregation services to smallholder maize farmers;
- ii. Developing bulk handling of maize to enhance efficiency, comprehensiveness, and gender inclusion in the maize value chain;
- iii. Improving the quantity, quality, and standards of maize markets; and
- iv. Providing access to a broader range of market access opportunities to the smallholder maize farmers.

1.2 Purpose of the Assessment and Key Assessment Questions

After almost three years of implementation, the activity's partners need insight into its performance, constraints and challenges, and the best practices that can be scaled up and or replicated in other future projects. Therefore, the purpose of this assessment was in two folds: 1) to assess the extent to which the activity has achieved its goal and objectives; and 2) to determine the extent to which the activity has contributed towards achieving the USAID/Ghana's Feed the Future (FTF) program objective of increasing the productivity and incomes of smallholder maize farmers in the activity target districts¹⁰. The assessment was expected to provide USAID, its implementing partner (Sahel Grains Limited), and all relevant stakeholders data on outcomes, best practices, and lessons learned to inform planning for future activities.

The assessment answered the following key questions:

1. To what extent has the activity achieved its intended goal and objectives? This question was answered by analyzing the issues that addressed the following sub-questions:

⁹ <https://knoema.com/atlas/Ghana/topics/Agriculture/Trade-Import-Value/Maize-imports> (date accessed 23 - 08 - 2019)

¹⁰ Sawla District, Tuna-Kalba District, Wa East District, Wa West District, Sissala East Municipal, Sissala West District, Nadowli-Kaleo District, Bole District and Wa Municipal

- a. Have the USAID-IPIMFS value chain interventions (end-to-end maize value chain engagement model) in the target district improved productivity, reduced post-harvest losses and increased incomes among smallholder maize farmers? If so, to what extent and why? If not, why not?
 - b. Have the IPIMF bulk-handling of maize interventions resulted in enhanced efficiency, competitiveness and inclusion of female smallholder farmers in the maize value chain in the activity target areas? If so, to what extent and how? If not, why not?
 - c. How has the broader range of market access opportunities implemented by the USAID-IPIMFS activity resulted in increased volumes of maize sales, and ultimately the average margins per hectare of maize in the target area?
2. What intended and unintended contributions, results, and/or impacts have the USAID-IPIMFS activity value chain approach and associated interventions achieved relative to improving farmer access to inputs?
 3. What factors affected the achievements and results of the IPMFS activity? What can be identified as lessons learned and best practices from stakeholders or beneficiaries?
 4. To what extent has Sahel Grains incorporated digital financial services into its programming, and how has that resulted in the achievement of its goal and objectives?
 - a. Do farmers find the use of digital financial service most convenient?
 - b. What are the challenges associated with the use of digital financial services?
 5. To what extent are the Sahel Grains interventions likely to continue after the support from USAID Ghana has ended? Is stakeholder buy-in likely to continue or be increased after the current activity expires?

1.3. Approach and Methodology

This section of the report outlines the approach the team adopted to meet the assessment's objectives. The population, units of enquiry, sampling design, sources of data and the analytical methods are also explained in this section of the report.

1.3.1. Assessment Approach

In compliance with the SOW, the team approached the assignment using the explanatory sequential mixed-methods approach (i.e. collecting and analyzing quantitative data and later collecting qualitative data to gain more insights into some of the results from the quantitative analysis). Under this approach, the team adopted the *before-and-after approach*, to determine the extent to which the activity has achieved its goal, objective(s) and key results. The baseline database made the choice of the before-and-after research approach, appropriate for the assessment. This means that primary data on the 2018 farming season were collected from beneficiary farmers to compare with the baseline (including the findings from the scoping study). The intent was to determine the extent

to which the activity has achieved its goal and objectives¹¹. It is instructive to indicate that the before-and-after approach is associated with threats to internal validity. However, the results are appropriate because the assessment did not focus on causality.

Qualitative approaches such as key informant interviews (KII) and focus group discussions were adopted to gather additional data with the aim of gaining insight into some of the findings from the quantitative analysis. Data from secondary sources were also used for the assessment. The team uses the term secondary data in this report to refer to data that are examined to respond to research questions that are different from the ones the original collector sought to answer (Vartanian, 2011). The secondary data were obtained from the USAID-IPIMFS' description document, baseline survey report, annual beneficiary-based survey reports and activity milestone reports. These secondary sources provided the requisite data for the determination of the assessment's sample size and for the selection of key baseline and performance indicators against which progress was measured.

The following key questions guided the collection and analysis of the secondary: a) what are the planned/expected activity outcomes? b) what are the activity's key performance indicators? c) what were the conditions in the households of the beneficiary smallholder farmers prior to the IPIMFS interventions (i.e. baseline situation)? d) what are the specific activity interventions in each target district? e) who are the activity beneficiaries and where are they located? f) what strategies does the activity intend to adopt to promote gender mainstreaming and address gender disparities?

The team collected primary data through a cross-sectional survey of beneficiary smallholder maize farmers in the target districts with the aid of researcher-administered questionnaires. The questionnaire administration took the form of a Computer-Assisted Personal Interview (CAPI), which was supported by a Paper and Pencil Personal Interview (PAPI), where necessary. By this, the enumerators administered the questionnaires using the KoBoCollect application. However, in times of failure (typically due to low phone battery), the enumerators resorted to the PAPI to forestall interruptions in the interview. The responses were then transferred onto the CAPI platform as soon as service was restored.

The questions that were answered under each assessment theme (effectiveness, outcomes and possible impacts, catalytic and replication effects, and sustainability), the data sources and the data collection instruments are outlined in Table 1.

¹¹ The non-inclusion of 'a control group' implies that the assessment provides data to judge the IPIMFS' effects and not impact.

Table 1: Sources of Data Based on Themes for the Assessment and Key Assessment Questions

Assessment Themes	Key Assessment Questions	Sources of Data	Data Collection Instruments
Effectiveness, outcomes and impact	<ul style="list-style-type: none"> Have the USAID-IPIMFS activity value chain interventions (end-to-end maize value chain engagement model) at the district level resulted in increased productivity, reduced post-harvest losses and increased incomes among smallholder maize farmers? If so, to what extent and why? If not, why not? 	<ul style="list-style-type: none"> Primary data from beneficiary farmers and KI interviews with nucleus farmers and in-depth interviews with Activity Management. Secondary data from relevant activity documents Data that was collected covered maize output (MT), farm size (hectares), post-harvest losses, cost of investment, proportion of maize output that was sold, and the revenue from produce sale. 	<ul style="list-style-type: none"> Semi-structured questionnaires for beneficiary smallholder maize farmers Interview Guide for key informants and in-depth interviews Checklist for activity document review
Effectiveness, outcomes and impact	<ul style="list-style-type: none"> Have the IPIMF bulk-handling of maize interventions resulted in enhanced efficiency and competitiveness among smallholder farmers in the maize value chain in the activity target areas? 	<ul style="list-style-type: none"> Primary data from beneficiary farmers and KI interviews with nucleus farmers and in-depth interviews with Activity Management. Secondary data from relevant activity documents Data from the beneficiary farmers covered the post-harvest losses and access to ready market. 	<ul style="list-style-type: none"> Semi-structured questionnaires for beneficiary smallholder maize farmers Interview Guide for key informants and in-depth interviews Checklist for review of activity documents
Effectiveness, outcomes and impact	<ul style="list-style-type: none"> How has the broader range of market access opportunities implemented by the USAID- 	<ul style="list-style-type: none"> Primary data from beneficiary farmers and Activity Management 	<ul style="list-style-type: none"> Semi-structured questionnaires for beneficiary farmers

Assessment Themes	Key Assessment Questions	Sources of Data	Data Collection Instruments
	<p>IPIMFS resulted in increased volumes of maize sales, and ultimately the average margins per hectare of maize in the target area?</p>	<ul style="list-style-type: none"> • Secondary data from relevant activity documents • The data covered volume of maize sales (MT), and the volume of maize for non-commercial purposes. 	<ul style="list-style-type: none"> • Interview Guide for Activity Management • Checklist to review activity documents
<p>Outcomes, impact and replication effects</p>	<ul style="list-style-type: none"> • What unintended contributions, results, and/or impacts have the USAID-IPIMFS activity value chain approach and associated interventions achieved relative to improving farmer access to inputs? 	<ul style="list-style-type: none"> • Primary data from beneficiary smallholder farmers and Activity Management • The intended contributions were based on the activity objectives, the unintended contribution focused on the following themes: <ul style="list-style-type: none"> ○ Household food security ○ Socio-cultural effects (gender mainstreaming, women access to land, etc.) ○ Non-activity beneficiaries adopting good agronomic practices¹² ○ Environmental effects (e.g. from tillage) 	<ul style="list-style-type: none"> • Semi-structured questionnaires for beneficiary farmers • Interview Guide for interviews with Activity Management
<p>Catalytic effects</p>	<ul style="list-style-type: none"> • What factors affected the achievements and results of the IPMFS activity? What can be identified as lessons learned and best practices from stakeholders or beneficiaries? 	<ul style="list-style-type: none"> • Primary data from beneficiary farmers and Key Informants (Activity Management). 	<ul style="list-style-type: none"> • Semi-structured questionnaires for activity beneficiaries

¹² The data required for this will be collected through focus group discussion with beneficiary farmers and interviews with Key Informant such as the District Directorate of Agriculture.

Assessment Themes	Key Assessment Questions	Sources of Data	Data Collection Instruments
		<ul style="list-style-type: none"> • The team approached this with an open mind. The factors covered include: <ul style="list-style-type: none"> ○ Increased productivity ○ Reduced post-harvest losses ○ Marketing efficiency ○ Increased gross margins ○ Adoption of appropriate technology ○ Gender mainstreaming in the maize value-chain 	<ul style="list-style-type: none"> • Interview Guide for interview of Activity Management
Effectiveness, outcomes and impact	<ul style="list-style-type: none"> • To what extent has Sahel Grains incorporated digital financial services into its programming, and how has that resulted in the achievement of its goal and objectives? <ul style="list-style-type: none"> ○ Do farmers find the use of digital financial service most convenient? ○ What are the challenges associated with the use of digital financial services? 	<ul style="list-style-type: none"> • The data were obtained from activity beneficiary farmers and Activity Management. • The data covered: <ul style="list-style-type: none"> ○ The types of digital financial services used by the farmers (e.g. online banking, mobile money, etc.) ○ Farmers' perception about digital financial services (ease of usage, etc.) ○ Effects of digital financing on access to farm inputs, access to production and marketing information, and prompt payment for services 	<ul style="list-style-type: none"> • Semi-structured questionnaires for activity beneficiaries
Sustainability	<ul style="list-style-type: none"> • To what extent are the Sahel Grains interventions likely to continue after the support from USAID Ghana has ended? Is stakeholder buy-in likely to 	<ul style="list-style-type: none"> • Primary data from beneficiary farmers and interviews with Activity Management. 	<ul style="list-style-type: none"> • Semi-structured questionnaires for activity beneficiaries

Assessment Themes	Key Assessment Questions	Sources of Data	Data Collection Instruments
	<p>continue or be increased after the current activity expires?</p> <ul style="list-style-type: none"> ○ What are the recommendations for similar support in future? 	<ul style="list-style-type: none"> • Secondary data from relevant activity documents • Data covered: <ul style="list-style-type: none"> ○ Exit strategies ○ Sustainability risk factors ○ Lessons learned and best practices 	<ul style="list-style-type: none"> • Interview Guide for interviews with activity management

1.3.2 Study Population and Units of Enquiry

The population for the assessment comprises the beneficiary smallholder maize farmers in the target districts (including nucleus farmers) and activity partners such as Sahel Grains Limited. In this regard, the units of enquiry for the assessment were activity beneficiary farmers (including nucleus farmers) and officials from Sahel Grains Limited. The units of analyses were beneficiary farmers and activity management.

1.3.3 Sampling Design

The sampling frame for the cross-sectional survey was 5,160 beneficiary farmers, comprising 1,804 farmers (35%) who received 'training and mechanization support' and 3,356 farmers (65%) who received 'training support only'. To assess the effects of the activity support on the beneficiary farmers, representative samples were drawn from each category of beneficiaries (namely 'training and mechanization' and 'training only'). Using a 95% confidence level and 5% margin of error, a total of 317 farmers (males 131 and females 186) and 346 farmers (males 149 and females 197) were selected from the 'training and mechanization' group and 'training only' group, respectively for interview. The team adopted the simple proportion approach to allocate the sample size among the targeted districts. This means that the size of the sample for a district (male and female) was based on the number of beneficiaries in that district as a proportion of the total number of beneficiaries. Details about the sample sizes by gender for each target district are given in Table 2.

Table 2: Sample Size by Gender, Type of Service and District

Beneficiary Districts	Training and Mechanization						Training only					
	Sampling Frame			Sample Size			Sampling Frame			Sample Size		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Sawla-Tuna-Kalba	119	168	287	19	31	50	248	527	775	25	55	80
Wa East	62	48	110	10	9	19	85	88	173	9	11	20
Wa West	0	0	0	0	0	0	165	257	422	17	26	43
Sissala East	578	829	1407	99	142	241	328	299	627	31	32	63
Sissala West	26	24	50	3	4	7	270	285	555	28	29	57
Nadowli-Kaleo	0	0	0	0	0	0	210	295	505	22	30	52
Bole	0	0	0	0	0	0	97	85	182	10	9	19
Wa Municipal	0	0	0	0	0	0	69	48	117	7	5	12
Total	785	1069	1854	131	186	317	1472	1884	3356	149	197	346

The data from the selected small-holder maize farmers were obtained through face-to-face interviews with the aid of semi-structured interview schedule (also called researcher-administered questionnaires). The focus group discussions, on the other hand, were

organized in eight communities, one each from the eight target districts¹³. The average size of a focus group was eight members; four females and four males.

The team adopted the simple random sampling technique, using random tables, to select the beneficiary farmers from the list of beneficiary farmers for the survey. This was made possible by the availability of a detailed list of beneficiary farmers. The use of the simple random sampling technique could have led to the selection of smallholder farmers that were not covered in the baseline survey. Purposively sampling smallholder farmers who were covered in the baseline survey for the final assessment (i.e. adopting a panel study) may have addressed some of the threats to internal validity that are associated with the before-and-after evaluation approach. However, the baseline survey did not provide detailed information to enable the team to trace the respondents¹⁴.

Consistent with the explanatory-sequential mixed methods, described in section 1.3.1 of this report, the team undertook follow-up qualitative interviews with focus groups (one in each district), Activity Management and Nucleus Farmers to have insights into the results of the quantitative data analysis. The focus group discussions were organized in eight communities, one each from the eight target districts¹⁵. The average size of a focus group was eight members; for females and four males.

