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IMPLEMENTATION COMPLETION AND RESULTS REPORT

TF0A4745

ON A

SMALL GRANT

IN THE AMOUNT OF US\$2.85 MILLION TO THE

REPUBLIC OF GHANA

FOR THE

Peri-Urban Commercial Vegetables Value Chains Project
December 30, 2021

CURRENCY EQUIVALENTS

(Exchange Rate Effective November 30, 2021)

Currency Unit = Ghana Cedis (GHS)

GHS 3.98 = US\$1

FISCAL YEAR

January 1 – December 31

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ABBREVIATIONS AND ACRONYMS

AEA	Agriculture Extension Agent
CPS	Country Partnership Strategy
DCS	Directorate of Crop Services
EFA	Economic and Financial Analysis
ESMF	Environmental and Social Management Framework
EMP	Environmental Management Plan
FASDEP	Food and Agriculture Sector Development Policy
FAO	Food and Agriculture Organization of the United Nations
FM	Financial Management
GAMA	Greater Accra Metropolitan Assembly
GAP	Good Agricultural Practice
GARID	Greater Accra Resilient and Integrated Development
GCAP	Ghana Commercial Agriculture Project
GDP	Gross Domestic Product
GIDA	Ghana Irrigation Development Authority
GEMS	Geo-Enabling Initiative for Monitoring and Supervision
GPRS	Ghana Poverty Reduction Strategy
GPVVCP	Ghana Peri-urban Vegetables Value Chains Project
GSDA	Ghana Shared Growth and Development Agenda
ICR	Implementation Completion Report
IR	Intermediate Results
JSDF	Japan Social Development Fund
M&E	Monitoring and Evaluation
MOFA	Ministry of Food and Agriculture
MoU	Memorandum of Understanding
PAD	Project Appraisal Document
PDO	Project Development Objective
PIU	Project Implementation Unit
PPEs	Productive Partnership Entrepreneurs
PERD	Planting for Export and Rural Development
PFJ	Planting for Food and jobs
PMP	Pest Management Plan
POM	Project Operation Manual
RAP	Resettlement Action Plan
SMEs	Small and Medium Enterprises
TOC	Theory of Change
WUA	Water Users Association
WHO	World Health Organization

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DATA SHEET

BASIC INFORMATION

Product Information

Project ID	Project Name
P150369	Ghana-Peri-Urban Commercial Vegetables Value Chains Project
Country	Financing Instrument
Ghana	Investment Project Financing
Original EA Category	Revised EA Category
Partial Assessment (B)	Partial Assessment (B)

Organizations

Borrower	Implementing Agency
Ministry Of Finance (MoF)	Ministry of Food and Agriculture

Project Development Objective (PDO)

Original PDO

The objective of the grant proposal is to improve on the productivity and access to market by the beneficiary vegetable farmers in selected peri-urban communities in Ghana.

**FINANCING**

	Original Amount (US\$)	Revised Amount (US\$)	Actual Disbursed (US\$)
Donor Financing			
TF-A4745	2,850,000	2,850,000	2,850,000
Total	2,850,000	2,850,000	2,850,000
Other Financing			
Local Beneficiaries	1,336,580	0	0
Total	1,336,580	0	0
Total Project Cost	4,186,580	2,850,000	2,850,000

KEY DATES

Approval	Effectiveness	Original Closing	Actual Closing
04-Nov-2016	15-Jun-2017	30-Jun-2020	30-Jun-2021

RESTRUCTURING AND/OR ADDITIONAL FINANCING

Date(s)	Amount Disbursed (US\$M)	Key Revisions
24-Jun-2020	1.42	Change in Components and Cost Change in Loan Closing Date(s) Reallocation between Disbursement Categories Change in Implementation Schedule

KEY RATINGS

Outcome	Bank Performance	M&E Quality
Moderately Satisfactory	Moderately Satisfactory	Substantial