1.3.4 Preparation for Data Collection

The team adopted the undeclared pre-testing procedure to pre-test the questionnaires in Tumu in the Sissala East Municipality. The pre-test ensured that the questionnaires were reliably formatted, and their wording appropriate (i.e. order of the questions not influencing the answers). This means that the primary concern of the pre-test was to ensure that the team, enumerators and respondents interpreted the questions in the same manner. The target group for the pre-testing were the smallholder farmers who were not included in the “actual survey”.

The questionnaires were amended based on the results of the pre-testing. The enumerators were then trained to understand the questionnaire and know how to administer it using the CAPI and PAPI. The training also covered themes such as ethics in research, techniques for household surveys, community entry techniques and measurement errors. Quality assurance procedures (e.g. need to collect accurate GPS coordinate data of the small-holder

¹³ Gindabour from the Sawla-Tuna-Kalba District; Sakpa Dure from the Bole District; Yaala N^o 1 from the Wa East District; Gadi from the Wa West District; Bugubelle from the Sissala East Municipality; Jawia from the Sissala West District; Kaleo from the Nadowli-Kaleo District; and Yibilee from the Wa Municipality.

¹⁴ The baseline survey ensured the anonymity of the respondents, which implies that the list of respondents did not include their names and detailed addresses. Given the time constraints and without these details, those farmers could not be traced.

¹⁵ Gindabour from the Sawla-Tuna-Kalba District; Sakpa Dure from the Bole District; Yaala N^o 1 from the Wa East District; Gadi from the Wa West District; Bugubelle from the Sissala East Municipality; Jawia from the Sissala West District; Kaleo from the Nadowli-Kaleo District; and Yibilee from the Wa Municipality.

farmers) were emphasized during the training. After the training, the enumerators pilot-tested the questionnaires with beneficiary farmers in the Sissala East District, where the training took place. The purpose of the pilot-test was to observe the time to complete an interview, learn how to phrase questions during the interviews to forestall measurement errors and determine whether the respondents understood the questions. The team amended the questions¹⁶ to account for the observations from the pilot-test.

1.3.5 Analytical Approach

Table 3 outlines the indicators that guided the assessment. To enhance readability of this report, the indicators are linked to each assessment questions.

Table 3: Indicators and Measurement Approaches for Key Assessment Questions

Assessment Questions	Indicators	Measurement Approach
1. To what extent has the activity achieved its intended goal and objectives? This question was answered by analyzing the issues that address questions 1a, 1b and 1c below:		
1a. Have the USAID-IPIMFS activity value chain interventions (end-to-end maize value chain engagement model) at the district level resulted in increased productivity, reduced post-harvest losses and increased incomes among smallholder maize farmers? If so, to what extent and why? If not, why not?	<ul style="list-style-type: none"> • Maize output (MT) • Farm size (hectares) • Yield per hectare • Post-harvest losses • Gross margin per hectare¹⁷ 	The before-and-after research approach was adopted to measure the activity’s effects on productivity, post-harvest losses and gross margin. Therefore, the data from the assessment was compared with existing data (including baseline data and annual beneficiary-based survey) to determine any changes that may have occurred due to the activity interventions.
1b. Have the IPIMF bulk-handling of maize interventions resulted in enhanced efficiency, competitiveness and inclusion of female smallholder farmers in the maize value chain in the activity target areas? If so, to what extent and how? If not, why not?	<ul style="list-style-type: none"> • Post-harvest losses • Access to ready market • Time (days) taken to market maize produce 	The data was compared with existing data (including baseline data and annual beneficiary-based survey) to determine the effects of the activity on efficiency, competitiveness and inclusion of female smallholder farmers. This is consistent with the before-and-after research approach.
1c. How has the broader range of market access opportunities implemented by the USAID-IPIMFS activity resulted in	<ul style="list-style-type: none"> • Volume of maize sales (MT) • Volume of maize for non-commercial 	The data was compared with existing data (including baseline data and annual beneficiary-based survey) to determine the

¹⁶ The mandatory function attached to the GPS coordinate was removed because the GPS application on the phones of some of the enumerators was slow to load. The other amendments that were made to the questionnaire include the rephrasing of the questions in the digital financing and changing farm size measurement from hectares to acres.

¹⁷ gross margin refers to net-income from production expressed as net-income from farmers’ production divided by the total number of units used in production.

Assessment Questions	Indicators	Measurement Approach
increased volumes of maize sales, and ultimately the average margins per hectare of maize in the target area?	<p>purposes and gross margin</p> <ul style="list-style-type: none"> Gross margin 	effects of the activity on volumes of maize sales and average margins per hectare of maize in the target districts.
2. What intended and unintended contributions, results, and/or impacts have the USAID-IPMFS activity value chain approach and associated interventions achieved relative to improving farmer access to inputs?	<p><u>Intended contributions:</u></p> <ul style="list-style-type: none"> Percentage of farmers who are adopting improved technologies or management practices (such as use of improved seedlings, minimal tillage, appropriate use of agrochemicals, water-use efficiency, etc.) Number of farmers adopting appropriate post-harvest handling disaggregated by males and females Access and forms of credit for maize farming (deferred payment for tractor services, farm loans in monetary and inputs terms, etc.) <p><u>Unintended effects</u></p> <ul style="list-style-type: none"> Household food security Socio-cultural (gender mainstreaming, women access to land, etc.) Non-activity beneficiaries adopting good agronomic practices¹⁸ Environmental effects (e.g. from tillage) 	The assessment of the activity's intended benefits was based on its objectives. The unintended benefits focused on the activity's replication effects, environmental consequences and changes to community traditions and conventions.
3. What factors affected the achievements and results of the IPMFS activity? What can be	<ul style="list-style-type: none"> Factors that affect activity performance in terms of: 	These factors are qualitative in nature. Therefore, the team used

¹⁸ The data required for this will be collected through focus group discussion with beneficiary farmers and interviews with Key Informant such as the District Directorate of Agriculture.

Assessment Questions	Indicators	Measurement Approach
identified as lessons learned and best practices from stakeholders or beneficiaries?	<ul style="list-style-type: none"> ○ Increased productivity ○ Reduced post-harvest losses ○ Marketing efficiency ○ Increased gross margins ○ Adoption of appropriate technology ○ Gender mainstreaming in the maize value-chain 	open-ended questions for interviews.
4. To what extent has Sahel Grains incorporated digital financial services into its programming, and how has that resulted in the achievement of its goal and objectives? This question was answered by answering questions 4a and 4b.		
<p>4a. How many farmers use digital financial services?</p> <p>4b. Do farmers find the use of digital financial service most convenient?</p> <p>4c. What are the challenges associated with the use of digital financial services?</p>	<ul style="list-style-type: none"> • Typology of digital financial services incorporated into Sahel Grain's programming • Number of farmers using digital financial services • Farmers' perception about digital financial services (ease of usage, etc.) • Challenges associated with the use of digital financing (frequency and proportion of farmers reporting these challenges) 	The data required to answer this assessment question are quantitative (e.g. number of beneficiaries) and qualitative (farmers' perception, digital financing, etc.) in nature.
5. To what extent are the Sahel Grains interventions likely to continue after USAID-Ghana's support ends? Is stakeholder buy-in likely to continue or be increased after the current activity expires?	<ul style="list-style-type: none"> • Activity exit strategies and approaches to phase out activity support • % of respondents asserting a specific disadvantage or challenge of the activity's sustainability • Factors that require attention to improve prospects of 	The data are both quantitative and qualitative in nature.

Assessment Questions	Indicators	Measurement Approach
	sustainability of outcomes • Lessons learned	

The before-and-after evaluation approach, expressed in Table 4, was adopted for the assessment. This implies that data for the 2018 farming season were matched against the baseline to measure the activity's effects.

Table 4: Activity Assessment Framework

Indicators	Baseline (a)	Now (b)	Change (a-b)
Intervention (Y1) (Beneficiary Smallholder farmers)	Y ₁₁	Y ₁₂	ΔY ₁

$$\Delta Y_1 = [Y_{12} - Y_{11}] \dots\dots\dots \text{Equation 1}$$

Where:

Y₁ = indicator of measurement (e.g. smallholder maize farmers' income)

Y₁₁ = baseline value of indicator

Y₁₂ = current value of indicator

ΔY₁ = difference between completion and baseline values

The qualitative data was used to triangulate and explain the results of the quantitative analyses. Data triangulation enhanced the validity and credibility of the results of the final activity assessment. The thematic analysis method was adopted for the analyses of the qualitative data, which was obtained from interviews with activity management and nucleus farmers. The themes below were for the qualitative data analyses: a) gender responsiveness of the activity design and benefits, b) reasons for changes in baselines performance indicators, c) effects of and perceptions about digital financing, d) farmers' views about the exit strategies, e) activity catalytic and replication effects, f) lessons from the activity implementation and g) recommendations for future programming support.

1.3.6 Ethical Considerations

The National Health and Medical Research Council (2007) notes the need for ethical consideration in human research processes. This is because, these ethical considerations will help in promoting the credibility of the assessment and its overall outputs. Also, it helped promote the generalizability of the lessons learnt from the assessment.

Gathering data from various sources, enhanced internal validity of the assessment process. In collecting the primary data, the consents of participants were sought. The participants were adequately briefed on the purpose of the assessment. Additionally, participation in this assessment exercise was voluntary, hence participants were free to withdraw from the process at any time. To ensure anonymity, the identities of participants were kept confidential (by referring to their unique identifications) and the data collected was protected based of the data protection policies of Sahel Grains Limited and USAID-Ghana.

1.3.7 Limitations of the Assessment

Some of the enumerators could not gather the GPS data on the respondents they interviewed. The cellphones the affected enumerators used for the data collection could not easily load the GPS coordinates of the respondents. To avert delays in interviewing a respondent, the KoBoCollect administrators changed the GPS coordinate field from “mandatory” to “optional”. Sahel Grains Limited’s Field Officers then monitored the enumerators to ensure the integrity of the data collection exercise.

Another limitation of the assessment was the inability of the team to obtain detailed data on the participants of the baseline study and subsequent annual beneficiary-based surveys from Sahel Grains Limited. The team did not have access to database that covered the names and location of the participants that were interviewed for the baseline data and those of the annual beneficiary-based surveys. In this regard, the consultants could not adopt a panel study for the assessment. The simple random sampling technique had to be adopted to mitigate the likelihood of selecting completely new farmers for the present study. It is worthy to point out that using probability sampling technique for the selection of the participants does not guarantee that all the participants of the previous studies would be covered in the final assessment. The non-inclusion of a *control group* in the assessment means that the observed changes in the measurement parameters cannot be explained entirely by the USAID-IPIMFS’ interventions. The results should therefore be interpreted with caution.

Finally, the data for this assessment were obtained from the participants through their recollection of the events of the previous farming season (2018). Therefore, the results would not be completely immune against recollection effects. Nevertheless, the short timespan between the previous farming season and the enumeration period, could limit the recollection effects on the results of the present assessment.

1.4 Structure of Report

The final assessment report has been divided into three major sections as follows:

- | | |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Section One | Presents details on the background of the assessment, comprising the activity’s background, the purpose of the assessment and the guiding questions, approach and methodology and structure of the report. |
| Section Two | Outlines details on the performance of the USAID-IPIMFS activity by covering themes such as farmer productivity, post-harvest losses and gross margin. The effects of the USAID-IPIMFS on efficiency, competitiveness and inclusion of female smallholder farmers in the maize value chain are also covered in section two of this report. |
| Section Three | Outlines the key findings, lessons, recommendations and conclusion. |

2. CHARACTERISTICS OF SMALLHOLDER FARMERS AND PERFORMANCE OF THE USAID-IPIMFS ACTIVITY

2.1 Socio-Demographic Characteristics of Maize farmers

This section of the report covers the socioeconomic profile of the 663 beneficiary smallholder farmers that were covered in the study. A total of 24 communities in the eight activity districts were covered in the survey (Table 5). The distribution is skewed in favor of the Sissala East Municipality because it had the highest concentration of beneficiaries among the activity beneficiary districts. The USAID-IPIMFS Management described the Sissala East Municipality as the hub of the USAID-IPIMFS. A total of 663 small-holder maize farmers in the ZOI were covered in the final assessment. This represent a 100% response rate.

Table 5: Names of Sampled Districts and Communities

Name of District	Communities
Nadowli-Kaleo	Sanakna, Kaleo, Chaangu and Papu
Sissala East	Kong, Bugubelle, Vamboi, Bandei, Kulfoo, Sakai and Nabugubelle
Bole	Sakpa Dure and Seripe
Sissala West	Jawia and Kupulima
Wa West	Gurungu, Polee, Gadi and Kouyebuo
Wa East	Yaala No. 1
Sawla-Tuna-Kalba	Tafori and Gindabour,
Wa Municipal	Yibilee and Junga

Source: Field Survey, May 2019

2.1.1 Gender Profile of the Beneficiary Smallholder Maize Farmers

The literature (see Farnworth and Mahama, 2012) indicates that women provide approximately 52% of the agricultural labor force¹⁹ in Ghana and contribute 90% of the labor (both paid and unpaid) for post-harvest activities. However, in Northern Ghana, the data in the conventional literature indicate that women are less represented in the agricultural labor force. They account for only 44% of the total agricultural labor-force (farming, forestry, fishing and hunting), which is a deviation from the national average. However, women are dominant in crop farming; accounting for over 70% of the labor force. Therefore, improving crop farming, which is dominated by women, could have positive implications for the attainment of gender equity goals and ultimately support sustainable poverty reduction efforts. Accordingly, the USAID-IPIMFS activity sought to improve the participation of women in maize production in the zone of influence (ZOI). Improving their participation in maize production would support gender equity efforts of central and local government institutions. The assessment shows that the USAID-IPIMFS supported more females (56%) than males (44%) in all the target districts except the Bole District (Table 6). The implication is that the activity made a deliberate attempt to provide equitable opportunities to males

¹⁹ Including farming, forestry, fishing and hunting.

and females in the target districts. This could have positive implications for gender equity goals in the targeted districts in the intermediate to long terms.

Table 6: Gender Profile of the Smallholder Farmers by District and Gender

Name of District	Male		Female		Total	
	N	%	N	%	N	%
Nadowli-Kaleo	62	9.4	69	10.4	131	19.8
Sissala East	102	15.4	140	21.1	242	36.5
Bole	15	2.3	12	1.8	27	4.1
Sissala West	38	5.7	49	7.4	87	13.1
Wa West	37	5.6	39	5.9	76	11.5
Wa East	15	2.3	19	2.9	34	5.1
Sawla-Tuna-Kalba	14	2.1	27	4.1	41	6.2
Wa Municipal	12	1.8	13	2.0	25	3.8
Total	295	44.5	368	55.5	663	100

Source: Field Survey, May 2019

The USAID-IPIFMS implementing partner indicated that:

“Women in many rural areas in Northern Ghana encounter several bottlenecks in their desire to enter the productive sector. For instance, access to tractor services has been a challenge to the female farmers even when they are willing and able to pay for such services. These bottlenecks undermine their effectiveness and efficiency, and ultimately hamper grassroot poverty reduction efforts. To change the status quo, the USAID-IPIFMS recruited more females than males for support. We have also appointed female Nucleus Farmers to serve as model to all female farmers. We later realized that the females were more credit worthy than males, which fueled and sustained our interests in them”

The Nucleus Farmers who were covered in the assessment also agreed that the USAID-IPIFMS promoted equitable access to economic opportunities for both females and males (Table 7). It is worthwhile to mention that the USAID-IPIMFS mechanization services were confined to the Sawla-Tuna-Kalba District, Wa East District, Sissala East Municipality and Sissala West District. Therefore, the Nucleus Farmers referenced in Table 7 come from these target districts. The results of the content analysis of the remarks of the Nucleus Farmers in Table 7 support the claim by the Nucleus Farmers and Management that conscious efforts were made to promote equitable access to farm services. More females than males in five out of the eight beneficiary districts (namely Sawla-Tuna-Kalba, Wa East, Wa West, Sissala West and Nadowli-Kaleo) received training support from the USAID-IPIMFS (refer to Table 2).

Table 7: Content Analysis of the USAID-IPIMFS' Effects on Gender Mainstreaming from the Perspectives of the Nucleus Farmers

Nucleus Farmers (NF)	Remarks from Nucleus Farmers	Theme (Pattern)
NF 1	The female beneficiary farmers in my operational area are more than the male beneficiary farmers. However, I do not discriminate against any gender.	Equitable access to interventions
NF 2	Female and maize farmers who are ready to farm are supported once they agree to the terms of the USAID-IPIMFS.	Equitable access to interventions
NF 3	Women's farm sizes are smaller compared to that of the males. Nevertheless, by meeting their needs, they are not only able to support their households but also escape from the grips of poverty. So, both females and males are supported once they apply for support.	Equitable access to interventions
NF 4	Although, the economic power of the females is relatively weaker, the female farmers are given prompt support after meeting the conditions. I do not allow cultural factors to be a barrier. Through the activity, more females are engaging in maize production.	Equitable access to interventions

Source: Extracts from Interviews with Nucleus Farmers, May 2019

2.1.2 Literacy Level of Smallholder Farmers

Following the Ghana Statistical Service (2012), a smallholder farmer was considered literate if he/she could read, write and understand a simple statement in the English language²⁰. The survey results indicate that an average of eight in ten of the smallholder farmers across the target districts could not read, write and understand simple statements in the English language (Table 8). The illiteracy rate among the smallholder farmers who were covered in the assessment ranged from 73% in the Nadowli-Kaleo District to 100% in the Wa Municipality. The high illiteracy rate, leading to the farmers' inability to read and understand instructions on agricultural products, could have adverse implications for the appropriate use of these products. For instance, Fianko et al. (2011) adduced enough evidence from a systematic review of Ghanaian literature to conclude that farmers overuse agrochemicals particularly pesticides; a situation that is precarious among illiterate farmers. The ramifications could range from personal health problems (acute and chronic diseases) to environmental sustainability issues (e.g. polluting water bodies, food, soil and sediment). The results underscore the importance of regular training events for the smallholder farmers in the target districts, which the district officials of Sahel Grains Limited provide. However, with the exit of the USAID-IPIMFS, Sahel Grains Limited's training activities are now concentrated in the districts where mechanization services are provided. This calls for active partnership with the District Departments of Agriculture, whose mandate is to offer extension services to farmers in their areas of jurisdiction, to provide training support to farmers who may not be covered by the Sahel Grains Limited. Using audio-visual materials

²⁰ The English language was the focus of the analysis because almost all written communications (e.g. instructions on agro-chemicals) are done in English.

in training could enhance comprehension and ultimately promote the uptake of information that would be disseminated to the farmers during training.

Table 8: Literacy Level of Smallholder Farmers – English Language by District

Name of District	Ability to Read, Write and Understand Simple Statements in the English Language					
	Yes		No		Total	
	N	%	N	%	N	%
Nadowli-Kaleo	35	5	96	14	131	20
Sissala East	58	9	184	28	242	37
Bole	0	0	27	4	27	4
Sissala West	23	3	64	10	87	13
Wa West	9	1	67	10	76	11
Wa East	5	1	29	4	34	5
Sawla-Tuna-Kalba	2	0	39	6	41	6
Wa Municipal	0	0	25	4	25	4
Total	132	20	531	80	663	100

Source: Field Survey, May 2019

2.2 Attainment of the USAID-IPIMFS Goal and Objectives

As stated earlier, the USAID-IPIMFS aims to increase the productivity and incomes of maize farmers in the SADA zone. In this regard, the activity' effects on productivity is assessed in this section of the report. The assessment covers productivity (defined as yield per hectare of maize farm), post-harvest losses and household income.

2.2.1 Productivity and Gross Margin Analysis

This section of the report covers the farm sizes, maize yield, total cost of production, volume of maize sales and gross margin.

2.2.1.1 Farm Size by District and Gender

Data from 20 farmers who reported abnormal farm sizes (either too small [e.g. 0.2 acres] or too large [e.g. 400 ha]) were excluded from the analyses. The intent was to minimize the effects of outliers on the measure of central tendency. The results (in Table 9) show a mean²¹ farm size of 1.54 ha for the 2018 farming season (2.18 ha for the males and 1.08 ha for the females). The mean farm size for the 2018 farming season differed marginally from that of the 2016 farming season of 1.55 ha but was 26% smaller that of the 2017 farming season of 1.94 ha. It is imperative to point out that the baseline survey report indicate a mean farm size of 2.04 ha for the 2016 farming season. However, the FY 2018 Milestone Report 14, reported the mean farm size for the 2016 farming season to be 1.55 ha. The inconsistency in the data undermined the interpretation of the data. For instance, by comparing the reported farm size of 2.04 ha for the 2016 farming season to that of the 2018 farming season of 1.54 ha, one would argue that the farm size has declined by about 32% between 2016 and 2018. A similar conclusion would be made by comparing the baseline farm size of 2.04 to that of the 2017 farming season of 1.94 ha. The trend would suggest that the farmers were reducing

²¹ The assessment uses 'mean' instead of 'median' to ensure consistency and facilitate comparison with earlier assessments that used mean instead of median.

the farm sizes (i.e. from 2.04 ha in the 2016 farming season to 1.94 ha in the 2017 farming season and 1.54 ha in the 2018 farming season). However, using the reported baseline data of 1.54 ha in the FY 2018 Milestone 14 Report shows that the farm size increased by 26% between the 2016 and 2017 farming seasons from 1.55 ha to 1.94 ha, respectively, but reduced to 1.54 ha during the 2018 farming season. The inconsistencies in the data in the various reports may be attributed to the reliance on farmers’ recollection for data on farm sizes. Mapping out the farm sizes of each beneficiary farmer during the farming season could be the way forward to obtaining accurate data for planning purposes. Adopting panel surveys for annual beneficiary-based survey may also minimize discrepancies in the reported data.

Table 9: Farm Size (Hectares) by District and Gender in 2018 (n = 643)

District	Total		Male		Female	
	2016	2018	2016	2018	2016	2018
Nadowli-Kaleo	2.89	1.07	3.54	1.19	1.99	0.96
Sissala East	1.88	2.09	2.44	3.10	1.13	1.39
Bole	n.a.	0.84	n.a.	0.93	n.a.	0.73
Sissala West	1.77	1.33	1.18	2.05	2.86	0.72
Wa West	1.08	1.43	1.08	1.81	1.07	1.08
Wa East	0.93	2.58	1.47	4.13	0.64	1.29
Sawla-Tuna-Kalba	n.a.	0.63	n.a.	0.97	n.a.	0.43
Wa Municipal	1.2	1.34	1.32	1.73	1.04	0.98
ZOI Mean	2.04	1.57	2.45	2.18	1.5	1.08

Source: Field Survey, May 2019

n.a. = Not Applicable

The survey results revealed further that the mean farm size was smaller for farmers who received both ‘training and mechanization support’ (1.2 ha) from the USAID-IPIMFS than those who received only ‘training support’ (2.115 ha). The team found that the farmers who received training and mechanization support from the activity had rather intensified²² the use of the available lands (details are presented in section 2.2.1.2). The extracts from the focus group discussions in Table 9 confirm the point that the small-holder farmers’ ‘perceived’ high cost of mechanization services partly informed their decision to adopt intensification rather than increasing the farm sizes (refer to the extracts in Table 10).

Table 10: Extracts from the Focus Group Discussions on Farm Size

Community	Remark about Farm Size	Theme
1: Gindabour in the Sawla-Tuna-Kalba District	We have realized that planting in rows, timely control of weeds and proper post-harvest handling improves yield. Keeping to these will lead to high yield. Tractor services are however	High yield and the need to avoid the high cost of mechanization services

²² Agricultural intensification refers to an increase in agricultural production per unit of inputs. Changes caused by intensification are to be understood conceptually in contrast to extensive adjustments, which involve increases or decreases in the amount of inputs used.

Community	Remark about Farm Size	Theme
	expensive, and so have to resort to keeping the farm size manageable.	
2: Sakpa Dure in the Bole District	It is surprising to learn that farm sizes are declining. For us, we are working hard to increase our farms. Maybe the people you interviewed are rather cultivating smaller parcels	Unaware that farm sizes have declined.
3: Yaala N ^o 1 in the Wa East District	We used to cultivate larger areas because we believed that by so doing our yield would be high. But keeping those farm sizes and adopting sound agronomic practices leads to high cost of investment. However, reducing the farm sizes do not negatively affect the yield provided sound agronomic practices are adopted	Importance of adopting sound farming practices <i>in lieu</i> of increasing farm size
4: Gadi in the Wa West District	We are increasing the farm sizes in hope of increasing yield and household incomes. We hope to have the means to maintain these farms. We want to grow to become large scale farmers.	Unaware that farm sizes have declined.
5: Bugubelle in the Sissala East Municipality	Large farm size is ideal if one can maintain it. However, the experience is that such farms are costly to maintain. Mechanization services and agro-chemicals are expensive.	Cost of maintaining large farms leads to intensification of the existing ones
6: Jawia in the Sissala West District	We are expanding our farms with the hope of improving our incomes to support our households. We do not know how farm sizes may be declining.	Unaware that farm sizes are declining
7: Kaleo in the Nadowli-Kaleo District	The high cost of maintaining larger farms if farming is to be done well is one of the reasons for the decline in the farm sizes. However, yield has increased within the period. So, it is not about large farm sizes.	Increasing yield despite declining farm sizes.
8: Yibilee in the Wa Municipality.	We are not aware that farm sizes have decreased. We continue to cultivate the farms we have cultivated since 2015. We are even expanding the farms.	Unaware that farm sizes are declining

2.2.1.2 Maize Yield Per Hectare (MT) by District and Gender

Table 11 presents the farm output (yield) disaggregated by gender and target districts. The results indicate a mean yield of 3.90 MT/ha, which represents a 22% and 16% increase in mean yields for the 2016 farming season of 3.20 MT/ha (3.17MT/ha in the FY 2018 Milestone 14 Report) and 2017 farming season of 3.37 MT/ha, respectively. Yield in all the target districts had increased (Table 11) but was highest in the Wa East District (males = 10.33 MT/ha, females = 3.22 MT/ha and total = 6.45 MT/ha) and Sissala East District (males = 7.68 MT/ha, females = 3.45 MT/ha and total = 5.19 MT/ha). Despite the relatively smaller

farm sizes compared to the baseline and the 2017 farming season, yield for the 2018 farming season was higher across all target districts. The results rationalize the general claim of the focus group discussants that small farm sizes could generate higher yield if sound agronomic practices, including the appropriate use of fertilizer, are observed (refer to Table 9). The USAID-IPIMFS management supports the farmers’ view of intensification with the following remark:

Prior to the USAID-IPIMFS, many smallholder farmers were broadcasting the fertilizer, which led to waste. After receiving training from the activity, the farmers either bury the fertilizer (in the case of urea) or place it close to the roots. This leads to efficiency. So, by accessing mechanization services and adopting other agronomic practices such as row planting, weeds control and pest and disease control, yield certainly increase.

Not only do the survey results suggest a marked improvement in productivity (i.e. yield per hectare) across the target districts, they also indicate that the farmers’ productivity was higher than the average (of 2.1 MT/ha) reported for Northern Ghana (i.e. Northern Region, Upper West Region and Upper East Region). The important lesson is that ‘intensification²³’ is an important means to increasing productivity and income levels of the smallholder farmers. The finding of the assessment show further that the yield was higher for farmers who received ‘training and mechanization services’ (5.26 MT) from the activity than those who received ‘training only’ (2.99 MT). The recurring themes from the extracts from the FGDs in Table 12 were a) farmers are able to plan the farming seasons with reliable access to mechanization services, b) access to mechanization services facilitates the adoption of appropriate post-harvest handling practices and c) access to mechanization services facilitates the adoption of good agricultural practices such as row planting. However, this is inconclusive as the team could not establish if the latter did not receive mechanization services from other actors in the target district. This is because in Northern Ghana, several private actors offer services such as land ploughing and harrowing to farmers at a fee.

Table 11: Yield (MT) Per Hectare by District and Gender in 2018 (n = 643)

District	Total		Male		Female	
	2016	2018	2016	2018	2016	2018
Nadowli-Kaleo	n.a.	2.67	n.a.	2.98	n.a.	2.39
Sissala East	n.a.	5.19	n.a.	7.68	n.a.	3.45
Bole	n.a.	2.11	n.a.	2.33	n.a.	1.83
Sissala West	n.a.	3.28	n.a.	5.14	n.a.	1.76
Wa West	n.a.	3.59	n.a.	4.53	n.a.	2.69
Wa East	n.a.	6.45	n.a.	2.5	n.a.	3.22
Sawla-Tuna-Kalba	n.a.	1.56	n.a.	2.43	n.a.	1.08
Wa Municipal	n.a.	3.36	n.a.	4.33	n.a.	2.46
Total	n.a.	3.90	n.a.	5.42	n.a.	2.69

Source: Field Survey, May 2019

n.a. = Not available. The baseline survey and 2017 Milestone 14 Report reported aggregated data but not mean output per farmer and per district

²³ Intensification refers to an increase in the productivity of a farmer without increasing the farm size.