**RATINGS OF PROJECT PERFORMANCE IN ISRs**

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US\$M)
01	05-Jun-2019	Moderately Satisfactory	Moderately Satisfactory	1.42
02	27-Dec-2019	Moderately Satisfactory	Moderately Satisfactory	1.42
03	30-Jun-2020	Moderately Unsatisfactory	Moderately Unsatisfactory	1.42
04	01-Feb-2021	Satisfactory	Satisfactory	2.77
05	28-Jul-2021	Satisfactory	Satisfactory	2.85

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I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

A. CONTEXT AT APPRAISAL

Context

1. At the time of appraisal of the Japan Social Development Fund (JSDF) funded Peri-Urban Vegetable Value Chains Project (GPCVVP) in April 2016, Ghana's economy was, as it still is, largely dependent on the agriculture sector. Agricultural growth was key to overall economic growth and development, despite the discovery and production of oil and gas in commercial quantities. The agriculture sector was also the largest employer, representing nearly 50 percent of total employment. The sector played a traditional role in the provision of food and nutrition security, supply of raw materials for industry, creation of employment and generation of foreign exchange earnings.
2. Despite the income generation and food security potential of peri-urban vegetable production, at appraisal farmers were only producing at 50 percent of attainable yields (MOFA, 2017)¹. Low yields were attributable to a lack of irrigation systems and limited use of improved agricultural inputs. In rainy seasons when there were usually product gluts, farmers experienced high post-harvest losses due to lack of processing and storage facilities. In addition, farmers' general lack of knowledge on the proper use and disposal of pesticides caused crop contamination and raised significant food safety concerns. While peri-urban irrigated vegetable farming could adequately meet a large share of the demands of the cities' populace, food safety concerns were causing super- and hypermarkets to import vegetables to serve the needs of the restaurants, hotels, the middle class, and the affluent who mistrusted local production due to safety concerns. Over the years, government and donor agencies intervened in the horticultural sector, with interventions mostly targeted at improving productivity and product quality of the local produce for mainly the European export market. Their interventions targeted mostly peri-urban commercial or semi-commercial ventures for the export market to the disadvantage of the poor smallholder farmers whose produce was purchased by middlemen and contractors at low farm gate prices to supply the city dwellers.
3. The project was designed as a pilot intervention to address key binding constraints in smallholder's peri-urban vegetable production, which included the inability to produce all year round due to lack of irrigation, poor agricultural practices, poor storage facilities and lack of market access. The project design aimed at responding to the specific needs of smallholder vegetable growers - building their capacities and assisting them with the requisite infrastructure to improve their productivity and produce. This was expected to enable the smallholder project beneficiaries to have direct access to high-value urban markets to improve their earnings and livelihoods.
4. The project was consistent with the Government of Ghana's vision of improving food security by increasing production and market access for vegetables both for domestic consumption and exports as articulated in the sector strategy-Food and Agriculture Sector Development Policy (FASDEP II) 2011-2017 as well as the Medium-Term Agriculture Investment Plan (METASIP) 2011-2017². Also, the project was consistent with the World Bank Group's Country Partnership Strategy (CPS) FY13-18³ which supported the Ghana Shared Growth and Development Agenda (GSGDA) and the Government's Agenda for Prosperity⁴. In particular, the project was aligned to CPS's Pillar 2 on Improving

¹ Ministry of Food and Agriculture (MOFA). 2017. Agriculture in Ghana: Facts and figures (2016). Accra, Ghana: MOFA

² Ministry of Food and Agriculture (MOFA). (2002;2011). Food and Agricultural Sector Development Policy (FASDEP I & II) & Ministry of Food and Agriculture (MOFA). 2011. Medium Term Agriculture Sector Investment Plan (METASIP), 2011-2015.

³ World Bank. 2013. Ghana Country Partnership Strategy FY12-18

⁴ Government of Ghana(GoG).(2010;2014) Ghana Shared Growth and Development Agenda (GSGDA) & Government of Ghana. 2017. The Coordinated Programme of Economic and Social Development Policies (2017-2024).



Competitiveness and Job Creation and its outcomes on increased adoption of new agricultural technologies and improved land and water management.