Table 12: Extracts from Focus Group Discussions on the Effects of Training and Mechanization Services on Productivity

Community	Remarks about Training and Mechanization Services	Theme
1: Gindabour in the Sawla-Tuna-Kalba District	USAID-IPIMFS has enhanced our access to tractors services. Accordingly, we plough our lands on time to begin farming at the right time.	Farming at the appropriate time
3: Yaala N ^o 1 in the Wa East District	Not only are we able to prepare our lands before the rainy season, we are also able to thresh and transport our produce to the house without delay. These could partly explain the improvements in yield.	Farming at the appropriate time and appropriate post-harvest management
5: Bugubelle in the Sissala East Municipality	With reliable access to tractors services, our farming is planned to meet the rains. Yield will certainly be high with good weather.	Farming at the appropriate time
6: Jawia in the Sissala West District	Ploughing the land makes it easy to plant in rows. This increases the plant density, which has positive effects on productivity. We are also able to plan the farming season to meet good rains.	Adopting appropriate farming practices and planning the farming season.

2.2.1.3 Total Cost of Maize Production (GHS) by Gender and District

The variable cost items were the focus of the survey. Like the baseline survey, the recall methodology was used to obtain the required information. This became necessary because of the poor record keeping habits of the smallholder farmers who were covered in the survey. Their poor record keeping possibly derives from their low literacy levels. The estimate for the variable cost items was one of the five variables used for the computation of gross margin. The results in Tables 13 and Figure 2 indicate that the maize variable cost items were: maize seeds, ploughing/harrowing, sowing (planting), weeds control, fertilizer and its application, transportation, farm implements (procurement and rental) and repairs, and harvesting. The farm input prices, and by extension, cost per farmer, varied across the target districts. This may partly explain the observed differences in farmers' expenditure. Generally, the cost of maize production in the target districts was higher for male farmers than the female farmers (see Table 13). The conventional literature indicates that male farmers tend to invest more in a unit area than females (Farnworth and Mahama, 2012; Fianko et al., 2011). In this case, the males cultivated larger land areas than the females, which underscores their higher total cost of production. The socioeconomic barriers against women's engagement in the productive sector²⁴ could explain the observed differentials in the cost of investment per hectare between male and female farmers.

Fertilizer and its application accounted for approximately 39% of the total cost of production, which was not significantly different from the baseline figure of 38%. The

²⁴ Barriers against their access to productive land and accessing input markets (particularly markets for labor and non-labor inputs)

continued use of fertilizer, coupled with the adoption of agronomic practices (such as proper post-harvest handling practices, increased plant density due to row planting and enhanced access to mechanization services), possibly explain the increased yield per hectare. It is worthy to note that appropriate application of fertilizer (e.g. burying or placement close to the roots) leads to efficiency. Land tillage (mainly ploughing) and maize harvesting accounted for approximately 21% and approximately 9% respectively of the total input cost. Although, the Ministry of Food and Agriculture in Ghana encourages minimal tillage (or zero tillage) (Government of Ghana, 2010: 42), many of the farmers in the target districts continued to adopt maximum tillage. This practice could have adverse implications for environmental sustainability. For instance, in a field experiment in Eastern Kenya, Karuma et al. (2014) found that soil moisture content was significantly low if the land is tilled with disc plough. The USAID-IPIMFS management is aware of the possible consequences of maximum tillage and has therefore piloted ripping service²⁵ at Bugubelle. The Management's preliminary observation²⁶ from the pilot indicates that the farmers are more likely to switch to this technology if it is readily available. Accordingly, Management aims to scale it up in the target districts. Promoting climate-smart agricultural practices and scaling up the ripping services could be helpful in minimizing the likely adverse effects of maximum land tillage in the target districts.

²⁵ USAID-IPIMFS promoted the ripping technology in Bugubelle in the Sissala East District. Ripping as an approach to reducing surface runoff and soil degradation, offers a promising solution to climate risk mitigation. It is reported that many of the farmers have expressed interest in adopting it for maize production purposes.

²⁶ Farmers report of improvement in yield and soil-water retention capacity.

Table 13: Cost of Production (GHS) in 2018 Disaggregated by District and Gender (n = 643)

Items	Nadowli-Kaleo		Sissala East		Bole		Sissala West		Wa West		Wa East		Sawla-Tuna-Kalba		Wa Municipal	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Maize seed	29.17	25.09	116.85	77.37	168.32	155.04	128.28	30.78	37.37	49.61	68.80	18.68	30.76	16.71	52.56	34.23
Ploughing / harrowing	182.19	239.93	280.16	183.87	223.57	127.89	246.73	141.49	264.78	442.79	230.09	109.70	179.71	104.51	564.21	482.80
Planting the maize seeds	37.51	27.29	121.33	86.67	108.91	91.49	158.37	78.20	53.60	53.31	114.79	43.69	100.38	47.49	37.28	79.66
Farm implements	11.62	16.42	21.09	11.14	67.53	58.71	19.34	27.00	14.15	23.94	11.15	8.53	53.75	1.13	3.03	12.68
Weeding (weeding during land preparation)	18.72	5.55	58.03	44.74	140.45	70.65	137.65	51.49	57.94	77.75	102.18	40.03	56.20	42.48	0.92	3.17
Fertilizer (including application)	344.96	370.59	783.17	610.92	426.93	380.81	716.98	431.24	516.53	406.01	418.56	217.47	357.60	244.51	483.06	605.35
Transport	5.30	1.97	26.97	20.26	91.34	157.12	21.44	9.97	101.06	27.89	10.49	8.99	68.92	52.49	29.64	23.66
Other farm inputs	2.81	0.12	7.80	1.58	47.89	40.38	0.00	0.00	22.93	8.89	0.00	0.00	14.47	2.64	2.24	0.00
Weeding from after germination	76.20	58.51	96.10	137.20	131.58	127.54	94.76	59.52	96.44	79.97	78.28	40.64	149.44	72.41	134.50	37.40
Repairs of farm equipment	20.12	0.00	2.44	0.96	20.50	10.81	7.78	0.00	6.42	4.44	0.00	0.00	7.27	1.04	0.00	0.00
Maize harvesting	9.44	0.12	266.29	236.33	93.51	55.51	263.68	152.52	19.16	30.85	253.82	121.90	72.63	37.10	0.00	0.00
Renting any farm equipment	2.89	7.40	7.56	10.53	0.66	8.04	35.68	15.00	40.67	71.33	16.46	10.58	0.00	6.99	0.26	5.28
Annual Cost of Maize Production (Total)	740.77	752.97	1785.99	1419.48	1521.00	1283.91	1830.65	997.20	1231.12	1276.78	1304.60	620.17	1080.36	629.40	1307.58	1284.23

Source: Field Survey, May 2019

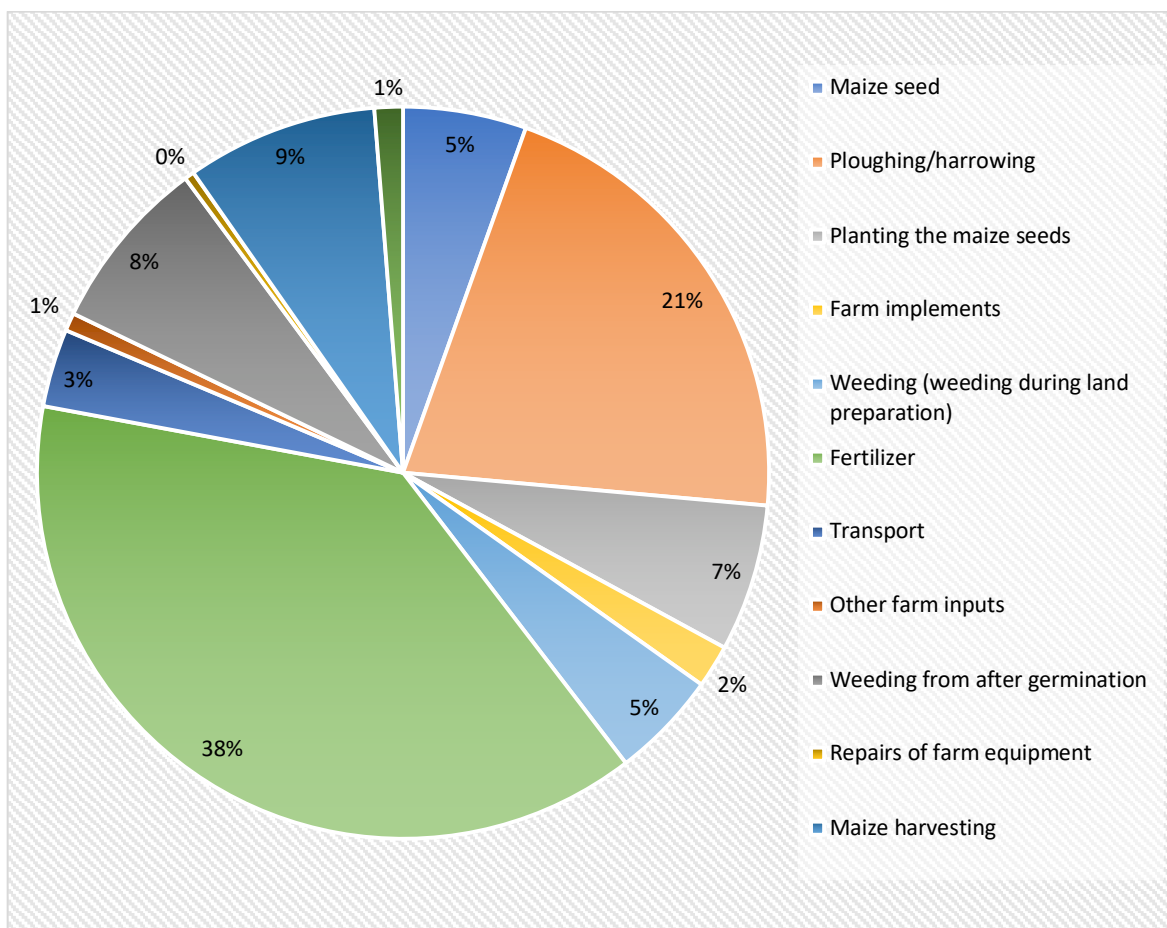


Figure 2: Item Cost as a Proportion of Total Cost of Production in 2018
 Source: Field Survey, May 2019

2.2.1.4 Volume of Maize Sales (GHS) by District and Gender in the 2018 Farming Season

The proceeds from maize farming could be sold, consumed, gifted or used during festivals and other ceremonies by the smallholder farmers. The quantity of maize sold by the smallholder farmers was one of the variables for the determination of gross margin. The other variables were value of sales, unit of production, total production cost and purchased recurrent input cost are also used in the determination of gross margin (see Equation 2 for details). The survey results in Table 14 indicate that the farmers sold an average of 3.32 MT in 2018. It is instructive to note that the quantity of maize sold was directly proportional to the total yield. It emerged that the quantity of maize sold by the farmers was higher for the male farmers than the female farmers that were covered in the study. Higher proportion of the produce by the female maize farmers were used for direct consumptive purposes, a situation that has been reported in literature (Doss et al., 2014). Scholars (such as Mallick and Rafi, 2010; Tibesigwa and Visser, 2016) indicate that females are the hardest hit when households are food insecure, hence their foremost concern is to have food available for all household members. They therefore sell less and keep more for direct household consumption. Due to differential gender roles, such as males providing money for domestic uses, males sold sell more of their farm produce to meet their obligations. The farmers sold

approximately 70% of the total harvest. Like the baseline study, the results of the final activity assessment reveal that the small-holder farmers that were covered in the assessment allocated approximately 30% of the yield for consumptive and other non-commercial purposes (such as gifts during festive occasions). This is consistent with the use of the maize as the largest food security crop across Ghana.

Table 14: Average Quantity of Maize (in MT) Sold by the Smallholder Farmers in 2018 (n = 643)

District	Total		Male		Female	
	2016	2018	2016	2018	2016	2018
Nadowli-Kaleo	0.75	2.27	n.a.	2.54	n.a.	2.03
Sissala East	5.44	4.41	n.a.	6.53	n.a.	2.93
Bole	n.a.	1.79	n.a.	1.98	n.a.	1.56
Sissala West	3.55	2.79	n.a.	4.36	n.a.	1.49
Wa West	1.5	3.05	n.a.	3.85	n.a.	2.29
Wa East	1.21	5.49	n.a.	8.78	n.a.	2.74
Sawla-Tuna-Kalba	1.26	1.33	n.a.	2.06	n.a.	0.92
Wa Municipal	n.a.	2.86	n.a.	3.68	n.a.	2.09
Total	3.2	3.32	n.a.	4.61	n.a.	2.28

Source: Field Survey, May 2019

2.2.1.5 Gross Margin Analysis

Following Feed The Future ‘Agricultural Indicators Guide’ (2014, pp. 53), gross margin is used in this report to refer to net-income from the beneficiary smallholder maize farmers and is expressed as the difference between the total value of production and the cost of production, divided by the total number of units used in production (ha). This is denoted by equation 2.

$$\frac{[TP * (\frac{VS}{QS})] - IC}{UP} \qquad \text{Equation 2}$$

Where:

- TP = Total Production for the 2018 farming season*
- VS = Value of Sales (GHS) during the 2018 farming season*
- QS = Quantity of Maize Sales during the 2018 farming season*
- IC = Purchased recurrent Input Costs for the 2018 farming season*
- UP = Unit of Production. This refers to the Ha planted in 2018*

The information required for the estimation of the gross margin are presented in section 2.2.1.1 – 2.2.1.4 of this report. The results show a mean gross margin per hectare of GHS 2,256.05 (males = GHS 2,364.98 and females = GHS 2,168.78). The mean gross margin

represents an 87% increase in the 2016 gross margin²⁷ of ²⁸GHS 1204.38 and a 106% increase in the mean gross margin of GHS 1,095.00 for the 2017 farming season. Generally, the sex-aggregated data²⁹ show that mean gross margin was higher for the male maize farmers than the female maize farmers that were covered in the survey. However, the sex-aggregated gross margin was higher for female than male farmers in all the districts except Bole and Wa West Districts (see Table 15). The dominance of females in the list of activity beneficiaries explain the higher aggregated gross margin for the female farmers. The sex-aggregated gross margin was highest in the Sissala East Municipality (GHS 569,052.65) and lowest in the Bole District (GHS 42,516.70). There were more beneficiary small-holder maize farmers in the Sissala East Municipality than any other beneficiary district. In this context, the concentration of the USAID-IPIMFS activities in the Sissala East Municipality explains its dominance in the sex-aggregated data on gross margin.

Overall, the gross margin was GHS 1,450,639.73 for the sample of 643 small-holder maize farmers who were covered in the final assessment. Given that the gross margin data were obtained from a sample (543 small-holder farmers) but not all the USAID-IPIMFS beneficiaries (5,210) and following the FTF guideline (see page 53), the team used the sample gross margin data to estimate the gross margin for all the USAID-IPIMFS beneficiaries across the ZOI. This was done by estimating the mean gross margin for males and females in each targeted district under the two typologies of activity interventions (“training and mechanisation” and “training only”). The estimated gross margin was then multiplied by the number of intervention beneficiaries in each district to derive the districts gross margin. The results in Table 16 shows that the gross margin was GHS 10,565,281.21 (males = 5,342,012.32 and females = 5,806,758.76) for all the USAID-IPIMFS beneficiaries.

The survey results in Figure 3 indicate that the mean gross margin was approximately 24% higher for farmers who received training and mechanization support (GHS 2,541.58) than those who received training only (GHS 2,050.84) from the activity³⁰ despite the focus group discussants’ perceived high cost of mechanization services (see Table 10 and the textbox below for supportive statements).

²⁷ This should be interpreted with caution because the inflationary effects have not been eliminated. The analysis based on the nominal values.

²⁸ The increase in the mean gross margin between the 2016 and 2018 farming seasons would be approx. 131% if the gross margin of GHS 975.14 reported for the 2016 farming season in the FY2018 Milestone 14 was used.

²⁹ After summing up the gross margin data each for males and females)

³⁰ GHS 1.00 = US\$ 5.40043 (8th August 2019)

Farmers' Perceived High Cost of Mechanization Services

... Meanwhile tractor services are expensive, so keep the farm size manageable.

Source: FGD, Gindabour

...Mechanization services and agrochemicals are expensive.

Source: FGD, Bugubelle

The high cost of maintaining larger farms if farming is to be done well is one of the reasons for the decline in the farm sizes...

Source: FGD, Kaleo

The perception may have been influenced by the fees the farmers paid for threshing and transport, which hitherto were executed by unpaid family labor. However, it is unclear from the present assessment if the smallholder farmers in the 'training only group' did not receive similar farm mechanization services from other projects and actors who are operating in the region. This calls for further studies to arrive at definitive conclusion and to design targeted interventions to address any short-coming. Nevertheless, the implication of the results is that farm mechanization, despite the associated costs, yields higher net-returns. The affected farmers may also be benefitting from higher returns to labor for using the mechanization services. Sahel Grains Limited should therefore endeavor to promote and sustain the farmers' access to farm mechanization services if the benefits of the USAID-IPIMFS would be sustained.

As presented in Figure 3, some of the beneficiary farmers were 'unsure' about the nature of support (n=1) they received from the USAID-IPIMFS. Others (n=2) claimed they received no support although they had been profiled as activity beneficiaries. The plausible explanation for these is that some of the beneficiaries may have certain expectations that were not met by the activity. The team could not investigate this due to time limitations. There is therefore the need for SGL to investigate this and take corrective measures, where necessary, to sustain the gains.

Table 15: Sex-Aggregated Gross Margin Data (in GHS) for the 2018 Farming Season by District and Gender (n = 643)

Name of District	Gender of Respondent	Farm size in ha	Average yield per farmer	QS = Quantity sold in MT	VS = Revenue after sales (GHS)	IC = Annual cost of maize production (GHS)	Gross margin (GHS)
Nadowli-Kaleo	Male	74	185	157.25	212,287.50	45,928.00	151,277.55
	Female	66	165	140.25	189,337.50	51,955.00	161,898.38
	Total	140	350	297.50	401,625.00	97,883.00	313,175.93
Sissala East	Male	298	745	633.25	854887.50	173,241.00	250,269.3
	Female	191.6	479	407.15	549,652.50	195,888.00	318,783.35
	Total	489.6	1224	1040.40	1,404,540.00	369,129.00	569,052.65
Bole	Male	14	35	29.75	40,162.50	22,815.00	22,491.28
	Female	8.8	22	18.70	25,245.00	14,123.00	20,025.42
	Total	22.8	57	48.45	65,407.50	36,938.00	42,516.70
Sissala West	Male	76	190	161.50	218,025.00	67,734.00	80,866.15
	Female	31.6	79	67.15	90,652.50	43,877.00	82,748.35
	Total	107.6	269	228.65	308,677.50	111,611.00	163,614.5
Wa West	Male	61.6	154	130.90	176,715.00	41,858.00	73,230.75
	Female	38.8	97	82.45	111,307.50	45,964.00	70,113.92
	Total	100.4	251	213.35	288,022.50	87,822.00	143,344.67
Wa East	Male	62	155	131.75	177,862.50	19,569.00	44,088.62
	Female	23.2	58	49.30	66,555.00	11,163.00	48,413.59
	Total	85.2	213	181.05	244,417.50	30,732.00	92,502.21
Sawla-Tuna-Kalba	Male	13.6	34	28.90	39,015.00	15,125.00	30,364.00
	Female	10.8	27	22.95	30,982.50	15,735.00	46,532.50
	Total	24.4	61	51.85	69,997.50	30,860.00	76,896.50
Wa Municipal	Male	20.8	52	44.20	59,670.00	15,691.00	23,797.74
	Female	12.8	32	27.20	36,720.00	16,695.00	25,738.83
	Total	33.6	84	71.40	96,390.00	32,386.00	49,536.57
Overall total	Male	620.00	1,550.00	1,317.50	1,778,625.00	401,961.00	676,385.39
	Female	383.60	959.00	815.15	1,100,452.50	395,400.00	774,254.34
	Total	1,003.60	2,509.00	2,132.65	2,879,077.50	797,361.00	1,450,639.73

Source: Field Survey, May 2019

Table 16: Extrapolated Sex-Aggregated Gross Margin Data (in GHS) for the 2018 Farming Season by District and Gender (N = 5,210)

Name of District	Type of Support	Gender Respondent	of Farm size	Average yield per farmer	QS = Quantity sold in MT	VS = Revenue after sales	IC = Annual cost of maize production	Gross margin
Nadowli-Kaleo	Training only	Male	250.64	626.62	532.62	719,038.30	155,562.58	512,391.71
		Female	282.17	705.43	599.62	809,486.40	222,126.45	692,174.22
		Total	532.80	1,332.05	1,132.24	1,528,524.70	377,689.03	1,204,565.93
Sissala East	Training only	Male	1,049.60	2,624.00	2,230.40	3,011,040.00	1,383,832.00	554,127.14
		Female	490.36	1,167.54	992.38	1,339,733.58	925,575.85	431,521.64
		Total	1,539.96	3,791.54	3,222.78	4,350,773.58	2,309,407.85	985,648.78
	Training and farm mechanization	Male	1,815.44	4,487.59	3,814.45	5,149,541.64	975,345.75	1,511,338.45
		Female	1,115.67	2,789.09	2,370.69	3,200,484.49	927,353.39	2,026,664.84
		Total	2,931.11	7,276.68	6,185.14	8,350,026.13	1,902,699.14	3,538,003.29
Bole	Training only	Male	90.53	226.33	192.38	259,717.50	147,537.00	145,443.61
		Female	62.33	155.83	132.46	178,818.75	109,132.27	141,846.73
		Total	152.86	382.16	324.84	438,536.25	256,669.27	287,290.34
Sissala West	Training only	Male	561.01	1,402.49	1,192.13	1,609,368.75	505,237.50	583,489.87
		Female	204.69	500.35	425.28	574,132.50	284,203.28	524,072.88
		Total	765.69	1,902.83	1,617.41	2,183,501.25	789,440.78	1,107,562.75
Wa West	Training only	Male	308.78	771.97	656.17	885,829.02	218,365.72	332,233.62
		Female	242.33	605.77	514.93	695,139.10	282,011.60	481,601.19
		Total	551.11	1,377.74	1,171.10	1,580,968.12	500,377.32	813,834.81
Wa East	Training and farm mechanization	Male	256.26	640.66	544.56	735,165.00	80,885.20	182,232.96
		Female	61.87	154.67	131.47	177,480.00	29,768.00	129,102.91
		Total	318.13	795.33	676.03	912,645.00	110,653.20	311,335.87
Sawla-Tuna-Kalba	Training only	Male	256.26	640.66	544.56	735,165.00	287,122.00	535,504.34
		Female	222.50	556.30	472.82	638,328.75	344,833.65	931,728.67
		Total	478.76	1,196.96	1,017.38	1,373,493.75	631,955.65	1,467,233.02

Name of District	Type of Support	Gender Respondent	of Farm size	Average yield per farmer	QS = Quantity sold in MT	VS = Revenue after sales	IC = Annual cost of maize production	Gross margin
	Training and farm mechanization	Male	71.40	178.50	151.73	204,828.75	73,304.00	264,923.75
		Female	76.79	192.01	163.20	220,320.00	94,968.00	353,010.00
		Total	148.19	370.51	314.92	425,148.75	168,272.00	617,933.75
Wa Municipal	Training only	Male	119.60	299.00	254.15	343,102.50	90,223.25	136,837.01
		Female	47.26	118.15	100.43	135,581.54	61,643.08	95,035.68
		Total	166.86	417.15	354.58	478,684.04	151,866.33	231,872.69
Overall Total		Male (N=2,257)	4,779.51	13,300.31	11,305.29	15,262,165.21	4,422,652.50	5,342,012.32
		Female (N=2,953)	2,805.96	6,945.13	5,903.26	7,969,505.11	3,281,615.57	5,806,758.76
		Total (N=5,210)	7,585.47	18,842.95	16,016.42	21,622,301.57	7,199,030.57	10,565,281.21

Source: Extrapolated based on the Gross Margin for the 2018 Farming Season; Sampling Frame obtained from SGL



Figure 3: Average Gross Margin (GHS) by Type of Service Received
 Source: Field Survey, May 2019

2.3 Competitiveness of Smallholder Maize Farmers

As indicated in the methods section of this report, the variables that were used to assess the competitiveness of the farmers are post-harvest losses, access to ready market and time taken to sell the produce. The data on these variables are analyzed in this section of the report.

2.3.1 Post-Harvest Losses (%) by District and Gender

The survey results in Table 17 indicate that the proportion of farmers who reported post-harvest losses was higher (26.8%) in 2016 than in 2018 (15.2%). The proportion of farmers who reported that they experienced no significant post-harvest losses has also increased from 73.2% prior to the activity to 84.8% at the end of the 2018 farming season. The reduction in post-harvest could be one of the factors that have accounted for the increased productivity and gross margins. The USAID-IPIMFS Management indicated that during training, the farmers are introduced to several post-harvest handling strategies with the aim of reducing post-harvest losses and improving upon production efficiency. The post-harvest handling strategies include a) timely harvesting from the field, b) pre-harvesting drying, c) threshing/ shelling the grains, d) cleaning the grains, e) transport (moving the grains to the collection point and how to maintain good quality grains at the collection point) and f) storage. These pre-harvest and post-harvest handling strategies are known to eliminate aflatoxin in the maize and ultimately enhance its competitiveness.

Table 17: Post-Harvest Losses for the Period Under Review (N = 663)

District	Gender	Experienced Post-harvest losses (%)		No Post-harvest Losses (%)	
		Before	After	Before	After
Nadowli-Kaleo	Male	0.3	0.2	9	9.2
	Female	0.2	0.2	10.3	10.3
Sissala East	Male	7.7	7.2	7.7	8.1
	Female	7.5	7.1	13.6	14
Bole	Male	2.3	0	0	2.3
	Female	1.8	0	0	1.8
Sissala West	Male	0.3	0.2	5.4	5.6
	Female	0	0.2	7.4	7.2
Wa West	Male	0.3	0	5.3	5.6
	Female	0.3	0.2	5.6	5.7
Wa East	Male	0	0.2	2.3	2.1
	Female	0	0	2.9	2.9
Sawla-Tuna-Kalba	Male	2.1	0	0	2.1
	Female	4.1	0	0	4.1
Wa Municipal	Male	0	0	1.8	1.8
	Female	0	0	2	2
Total		26.8	15.2	73.2	84.8

Source: Field Survey, May 2019

Clearly, the results in Table 16 and extracts from the FGDs below indicate that the post-harvest handling training programs are yielding positive results. Although, the remark below is attributed to the focus group discussants from Gindabour, it resonates the views that were expressed by all the discussants from the other communities.

“We do not allow the maize to over-dry in the field. Staying in the field for long exposes them to pests such as weevils and even birds. We no longer put the harvested corns on the bare floor during harvest. They are kept in sacks and transported to the depot when the bags are full. We are also told that the quality of the maize is adversely affected if they remain uncollected for days. The threshing and transportation services Sahel Grains Limited offer to us enable us to transport our produce home on time. At home, we make sure that the maize is wee-dried. During storage, the bags are placed on pellets to avoid direct contact with the floor”.

Source: FGD, Gindabour in the Sawla-Tuna-Kalba District

2.3.2 Access to Ready Market

Access to ready market was used as proxy for the determination of competitiveness of the produce by the smallholder maize farmers. The results of the cross-sectional survey indicate that the smallholder farmers sold their produce at the local markets within and outside their districts of residence. The frequencies were associated with the relative importance of the various market points. This implies that the influence of Sahel Grains Limited on market

opportunities for the small-holder farmers who were covered in the study has been minimal (see Figure 4). Many of the farmers continued to sell the produce in the local markets. The results of the interviews with the focus group discussants and the IPIFMS management confirm the findings from the cross-sectional survey. Sahel Grains Limited appear to focus more on loan recovery. Details of the focus group discussions are presented in Table 18.