Theory of Change (Results Chain)

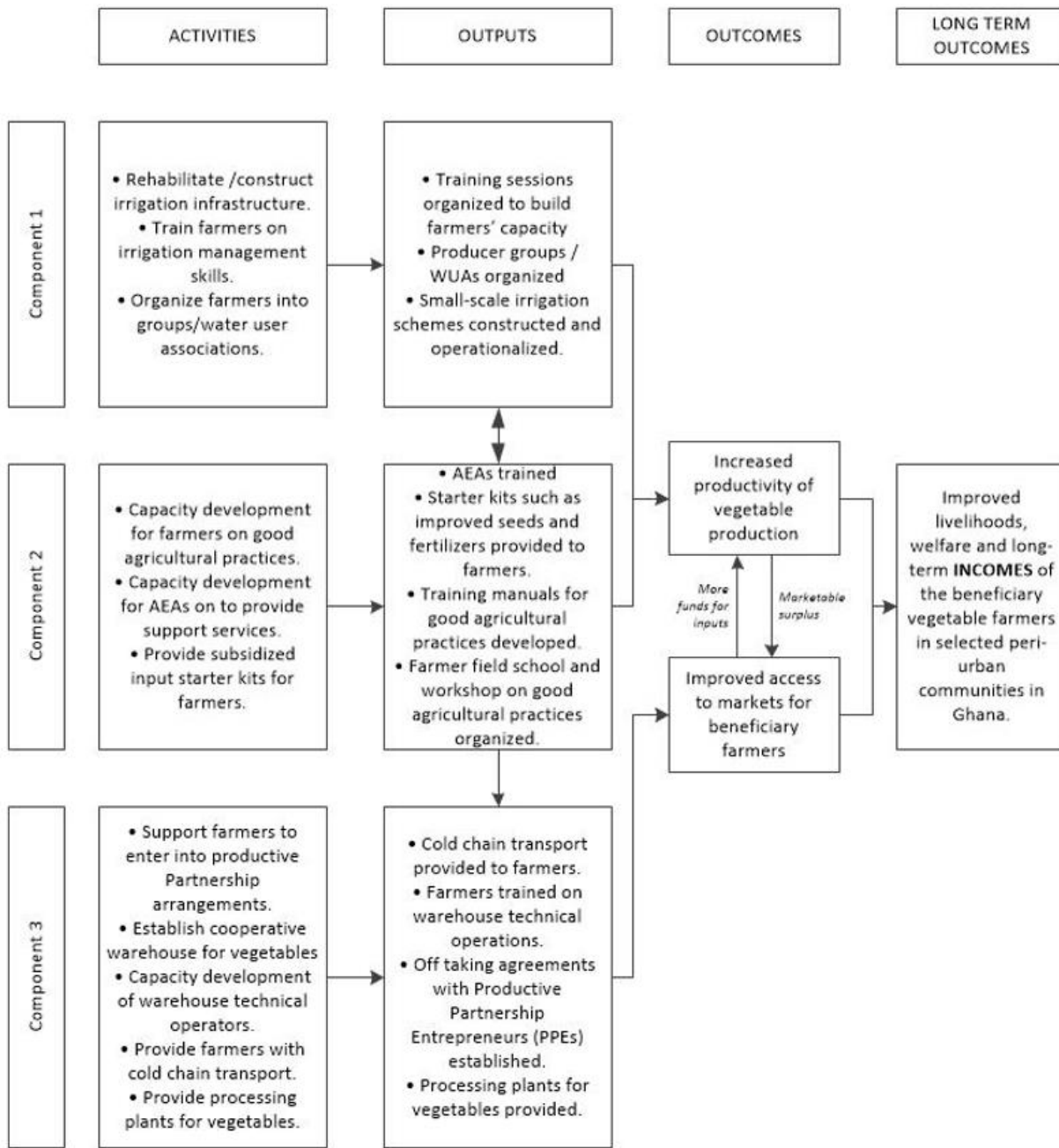
5. The project sought to address agricultural productivity and market access constraints among smallholder peri-urban vegetable producers. Please see Figure 1 for the graphic presentation of the theory of change (ToC) on project activities, outputs, and outcomes. The project would finance the design, rehabilitation, and construction of irrigation infrastructure to facilitate the delivery of an adequate amount of water to intensify production all year round. In addition, the project would provide starter kits (productivity-enhancing input such as seeds, fertilizer, and agrochemicals) to facilitate technology uptake. Also, the project would upgrade the knowledge of the extension agents to carry out demonstrations (through the Farmer Field School) on improved practices to build the capacity of the beneficiaries to use inputs effectively. The combination of these would lead to improved yield and productivity