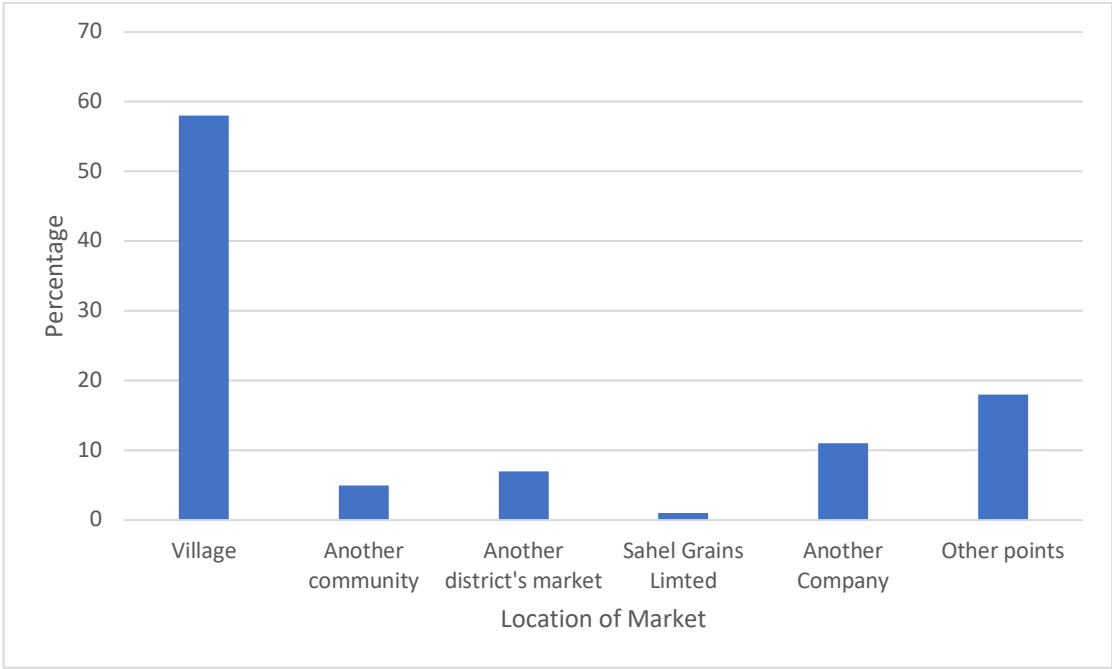


Figure 4: Market Destination for Farm Produce
Source: Field Survey, May 2019

Table 18: Access to Ready Market from the Perspectives of Focus Group Discussants

Community	Remark about Farm Size	Theme
1: Gindabour in the Sawla-Tuna-Kalba District	Although our yield has improved, we have not seen any corresponding increase in access to market. It takes us longer time to sell off our produce.	No marked improvement in market for produce.
2: Sakpa Dure in the Bole District	Access to market has not improved. We still sell in our local markets and on market days.	No marked improvement in market for produce.
3: Yaala N ^o 1 in the Wa East District	Sahel Grains hardly come to us for the maize after they have taken their credit. We travel to some local and outside markets to sell our produce. The prices offered are also low.	Selling to local middlemen/women
4: Gadi in the Wa West District	The length of time it takes us to market our produce has not improved significantly. We still depend on middlemen/women to market our produce.	Selling to local middlemen/women

Community	Remark about Farm Size	Theme
5: Bugubelle in the Sissala East Municipality	Sahel Grains sometimes come to buy maize three months after harvest. Not all of us can store the maize up to that time. We must sell the produce early to settle our debts.	Market opportunities have not improved significantly
6: Jawia in the Sissala West District	The local markets and those in other districts remain our main market destinations. Maybe Sahel Grains can sustain themselves for a long time with the produce they pick from us during threshing. We cannot always wait on them. So we sell to other people.	Selling to local middlemen/women
7: Kaleo in the Nadowli-Kaleo District	We sell our produce to people at the local market. They are our main source of market.	Selling to local middlemen/women
8: Yibilee in the Wa Municipality.	We sell to people who come to the market to buy maize.	Selling to local middlemen/women

When asked to comment on the claim by the focus group discussants that market for the produce has not improved remarkably, the USAID-IPIMFS Management remarked that:

“the maize from the Upper West Region, especially Sissala East District and the Sissala West District, are among the best in Ghana. The aflatoxin content is very low, which explains the concentration of our concentration in these districts. However, the company does not have ready funds to purchase the produce. To do that we may have to depend on the banks and pay interests. The long turn-around time is the reason we are unable to buy the produce on time”

2.3.3. Factors that Underpin the Activity’s Performance

The results in section 2.2 of this report indicate that the activity has promoted agricultural land use intensification, enhanced productivity and increased gross margin per hectare of maize farm. The factors that have led to these results are outlined in this section of the report.

2.3.3.1 Reduced Post-harvest Losses

As discussed earlier (refer to section 2.3.1 of this report), the proportion of farmers who reported post-harvest losses has decreased from 26.8% in 2016 to 15.2% in 2018. The respondents attributed this to the post-harvest handling techniques they have been introduced to by the activity. As stated earlier, the post-harvest handling strategies include a) timely harvesting from the field, b) pre-harvesting drying, c) threshing/ shelling the grains, d) cleaning the grains, e) transport (moving the grains to the collection point and how to maintain good quality grains at the collection point) and f) storage. These pre-harvest and post-harvest handling strategies are known to have positive implications for the elimination of aflatoxin in the maize and ultimately enhance its competitiveness.

2.3.3.2 Activity's Gender Mainstreaming Strategy

The activity consciously integrated the needs of gender into its design and support systems. As outlined in section 2.1 of this report, approximately 56% of the beneficiary smallholder farmers were females. However, in Northern Ghana, females account for between 44 and 47% of the population of farmers ((Farnworth and Mahama, 2012; Ghana Statistical Service, 2016). Female nucleus farmers were also been recruited to offer support to females and serve as models to them. These possibly explain the improvement in the productivity of females and their ability to break away from gender stereotypes. The implication is that USAID-IPIMFS has contributed to mainstreaming females into the development process at the local level.

2.3.3.3 Training and Mechanization Support Services

The smallholder farmers' ability to intensify the lands they cultivate results from the training in agronomic practices and post-harvest handling they received from the activity. The survey data indicate that approximately 35% of the farmers who were recruited onto the USAID-IPIMFS activity received training and mechanization services (males =15% and females = 21%). Refer to Table 19 for details. These services include, harrowing, ripping, planting, threshing and transport. The result further highlights the conscious attempts the activity made to address the needs of both males and females in the target districts. The mechanization services, whose repayment were often deferred to post-harvest, has made a profound effect on productivity. The USAID-IPIMFS Management added that the produce of each smallholder farmer who received mechanization support was transported to the point of storage without any fees. These support systems motivated the farmers to invest in their farms.

Table 19: Farmers who Benefitted from Mechanization Services (N= 5195)

Target Districts	Number of Beneficiary Farmers			Training and Mechanization			Farmers who Benefitted from Mechanisation Services (%)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Sawla-Tuna-Kalba	367	695	1062	119	168	287	2	3	6
Wa East	147	136	283	62	48	110	1	1	2
Wa West	165	257	422	0	0	0	0	0	0
Sissala East	906	1128	2034	578	829	1407	11	16	27
Sissala West	296	309	605	26	24	40	1	0	1
Nadowli-Kaleo	210	295	505	0	0	0	0	0	0
Bole	97	85	182	0	0	0	0	0	0
Wa Municipal	69	48	117	0	0	0	0	0	0
Total	2257	2953	5210	785	1069	1844	15	21	35

2.3.3.4 Catalytic Effects from Sahel Grains Limited Clients

During the activity implementation, Sahel Grains Limited secured maize supply contract with Nestle Ghana Limited. Through the contract, 300 youth farmers will be trained as agripreneur on their flagship “Youth Agripreneurship Development in the SADA Zone (YADIS) activity”. The company has also introduced to the Ghanaian market “Faast Mmori”, which is produced from the maize it procures from the smallholder farmers. The implication is that the ready market the activity has offered to the smallholder farmers has its roots in the maize supply contract and the products the company sells to the Ghanaian market.

2.4 Intended and Unintended Effects of the Activity

As discussed in section 2.2 of this report, the intended benefits include a) increased yield per hectare, b) reduced post-harvest losses, c) increased volume of maize sales and consumption, d) increased gross margins for the smallholder maize farmers, and e) gender mainstreaming in maize production. These imply that the USAID-IPIMFS has attained its objective of increasing the incomes of smallholder farmers in the target district, which has positive implications for household food security. The important lesson is that the activity has changed the perspectives of smallholder farmers to consider farming as a business. The next section of the report is dedicated to a discussion of the unintended benefits and cost of the activity in the target districts.

2.4.1 Unintended Positive Effects

2.4.1.1 Career in Maize Production by Female Smallholder Farmers

The USAID-IPIMFS aimed at ensuring gender equality. Now the females are respected at both the community and household levels. The females have had improved access to land for farming purposes, although that barrier has not been removed completely. The use of female Nucleus Farmers in the target districts has also improved the female smallholder farmers’ access to training and mechanization services. The Nucleus Farmers also serve as models to the female farmers in the target districts. From the focus group discussion, female participants remarked that they are now included in decision making at both household and community level. This is because **“we are now relatively economic independent”**. This remark resonates the perspective of all the female farmers who were covered in the focus group discussions.

2.4.1.2 Improved Staffing Capacity of Sahel Grains Limited

Through the USAID-IPIMFS, the corporate image of Sahel Grains Limited has been transformed. Prior to the activity, Sahel Grains Limited had ‘full-time’ staff strength of four. As of the time of this assessment, its “full-time” staff strength had increased from 4 to 40 (with 98% within the youth bracket and approximately 35%, as females). The additional staff were employed because of USAID-IPIMFS but will continue to work after the exit of the activity. The assessment team also observed that the Company had set-up Quality Control Unit; Planning and Coordination Unit; Agricultural Mechanization Unit, Sales and Marketing Unit and had three offices that were in Techiman (production), Tumu (field monitoring activities of farmers) and Kumasi. The arrangement to establish the departments was not

part of the plan but became necessary due to the need to distribute and sell the Faast Mmori product.

The quality of staff has also been enhanced. It was observed that all the Field Officers at Sahel Grains had graduated from various university degree programs. This implies that the USAID-IPIMFS has enabled SGL to employ and retain competent staff. Sahel Grains Limited had expanded its network to cover other organizations in the maize value chain. For instance, the Fast Koko Mmori has been endorsed by the Pediatric Society of Ghana (PSG).

2.4.1.3 Adoption of Sound Agronomic Practices by Non-Activity Beneficiaries

Interviews with Activity Field Staff indicates that they sometimes allowed non-activity beneficiary farmers to join the training programs. These are farmers who were not profiled under the USAID-IPIMFS. These farmers are adopting the agronomic practices (such as row planting, correct use of fertilizer and post-harvest management practices) the activity introduced to the direct beneficiary smallholder farmers. It is instructive to note that benefits to these non-targeted farmers came at no cost to the USAID-IPIMFS.

2.4.2 Unintended Negative Effects – Environmental Consequences

As discussed earlier, the ploughing services the activity offered to the smallholder farmers are inconsistent with the minimum tillage policy of the Ministry of Food and Agriculture (Government of Ghana, 2010: 42). This practice could have adverse implications for the sustenance of soil moisture content, which is vital for the promotion of climate smart agricultural practices (Karuma et al., 2014). The USAID-IPIMFS Management aims to scale up ripping services to mitigate the adverse effects of maximum tillage on the environment. Where maximum tillage is the only option, tractors operators need to comply with appropriate tillage practices to mitigate any likely environmental consequences of the activity.

2.5 Incorporation and Effects of Digital Financial Services

Digital financial services provide increased financial inclusion to help reduce poverty levels and lead to economic growth. Such services increase access to finance among the poor and reduce the cost of financial intermediation for banks. The activity unintentionally introduced the smallholder farmers to digital financial services. This section of the report discusses typologies of digital financial services the smallholder farmers in the target districts patronize.

2.5.1 Typologies of Digital Financial Services

The survey results show that 26% of the smallholder farmers (males = 29% and females = 24%) have been introduced by the activity to mobile money financial service. The activity management paid for the maize they bought from the smallholder farmers mainly using the ‘mobile money platforms’ of the telecommunication firms in Ghana. The content of the activity’s training programs was revealed to include digital financing where there were proposals to allocate some capital to co-financing with banks direct credit to farmers for inputs, support negotiations for input prices, provide forward contracts and facilitate an agreed system of shared ownership and risk for the entire process amongst partners, ensure field staff are assigned to a target number of farmers and assume responsibility for training

and agronomic support. Others were to expand production which is to be phased in parallel with investments in factory operational capacity and creating market demand over the project life cycle, offering premium pricing based on quality above the benchmarked market price to give farmers an incentive to sort the maize and working closely with FBO leaders to ensure efficient utilization of available equipment. Additionally, the singular action of paying the farmers through ‘mobile money’ has created awareness of and patronage for mobile money (refer to Table 19). This creates employment for the mobile money vendors as well as promote the safety of the smallholder farmers.

The other digital financial services the farmers were aware of and used occasionally were mobile banking and credit/debit cards. These were more profound in the Sissala East District ((males = 96% and females = 100). The activity could not be linked to these other digital financial services.

Table 20 Typologies and Use of Digital Financial Services

Name of District				Mobile money	Mobile banking	Credit/debit cards	Total
Nadowli-Kaleo	Gender	Male	Number	22	7	0	22
			%	100.0	31.8	0.0	50
		Female	Number	20	6	0	20
			%	100.0	30.0	0.0	50
Sissala East	Gender	Male	Number	10	43	42	45
			%	22.2	95.6	93.3	51.1
		Female	Number	4	43	43	43
			%	9.3	100.0	100.0%	48.9
Wa West	Gender	Male	Number	2	1	0	2
			%	100.0	50.0	0.0	100
Wa Municipal	Gender	Male	Number	1	0	0	1
			%	100.0	0.0	0.0	33.3
		Female	Number	1	1	0	2
			%	50.0	50.0	0.0	66.7
Total	Gender	Male	Number	35	51	42	70
			%	50.0	72.9	60.0	51.9
		Female	Number	25	50	43	65
			%	38.5	76.9	66.2	48.1
		Total (Male + Female)	Number	60	101	85	135
			%	44.4	74.8	63.0	100.0

Source: Field Survey, May 2019

2.5.2 Farmers’ Experiences and Perception about the Use of Digital Financial Services
 Interviews with the smallholder farmers revealed that the activity beneficiary farmers were using digital financial services introduced to them for a myriad of reasons. The reasons include timesaving (93%), cost-effectiveness (92%) and guaranteed and convenient access to one’s funds (72%). As presented in Table 20, the some of the smallholder farmers did not use the services because of poor mobile connectivity, their inability to read and understand and safety concerns (activities of fraudsters and scammers).

Table 21: Reasons for Non-Utilization of Digital Financial Services

Name of District			Poor mobile connectivity	Inability to read and write	Security concerns	Total
Nadowli-Kaleo	Male	Count	3	1	1	11
		%	27.3	9.1	9.1	44.0
	Female	N	0	8	0	14
		%	0.0	57.1	0.0	56.0
Sissala West	Male	N	0	0	0	1
		%	0.0	0.0	0.0	50.0
	Female	N	0	0	0	1
		%	0.0	0.0	0.0	50.0
Wa West	Female	N	5	2	0	6
		%	83.3	33.3	0.0	100.0
Wa Municipal	Male	N	2	0	0	2
		%	100.0	0.0	0.0	66.7
	Female	N	1	0	0	1
		%	100.0	0.0	0.0	33.3
Total	Male	N	5	1	1	14
		%	35.7	7.1	7.1	38.9
	Female	N	6	10	0	22
		%	27.3%	45.5	0.0	61.1
	Male + female	N	11	11	1	36
		% of Total	30.6%	30.6%	2.8	100.0

2.6 Sustainability and Catalytic Role

2.6.1 Activity's Catalytic Effects

The assessment of the catalytic effects of the USAID-IPIMFS activity focusses on the various interventions and strategies that were not part of this activity but influenced the actualization of the goal and objectives. The catalytic effects include Agricultural Policies by Government of Ghana, improved staff strength and corporate image of Sahel grains Limited and support from other Feed-the-Future projects (ADVANCE and USAID-Financing Ghanaian Agricultural Projects [USAID-FinGAP]). These are discussed in this section of the report.

2.6.1.1 Agricultural Policies in Ghana

The Government of Ghana's agricultural policies such as the Planting for Food and Jobs and the Fertilizer Subsidy Program seek to increase agricultural productivity, as this will help to promote maize productivity; thus, helping to improve access to maize by the small-holder farmers under the USAID-IPIMFS. These agricultural policies and strategies focus on the provision of free seedlings, fertilizers and other farm inputs, which impliedly translates into a reduction in the cost of production for farmers whilst at the same time helping them to increase productivity. In terms of logistics, Sahel Grains Limited had resources such as tractors, ploughs, air/screen, rotary drum cleaners, and Brock SuperB continuous flow dryers, grain bins/silos, a truck and human resources. These were acquired before the USAID-IPIMFS but used as leverage for the implementation of the activity. These resources, though inadequate, supported the implementation of the USAID-IPIMFS activity.

Despite the important role agriculture plays in the socio-economic development of Ghana, farmers especially those in the rural areas are among the low-income groups in the country. This is due to the use of rudimentary approaches to farming and high postharvest losses. The USAID-IPIMFS, which sought to increase the productivity and incomes of maize farmers in the SADA zone, has helped to address some of these fundamental problems facing Ghanaian farmers. The Activity has helped to increase the productivity of beneficiary farmers whilst at the same time helping to reduce postharvest losses. This has helped increase the income levels of farmers. Overall, Sahel Grains has been able to reach 5,248 farmers of which some have been provided with pre/post-harvest mechanized services (ploughing, ripping, planting, threshing and transportation) and also, guaranteed market access through the company's business relations with Nestle Ghana and also as a consumer food business (producing Faast Mmori). The increase in income has helped improve the overall household purchasing power of beneficiaries which has positively influenced their standard of living.

2.6.1.2 Improved Corporate Image of Sahel Grains Limited

Through the USAID-IPIMFS Activity, Sahel Grains has increased its staff strength by 400%. The newly recruited employees now have a stable income, as this will go a long way to improve their living standards and that of their dependents. The USAID-IPIMFS Activity has also helped empower the women in the beneficiary communities through the increase in their participation in economic activities. This has helped to improve women's participation in decision making processes at the household and community levels. The USAID-IPIMFS Activity has further helped actualize the potentials of beneficiary women to actively engage in economic activities such as farming. Through the USAID-IPIMFS Activity, Sahel Grains offered internship opportunities to students of the Kwame Nkrumah University of Science and Technology (KNUST). Also, students of the University for Development Studies (UDS) were recruited as enumerators for the annual beneficiary based (BBS) surveys. This has benefited the students by helping them get practical experience for their professional development.

2.6.1.3 Support from Other Feed The Future Projects

Sahel Grains Limited expanded its network to cover other organizations in the maize value chain in Ghana. This strategy has enhanced the implementation of the USAID-IPIMFS. For instance, Sahel Grains Limited through USAID-IPIMFS collaborated with USAID-ADVANCE to develop a manual to facilitate the training of small-holder maize farmers in both pre and post-harvest agronomic practices. The use of the manual ensured efficiency by eliminating the resources that would otherwise been spent on the development and testing of new manuals for same purposes. Similarly, the USAID-ADVANCE Nucleus Farmer (NF) model was adopted by Sahel Grains to profile and train maize farmers across the zone of influence (ZOI). Using this tried and tested model also facilitated the recruitment of the farmers for training and other support services.

USAID-IPIMFS replicated USAID-FinGAP's Business Advisory Service model by setting up business advisory desks in the Wa and Tumu offices. These desks assisted the nucleus farmers to grow their outgrower businesses. The USAID-IPIMFS piloted the Business Advisory Service model delivery in business planning, cost structuring, market development, and cash flow development for two nucleus farmers in Sissala West and

Sawla-Tuna-Kalba. Discussion with management revealed that the model was very effective. Discussions with project managers revealed that the model was very effective because all 22 Nucleus Farmers (4 females and 18 males) within the ZOI (8 districts) had at least 70 smallholder farmers. The farmers assessed the necessary training and mechanization services through the Nucleus Farmers.

Further discussions with management revealed that Nucleus Farmers mobilized the farmers for training and to access farm mechanization services. The Nucleus Farmers also managed all mechanized inputs. The work of the Nucleus Farmers was confirmed during discussions with farmers who maintained that they were given tractors and the needed training to mechanize and improve their activities”.

2.6.2 Likelihood of Continuation

The sustainability of the activity is the ability of its activities and benefits to be maximized and continued after its exit. Thus, to remain a going concern, the leveraged capital invested, together with the aligned strategic objectives of the Sahel Grains Limited should necessitate that the goal and activities defined in the USAID-IPIMFS activity continues to ensure the survival of the Company and the well-being of its beneficiaries. In this light, for continued success, post-activity, farmers should have sustainable linkages to both the market, and all factors of production. The existence of this linkage is perhaps the unique and most attractive feature of the transition. As Sahel Grains has a major competence in the primary processing of maize to ensure quality at all times, the company will continue to provide mechanized services (essentially the full suite of mechanized services in the areas of ploughing, threshing, planting, threshing and transport) on a sustainable interest-free basis to farmers. Farmers can then pay for 40% of the market rate for mechanized service (to cover operating expenses) and with an interest and pay the remaining 60% in-kind after harvest. According to Management, this is yielding some positive effects since its recovery from this setup in the past three (3) years has been over 90%. However, because the current number of Sahel Grains Limited’s field equipment does not meet the growing demand of its farmer network, there is the need to identify and profile specific number of farmers to work with in every farming season. According to Management, during harvesting period, the farmers will also be provided with a strong market access, and with this, Nestle Ghana Limited will serve as an anchor off-taker, purchasing on a whole, about 700 metric tons yearly from the farmers at a premium price for the high-quality maize produced. Additionally, Sahel Grains Limited, as a grain handling company, in the case of saturation, will link these farmers to some of its service providers and buy some of the maize in bulk to produce innovative packaged fermented dough product ‘Faast Mmori’³¹.

Moreover, Sahel Grains recently developed a 12,000 MT factory grain-bin. This could enable the company to increase its capacity in buying and storing maize from smallholder farmers in Ghana and ultimately support the activity’s efforts to sustain the benefits. It is therefore noteworthy that the USAID-IPIMFS activity presents an important opportunity for farmers to therefore be committed to the activity’s sustainability as they will continue to increase productivity whilst at the same time reducing postharvest losses.

³¹ Processed corn dough, which has been packaged and sold in various supermarkets in Ghana

Through the implementation of the USAID-IPIMFS activity, Sahel Grains has established an efficient organizational structure which will go a long way to promote the sustainability of the Activity after exit. These organizational structures include the existence of Sahel Grain's headquarters at Techiman which also serves as the center for storage and manufacturing, the Kumasi office which is in charge of the marketing of "Fast Mmori" and the Tumu office which is in charge of the coordination of the field activities such as training and mechanization services. Sahel Grains have also established various departments including the production and quality control unit; planning and coordination unit; agricultural mechanization unit, sales and marketing unit. These organizational structures, the human and logistical resources that are currently being used for the implementation of the USAID-IPIMFS will still be in existence after the Activity exit and this will go a long way to promote the sustainability of the Activity. Finally, the ability for Sahel Grains to identify and tap into existing market demand for their products is an important sustainability strategy. Sahel Grains continue to expand its market for its "Fast Mmori" which is distributed throughout Ghana including all ShopRite branches; pharmacy shops and vantage places in Kumasi. Sahel Grains also currently supply Nestle with high quality maize for 'Cerelac'³².

2.6.3 Appropriateness of USAID-IPIMFS Exit Strategies

The activity's exit strategies include a) *continuous mechanization service support and b) guaranteed access to market*. These exit strategies will enhance the sustainability of the activity benefits. The existence of organizational structures such as the headquarters in Techiman and the Kumasi and Tumu Offices are important and appropriate strategies that will help promote the sustainability of the Activity. However, there is the need to strengthen the public relations and marketing strategies of Sahel Grains. In as much as, the target market continues to expand, there is the need for Sahel Grains to take advantage of marketing opportunities on electronic and digital media such as social media. Digital marketing such as the social media platforms helps reach a wider target market with little cost and this will go a long way to promote the sustainability of marketing opportunities. Also, through the USAID-IPIMFS Activity Sahel Grains has offered pre/post-harvest mechanized services and expanded market access to 5,248 farmers. The existence of nucleus farmers who have been given eight (8) tractors is an important exit strategy that will ensure the continuation of the provision of the pre/post-harvest mechanized services. On the other hand, Sahel Grains Limited's current processing capacity of 20,000 metric tons could ensure the continuous demand for maize which will be vital for the sustenance of expanded market opportunities. These are important exit strategies that will help promote the sustainability of USAID-IPIMFS Activity.

Finally, Sahel Grains has improved its human and logistical capacity which is an important exit strategy. In terms of human resources, Sahel Grains has been able to increase its staff strength by 400% and recruited staff with background in food science, business and development policy planning. The recruitment of these highly qualified staff is an important strategy that is going to help ensure the sustainability of the Activity after exit. However, for Sahel Grains to fully benefit from its staff strengths there is the need for management to put

³² A brand of instant cereal with milk made by Nestle purposely for complementary feeding of babies from 6 months

in place measures to ensure the retention of these skilled labor force and their continuous skills upgrading. Through the USAID-IPIMFS Activity, the logistical capacity of Sahel Grains has improved enormously. These include the purchase of equipment such as tractors, threshers, trucks and investment in ultra-high-quality grain cleaning, automated bagging, scaling and closing operations. This equipment will be in place after the exit of the USAID-IPIMFS Activity; however, for Sahel Grains to maximize the benefits derived from this equipment, there is the need for a maintenance plan to ensure effective maintenance of these equipment.

2.6.4 Risk Factors that Require Attention to Improve the Activity Sustainability

Ghana's agricultural sector is rain fed which is not sustainable. Due to limited access to irrigation facilities, farmers in Ghana are not able farm during the dry season. This threatens the raw material base of Sahel Grains. The development of a 12,000 MT factory grain-bins by Sahel Grains will help in the storage of maize during the bumper season. However, there is the need for future strategies to look at the provision of irrigation facilities for all-year-round farming; thus, helping to promote sustainable supply of maize. Through the USAID-IPIMFS Activity, Sahel Grains has been able to install various equipment which will help in the manufacturing and storage of maize. Even though this equipment are fixed assets, due depreciation adequate provisions must be made for the high cost of equipment maintenance. The high cost of equipment maintenance could lead to cost transfer to small holder farmers. Additionally, due to macroeconomic instability within the Ghanaian context, the cost of farm inputs continues to increase. This contributes to increase in the cost of production which will go a long way to affect the prices of maize being bought by Sahel Grains. In terms of marketing, Sahel Grains continue to penetrate through the Ghanaian market with its "Faast Mmori"³³. Also, the company's ability to get Nestle Ghana as one of its customers is an important marketing strategy. However, the unstable nature of the Ghanaian market in terms of price stability and retention of customers calls for prudent marketing strategies for Sahel Grains to sustain its current customer base and expand to other marketing potentials. In as much as Ghana's labor market has a highly skilled labor force, retaining well trained staff is a major problem for growing companies such as Sahel Grains. There is therefore the need for the Sahel Grains to put in place sustainable staff retention policies which centers on incentives, on the job training and opportunities for career advancement and development.

3 SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

This study sought to: 1) to assess the extent to which the activity has achieved its goal and objectives; and 2) to determine the extent to which the activity has contributed towards achieving USAID/Ghana's Feed the Future (FTF) program objective of increasing the productivity and incomes of smallholder maize farmers in the activity target districts. This section of the report, hence, presents findings on the extent to which the USAID-IPIMFS has achieved its aim of increasing the productivity and incomes of maize farmers in the SADA zone. Also, the lessons, challenges and best practices are presented which informed the recommendation to guide future implementation arrangements.

³³ Processed corn dough, which has been packaged and sold in various supermarkets in Ghana

3.1 Summary of Findings

3.1.1 Attainment of Activity Goals and Objectives

3.1.1.1 Farm Size by Gender and District

The mean farm size of smallholder farmers had decreased significantly (23%) from 2.04 ha in 2016 to 1.57 ha in 2018. However, farm sizes in the Sissala East Municipality, Wa East, Wa West Districts and Wa Municipality had increased for the period under review. The farm sizes in the target districts were generally larger for males than females. The survey results revealed further that the mean farm size was smaller for farmers who received both 'training and mechanization support' (1.2 ha) from the USAID-IPIMFS than those who received only 'training support' (2.115 ha). Farmers who received training and mechanization support from the activity had intensified the use of the available lands. Extracts from the focus group discussions confirm the point small-holder farmers' 'perceived' high cost of mechanization services partly informed their decision to adopt intensification rather than increasing the farm sizes.

3.1.1.2 Maize Yield per Hectare (MT) by Gender and District

The mean maize yield by farmers was 3.9 MT/ha, which represent a 22% increase in the mean yield of 3.20 MT/ha in 2016. The yields in all districts increased within the period under review. The increases were highest in the Wa East District (6.45 MT/ha) and Sissala East Municipality (5.19 MT/ha). Generally, male farmers had higher outputs than female farmers in the districts. Farmers' productivity was observed to be higher than the average yield (of 2.1 MT/ha) reported for Northern Ghana (i.e. Northern Region, Upper West Region and Upper East Region). The higher yield has positive implications for household food security.