6. To improve market access, the project would facilitate market linkages with off takers (Productive Partnership Entrepreneurs) to access high-end markets. To meet the quality requirements for such markets and reduce post-harvest losses on the farm, during transport and in the packhouses, the project would build the capacity of beneficiaries on post-harvest handling technologies, food safety, and finance the rehabilitation and construction of post-harvest facilities, and equipment (vegetable cleaning shed, packhouses, cold van, reefer container, etc.) that allows for value addition activities (cleaning, grading, and sorting). The provision of these facilities was a prerequisite for green label certification and subsequent access to high-end markets.

7. Some of the critical assumptions made include: (i) farmers are receptive to improved inputs; (ii) water will be available at the right time to irrigate all year round; (iii) that farmers and PPEs will use the post-harvest facilities; (iv) continued maintenance of the constructed/rehabilitated infrastructure through the payment of water user charges by the Water Users' Associations (WUAs) for sustained access to irrigation; and (v) market linkages would endure and continue to function well.



Figure 1: Theory of Change of the Ghana Peri-Urban Vegetable Value Chains Project



Project Development Objectives (PDOs)

8. As per the Grant Agreement, the PDO of the project was to improve on the productivity and access to market by the beneficiary vegetable farmers in selected peri-urban communities in Ghana.



Key Expected Outcomes and Outcome Indicators

9. The project had two major outcomes: increased productivity and market access. These were to be measured using five PDO level indicators:

- Improvement in the yield levels of vegetable crops cultivated by small-holder farmers.
- Increase in marketed sales through improved access to high value markets.
- Reduction in vegetable post-harvest losses (over current farmers' levels) among the participating farmers.
- Increase in income levels of farmers cultivating vegetables under the project; and
- Direct project beneficiaries (at least 40 percent of whom are women).

Components

10. The project consisted of four components as follows:

11. **Component 1: Farmer Managed Irrigation Systems Development (appraisal cost US\$0.71 million; actual cost US\$0.95 million):** The objective of the component was to improve existing small scale riverine irrigation systems for resource poor farmers in the selected farming communities, which are bounded by perennial water bodies with high potential for irrigation farming. The component aimed to increase vegetable production and empowerment of selected farmers thereby increasing their earnings by financing: (i) the design and implementation of small-scale irrigation infrastructure; and (ii) the establishment of producer associations/(WUA) to ensure fair field water distribution, irrigation infrastructure management, and capacity building of such users for irrigation systems management.

12. **Component 2: Farmer Capacity Development and Support for Productivity Improvement (appraisal cost US\$0.55 million; actual cost US\$0.58 million):** To support the adoption of modern and improved technologies, this component financed: (i) the design and implementation of an intensive farmer capacity development program to ensure that farmers had the know-how to adopt modern vegetable production and post-harvest handling techniques for improving productivity and output; (ii) capacity development for selected Agriculture Extension Agents (AEAs) in the beneficiary communities to upgrade their technical know-how in order to effectively provide extension and other support services; and (iii) subsidized starter kits (improved seeds, fertilizer, herbicides, etc.) as Sub-grants to the selected Beneficiaries to help accelerate technology adoption and increase productivity. Each beneficiary was to receive a starter kit worth approximately US\$70 which would be repaid into a revolving fund managed by the farmers' organization. Both workshop-based and field-based training including Farmer Field School approaches were to be adopted for the farmer capacity development. Training areas included productivity improvement technologies, appropriate use of chemicals and pesticides, agribusiness management, farm management and farm record keeping, accounting and financial management, and post-harvest handling. Relevant themes under the Ghana Good Agricultural Practices (GHANA GAP) were incorporated into the farmer training program.