3.1.1.3 Total Cost of Maize Production (GHS) by Gender and District

The results further showed that maize seeds, ploughing/harrowing, sowing (planting), fertilizer and its application, weeding (including the use of agrochemicals), transport, farm implements (procurement and rental) and repairs, and harvesting, were the major maize variable cost items. Input prices varied across activity districts mainly because of the observed differences in farmers' expenditure. Maize production cost in the target districts was higher for male than female farmers. Fertilizer and its application were the major cost item (38%) of the total cost of production, across all the target districts. The use of fertilizer could be one of the explanatory factors for the observed improvement in productivity. The other factors could be the adoption of sound agronomic practices such as row planting, timely control of weeds, timely application of fertilizer and appropriate post-harvest handling. Cost of land tillage (mainly ploughing) and maize harvesting accounted for approximately 17% and approximately 13% respectively of the total cost of investment. It should however be noted that land tillage using the plough could have adverse implications for environmental sustainability; hence, the need to minimize the practice. The ripping tillage method could be scaled up in other target communities.

3.1.1.4 Volume of Maize Sales (GHS) by Gender and District

The results showed that farmers sold an average of 3.32 MT in 2018, which was higher for male than the female farmers covered in the study. Farmers sold approximately 70% of the total harvest. Like the base year, there was a high maize allocation for consumptive and other non-commercial purposes (such as gifts during festive occasions) by the smallholder farmers in the districts. This is consistent with the use of the maize as the largest food security crop across Ghana.

3.1.1.5 Gross Margin Analysis

A mean gross margin per hectare of GHS 2,256.05 was obtained, which was generally higher among the male maize farmers than the female maize farmers covered in the survey. This finding was found to be consistent with the volume of maize sold by male and female farmers. Based on this assessment the higher the yield and volume of maize sales (all higher than the rate of increase in input cost), the higher the gross margin. Other variables such as value of sales, unit of production, total production cost and purchased recurrent input cost are also used in the determination of gross margin. The sex-aggregated gross margin was highest in the Sissala East Municipality (GHS 569,052.65) and lowest in the Bole District (GHS 42,516.70). Gross margins were highest for males in the Sissala East and Wa East Districts, which is directly proportional with the data on 'yield' and 'volume of maize sold' and further underscores the importance of farm mechanization in increased incomes for smallholder farmers. The mean gross margin was approximately 24% higher for farmers who received only training and mechanization support (GHS 2,541.58) than those who received both training support (GHS 2,050.84) from the activity.

3.1.1.6 Post-harvest Losses (%) by Gender

The proportion of farmers who experienced post-harvest losses in 2016 was 11.6% higher than those who experienced post-harvest losses in 2018. The results generally showed that the proportion of male and female who reported that they experienced no significant post-harvest losses has also increased over the period at the end of the 2018 farming season, with very little variations in terms of responses among gender. The reduction in the number of farmers who experienced post-harvest losses during the period under review could be one of the factors that account for increased productivity and gross margins.

3.1.2 Intended and Unintended Effects of the Activity

3.1.2.2 Unintended Positive Effects

Premised on the USAID-IPIMFS' aim of ensuring gender equality, the results showed that females were more independent than the period before the USAID-IPIMFS. They are, therefore, included in the decision-making process at the household and community levels. Their access to land for productive purposes has also improved. The use of female Nucleus Farmers in the target districts was also found to have improved the female smallholder farmers' access to training and mechanization services. The activity's gender mainstreaming strategies have thus had multiplier effects on broader gender equality objectives.

3.1.3 Incorporation and Effects of Digital Financial Services

3.1.3.1 Typologies of Digital Financial Services

Approximately 26% of the smallholder farmers have been introduced by the activity to mobile money financial service, which was higher among male (29%) than female (24%) smallholder farmers. The results showed that the activity management paid for the maize they bought from the smallholder farmers mainly from the 'mobile money platforms' of the telecommunication firms in Ghana. The team's review of the content of the activity's training programs was revealed that the USAID-IPIMFS was designed to include digital financing. The activity was designed to allocate some capital to co-finance banks direct credit to farmers for inputs, support negotiations for input prices, provide forward contracts and facilitate an agreed system of shared ownership and risk for the entire process amongst partners, and ensure field staff are assigned to a target number of farmers and assume responsibility for training and agronomic support. The singular action of paying the farmers through 'mobile money' has also created awareness of and patronage for mobile money. This has created employment for the mobile money vendors as well as promote the safety of the smallholder farmers. Other digital financial services farmers were aware of and used occasionally were mobile banking and credit/debit cards, which were more profound in the Sissala East District.

3.1.3.2 Farmers' Experiences and Perception about the Use of Digital Financial Services

Smallholder beneficiary farmers were using digital financial services introduced to them for reasons such as timesaving (93%), cost-effectiveness (92%) and guaranteed and convenient access to one's funds (72%). Reasons for the non-use of digital financial services by beneficiaries included among others poor mobile connectivity in communities, no money to purchase phones or engage in any of the services, and the inability to read and write the English language (which was highly reported among female than male farmers).

3.1.4 Sustainability and Catalytic Role

The sustainability of the activity is the ability of its activities and benefits to be maximized and continued after its exit. The program was found to play various catalytic role which has influence on its sustainability. The sustainability and catalytic roles of the activity were assessed under three key areas, which are stated below.

3.1.4.1 Appropriateness of Activity's Strategies

Several exit strategies have been put in place to ensure the sustainability of USAID-IPIMFS Activity. Significant among them are the existence of organizational structures such as the headquarters in Techiman and the Kumasi and Tumu Offices, and establishment of the production and quality control unit; planning and coordination unit; agricultural mechanization unit, sales and marketing unit. These are currently being used for the implementation of the USAID-IPIMFS and expected to be in existence after the Activity's exit. This notwithstanding, there is the need to strengthen the public relations and marketing strategies of Sahel Grains. Additionally, the existence of nucleus farmers who have been given eight (8) tractors is an important exit strategy to ensure the continuation of the provision of the pre/post-harvest mechanized services. Sahel Grain's current processing capacity of 20,000 metric tons will further ensure the continuous demand for maize which

will go a long way to sustain the expanded market. Another important strategy is the improved human and logistical capacities of the company through the USAID-IPIMFS. Sahel Grains has been able to increase its staff strength by 400% and recruited staff with background in food science, business and development policy planning. In terms of logistics, the company has purchased tractors, threshers, trucks and investment in ultra-high-quality grain cleaning, automated bagging, scaling and closing operations. These are expected to be in place after the exit of the USAID-IPIMFS Activity. There is however the need for a maintenance plan to maximize the benefits derived from this equipment. The above, in addition to others, are important exit strategies that will help promote the sustainability of USAID-IPIMFS Activity.

3.1.4.2 Likelihood of Continuation

An important effort to promote continuation of the activity was revealed to be improving farmers' access to strong market during harvesting periods. As such, Nestle will serve as an anchor off-taker, purchasing yearly from the farmers at a premium price for the high-quality maize produced. Also, Sahel Grains, in the case of saturation, will link farmers to some of its service providers and purchase some of the maize in bulk to produce innovative packaged fermented dough products. Moreover, Sahel Grains recently developed a 12,000 MT factory grain-bin. The company can thus continue to purchase the produce from the further, which could have implications for the sustenance of the benefits of the USAID-IPIMFS.

3.1.4.3 Risk Factors that Require Attention to Improve the Activity Sustainability

To improve upon productivity and minimize losses, the USAID-IPIMFS Activity has installed several relevant equipment to help in the manufacturing and storage of maize. Also, to minimize risks of poor access to markets and income, Sahel Grains continue to penetrate through the Ghanaian market with its "Faast Mmori". Also, the company's ability to get Nestle Ghana as one of its customers is an important marketing strategy. The unstable nature of the Ghanaian market in terms of price stability and retention of customers however calls for prudent marketing strategies to sustain its current customer base and expand to other marketing potentials

3.2 Key Lessons from the USAID-IPIMFS

Five key lessons were drawn from the activity. These are stated below:

- The activity's deliberate focus on gender mainstreaming was observed to have made profound contribution to improving women livelihoods and giving them a voice; hence, the need to intensify and continue with such efforts;
- Economic empowerment breaks barriers against females, as they are now empowered by their access to land for farming. However, the observation from the assessment females' investments were lower than that of men. Efforts are required to support the females to invest more in the farms;
- Using maximum tillage (mainly the disc plough) is inconsistent with MoFA's quest for minimal tillage (or zero tillage);
- Farmers are largely illiterate and considering evolution of farm management practices, there is the need to intensify farming practices. Hence, beyond the project, Sahel grains should continue to offer training on sound agronomic practices;

- Training and mechanization make profound contribution to improvement in productivity. However, the mechanization services lower gross margin; and
- Access to market for produce has not improved significantly because of late purchases by Sahel Grains Limited. Many of the farmers continue to sell their produce at the local markets. This could threaten the momentum in farming as a business in the ZOI.

3.3 Recommendations

Premised on the findings of the assessment, the following recommendations are made.

3.3.1 Continuous Training and Mechanization Activities

The study found that smallholder farmers were highly illiterate and could have adverse implications for the attainment of the activity objectives especially if the farmers are to read and understand directives on the use of agro-chemicals. This underscores the importance of annual training events for the smallholder farmers in the target districts. The Agricultural Extension Agents at the various District Assemblies present vital potentials for sustaining the training events. It is further recommended that Sahel Grains should adopt and implement more demonstrations to complement the training programmes given to farmers to improve upon related activities.

3.3.2 Promoting Sustainable Agricultural Practices

Promotion of sustainable agricultural practices in the activity districts will not only strengthen community resilience to the environmental risks but also minimize the impacts on the environment. These sustainable practices are intended to enable farmers incorporate into their farming practices systems that help maintain the soil fertility and texture as well as conserve water. The study recommends the incorporation of two mutually exclusive and harmonious packages: a) economically viable, ecologically sound, and socially compatible farming technologies, and b) services and inputs to help farmers. The following strategies could adopt by Sahel Grains Limited:

- Promoting minimal tillage in all districts (through the ripping service).
- Training tractor operators on environment-friendly tilling practices (e.g. ripping across the slope and protecting small trees during tilling).
- Sensitize farmers and agrochemical vendors on the appropriate use and disposal of agrochemicals. The Departments of Agriculture can be encouraged to recover the agro-chemical waste from the farmers for safe disposal.
- Promoting an integrated pest and disease management system e.g. pesticides risk reduction and integrated pest management.
- Promoting the improved land management practices. Establishing demonstration farms on which all the improved land management practices can be practiced. This will help the farmers appreciate not only the significance of these recommended practices but also their feasibility.

3.3.3 Intensifying Capacity Building

The study showed that Sahel Grains Limited has been able to improve its staff strength (numbers and quality). The recruitment of these highly qualified staff is an important strategy that is going to help ensure the sustainability of the benefits of the USAID-IPIMFS in

the ZOI. However, for Sahel Grains Limited to fully benefit from its staff strengths, there is the need for management to put in measures to ensure the retention of these skilled labor force and their continuous skills upgrading. In as much as Ghana's labor market has a highly skilled labor force, retaining well trained staff is a major problem for growing companies such as Sahel Grains Limited. There is therefore the need for the Company to adopt staff retention policies that center on incentives, on the job training and opportunities for career advancement and development. The assessment proposes bi-annual training in the form of capacity building program and workshop to its staff to equip them with the needed skills and tools. Clear policies are required on rewards for achieving targets, performance contracts, annual leave and maternity leaves. Policies on staff progression is another important requirement for the sustenance of the Company and by extension the sustenance of the benefits of the USAID-IPIMFS.

3.3.4 Improved Data Management System

Sahel Grains Limited is encouraged to develop systems to collect pristine data that can be used for future assessments. Field Officers should be resourced to continuously gather data from the smallholder farmers instead of relying on their recollection of past events for data. Doing this could guarantee the integrity of the data and its utility for decision-making.

3.3.5 Intensifying Gender Training and Mainstreaming Strategies

There should also be regular (specifically, annual) training of groups (both men and women) on basic laws that protect the rights of women as well as issues pertaining to violence against women, female farmers are mostly marginalized in most farming communities. It will be important to include men and community leaders in gender equality and women empowerment sensitization activities in order to develop their knowledge base and gain their cooperation. Females should be supported to have agreements (in the forms of Memorandum of Understanding) with landowners to forestall the possibility of forceful eviction from lands.

Training in sexual reproductive and health rights could also be mainstreamed into the operations of Sahel Grains Company Limited. With this, families can plan their lives to enhance productivity. The study lastly recommends the adoption of the USAID's Feed the Future Gender Integration Framework to guide the development of a comprehensive strategic plan to achieving more results on gender training and mainstreaming efforts.

3.4 Conclusion

The activity was designed to increase the productivity and incomes of maize farmers in the SADA zone by: providing farm-level support and aggregation services to smallholder maize farmers; developing bulk handling of maize to enhance efficiency, comprehensiveness, and gender inclusion in the maize value chain; improving the quantity, quality, and standards of maize markets; and providing access to a broader range of market access opportunities. This study is expected to provide USAID, its implementing partner (Sahel Grains), and activity stakeholders with data on outcomes, best practices, and lessons learned to inform planning for future activities.

It was found that although there is a 17% decrease in farm size to use of different units for the baseline and end of activity assessment, the program has helped increase the productivity of beneficiary farmers whilst at the same time helping to reduce postharvest losses. This has had corresponding increase in the income levels of farmers. Beneficiary farmers have been provided with pre/post-harvest mechanized services (ploughing, ripping, planting, threshing and transportation) and, guaranteed market access through the company's business relations with Nestle Ghana and as a consumer food business (producing Faast Mmori). Also, the activity's deliberate focus on gender mainstreaming have made profound contribution to improving women livelihoods and giving them a voice. Also, the training and mechanization activities introduced by the USAID-IPIMFS have make profound contribution to improvement in productivity.

Premised on the findings, the study calls for a call for longitudinal survey to ascertain the exact extent of progress and the impact of the activity, intensifying training and mechanization activities, promoting sustainable agricultural practices, strengthening policy actions for reducing poverty among farmers, promoting disease and drought resistant crop varieties with shorter gestation periods, improving access to stronger market and financial services, intensifying capacity building and staff retention policies and intensifying gender training and mainstreaming strategies, were critical factors which required attention to ensure the successful implementation of the program. In the context of the above, this report has offered new trajectories which can help to navigate the existing challenges as well as document arrangements in order to provide the needed assurance which can stimulate positive investment attitude among the program beneficiaries.

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