13. **Component 3: Improving Post-Harvest Handling and Market Access: (appraisal cost US\$2.02 million, actual cost US\$0.8 million):** This component aimed to develop and coordinate the vegetable value chain through support to producers' organizations to enhance their productive capacity and competitiveness, and to develop market linkages. The grant supported vegetable farmers to enter productive partnership arrangements with agriculture entrepreneurs to establish and operate two farmer cooperative vegetable warehousing systems. The systems were expected to improve their access to markets and stabilize prices. The warehousing systems were to be equipped with a refrigerated and cold-chain transport system and were to serve as an essential off-take facility that guarantees ready, high value markets for the farmers' produce. Multi-year supply-purchase agreements between the farmer groups and the warehousing center were to be facilitated and expected to be supported with capacity development for farmers groups for better understanding and adherence to the basic tenets and guiding principles of such systems. Two processing plants were



required to be set up with one plant at the Accra Plains to serve beneficiaries in Greater Accra, Volta, and Eastern Regions and the second plant in Anoe (Shama Ahanta Municipality) to serve beneficiaries in the Western Region.

14. **Component 4: Project Management, Monitoring and Evaluation, and Knowledge Management (appraisal cost US\$0.37 million; actual cost US\$0.52 million):** This component supported all activities necessary to ensure that the project was implemented in accordance with the Project Operation Manual (POM). The component also financed incremental expenses incurred by the government in implementing the project, as well as monitoring and evaluation costs of the project.

B. SIGNIFICANT CHANGES DURING IMPLEMENTATION

Revisions to the PDO and Results Framework

15. There were no revisions to the PDO and Result Framework.

Revised Components

16. The following modification were made to project components:

Component 1:

17. Design and supervision of irrigation infrastructure: Instead of relying on an independent consultant to undertake engineering surveys, design the irrigation solutions and to supervise the construction and installation of irrigation infrastructure as envisaged at appraisal, these roles were given to the Ghana Irrigation Development Authority (GIDA).

Component 2:

18. New activities: The following new activities were added to Component 2: (i) support for green label certification and training to access high-end markets; (ii) support for land preparation and mechanization; and (iii) support to knowledge exchange and digital advisory services.

Other Changes

19. Project locations: Original project locations were Hikpo and Tordzinu in South Tongu district (Volta region); Sega Akpokope I & II in Dangme East District (Greater Accra Region) and Anoe in Shama Ahanta (Municipal in the Western Region). Some of these locations were dropped and the final project locations were the following: Michel Camp (Greater Accra Region), Hikpo (Volta Region), Natriku, Askowa (Kumasi), and Angosikorpe (Greater Accra Region).

20. Closing date extension: The closing date of the project was extended for 12 months, from June 30,2020 to June 30,2021.

21. Project costs and reallocation between disbursement categories: Project costs were revised as follows: component 1 - from US\$0.71 million to US\$0.95 million; component 2 - from US\$0.55 million to US\$0.58 million; component 3 - from US\$2.02 million to US\$0.8 million; and component 4 - from US\$0.37 million to US\$0.52 million. In addition, grant proceeds were reallocated between disbursement categories as shown in Table 1.

**Table 1. Reallocation of Grant Proceeds**

Category	Original allocation (US\$)	Revised allocation (US\$)
Consultancy	324,792.00	245,000.00
Goods	1,189,700.00	827,000.00
Works	588,156.00	915,000.00
Training	504,400.00	340,500.00
Operating costs	132,952.00	277,500.00
Sub-grants	110,000.00	245,000.00
TOTAL	2,850,000.00	2,850,000.00

Rationale for Changes and Their Implications on the Original Theory of Change

22. The decision to rely on GIDA a government entity, for design and supervision of irrigation infrastructure instead of relying on an independent consultant, was occasioned by the failure to make budget provisions for a consultant to undertake those tasks as part of appraisal, as well as the need to mainstream project activities into relevant government institutions for sustainability. Green label certification, support for land preparation, and support to knowledge exchange service were respectively added to component 2 activities to enable farmers’ access to higher value markets which required such labelling, help ensure profitability of vegetable production amidst the COVID-19 mediated decline in demand by defraying some of the production costs earlier envisaged to be incurred by the warehousing centers, and to enable the digital transfer of knowledge to overcome the constraints imposed by social distancing (in response to COVID-19) on extension services. Changes to project locations were made because some of the earlier sites were deemed unsuitable for project investments for various reasons such as the inability to identify PPEs willing to off-take from the identified locations, the unwillingness of the farmers to participate in the project, the unanticipated larger scope of rehabilitation works, among others. The closing date was extended to allow for the completion of project activities, while changes to project costs and reallocation between project categories were due to addition of new activities as well as increase in operation costs because of COVID-19. None of the changes had an impact on the ToC.

II. OUTCOME**A. RELEVANCE OF PDOs****Assessment of Achievement of Each Objective/Outcome**

25. The PDO remains valid today. It is consistent with the Bank’s FY21-26 Country Partnership Framework (CPF)- still under preparation, especially Focus Area 2 (Enhancing Conditions for Diversified Growth and Job Creation). Specifically, the PDO is aligned with objective 2.1 of improved access to market and increased productivity. The PDO also aligns with the Government of Ghana’s flagship program, “Investing for Food and Jobs (IFJ)” - An Agenda for Transforming Ghana’s Agriculture (2018-2021)⁵ developed to operationalize the vision of the Government of Ghana as indicated in its medium-term national development policy framework. IFJ aimed to modernize the agricultural sector to improve food security,

⁵ MOFA. 2018. Investing for Food and Jobs (IFJ)” - An Agenda for Transforming Ghana’s Agriculture (2018-2021).



create employment opportunities and reduce poverty.

B. ACHIEVEMENT OF PDOS (EFFICACY)

26. Achievement of the PDO was to be measured by the following outcome indicators, including (i) improvement in yield of vegetables among the participating smallholder farmers (mt/ha); (ii) Increase in marketed sales through improved access to high value markets; (iii) reduction in vegetable post-harvest losses among participating farmers; (iv) increase in income levels of a farmers cultivating vegetables under the project; and (direct project beneficiaries (at least 40 percent of whom are women).

27. Targets for two out of the five PDO indicators were fully achieved and surpassed, while the remaining three indicators, were substantially achieved (see Table 2) with the least achievement registered for the indicator “increase in income levels of a farmer cultivating vegetables under the project” where 70 percent of the target was achieved (i.e., 14 percent against 20 percent). The average targeted improvement in yield of vegetables and increase in marketed sales to high value markets were substantially achieved - at 89 and 84 percent of the target, respectively. The indicator measuring reduction in vegetable post-harvest losses, and the number of direct beneficiaries were achieved and surpassed at 133 and 128 percent, respectively. Overall, project efficacy is rated SUBSTANTIAL.

Table 2. PDO Indicators

Indicator	Target	Achievement
Improvement in yield of vegetables among the participating smallholder farmers (%)	80	71
Increase in marketed sales through improved access to high value markets (%)	40	33.5
Reduction in vegetable post-harvesting losses among participating farmers (%)	<8	6
Increase in income levels of a farmer cultivating vegetables under the project (%)	20	14
Direct Project Beneficiaries (of which is female)	900	1151

Assessment of Achievement of Each Objective/Outcome

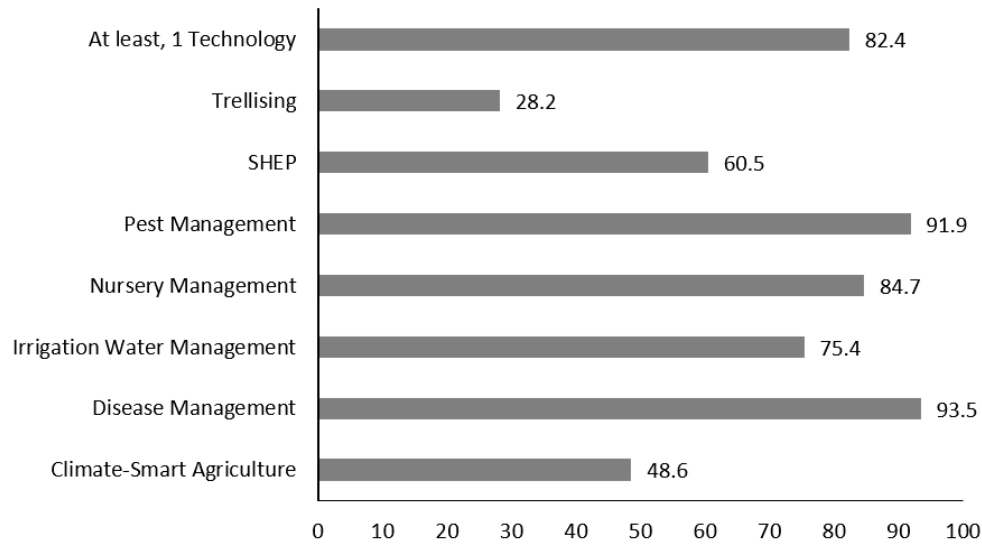
28. **Outcome 1 - Improved productivity of vegetable farmers:** Through project support, a total of 541 ha of land were provided with adequate water supplies through the construction of small-scale irrigation infrastructure. The project also created and strengthened the capacity of four WUAs to facilitate irrigation water management. In addition, 1,151 beneficiary farmers were supplied with certified seed (a total of 76kg with the potential to cover over 1,000 ha) as well as other production input as part of starter kits⁶, and 10 greenhouses for the cultivation of high-value crops under controlled environments. The farmers were also provided with complementary training on Good Agricultural Practices as well as other technologies in support of improved productivity. A production survey⁷ conducted during implementation (see Figure 2) pointed to high levels of technology adoption which underlie the registered improvement in yield of vegetables among the participating smallholder farmers.

⁶In aggregate, the starter kits comprised 76kg of various hybrid vegetable seeds, including those meant for the export market - 2,244 pieces of sticky traps and pheromones; 1,596 bottles, 456 sachets of agrochemicals; 98,200kg of granular fertilizer; 84 bottles of liquid fertilizers, and 10 greenhouses for women farmers. Farmers were to repay the cost of starter kits supplied into a revolving fund at the end of the growing season.

⁷ Ghana Commercial Agriculture Project. 2021. Production survey. GCAP



Figure 2: Technology adoption by participating farmers



Source: Production survey 2021

29. **Outcome 2 - Improved access to markets for beneficiary vegetable farmers.** With project support, four farmers groups for collective production and marketing were formed. All 1,151 farmers supported by the project belonged to one of these four groups. The project identified 14 PPEs and facilitated off-take arrangements between the PPEs and farmers. As part of these arrangements, seven vegetable warehousing centers each equipped with a cold chain to reduce postharvest losses were established and these now supply fresh vegetables to the supermarkets and the hospitality industry. Farmers and PPEs were also trained on value addition, quality assurance, and ensuring food safety to ease access of produce to high-end markets.

C. EFFICIENCY

Assessment of Efficiency

Rating: Modest

30. **Economic and financial analysis:** An economic rate of return (ERR) of 1325 percent and Net Present Value (NPV) of \$14 million were estimated at appraisal⁸. These returns were recomputed at closing, considering increased irrigation costs, implementation delays and a discount rate of 15 percent. The re-estimated ERR is 45.1 percent, the NPV is \$1.8 million, and the benefit cost ratio was 1.59. The divergence between appraisal and completion returns is mostly due to unrealistic assumptions of project benefits, as well and underestimation of investment costs at appraisal.

31. **Operational efficiency** was low because of notable of delays in implementation including: (i) delayed safeguards approval following a change in project sites; (ii) 7-months delay between approval and signing of Grant Agreement because of political transition in Ghana; (iii) delayed effectiveness and;(iv) 18-months delay after effectiveness because of changes in PIU; (v) delay in completing the rehabilitation of irrigation infrastructure because of disruption of work

⁸ The appraisal EFA covered the two warehousing centers but not the whole project.



schedule by COVID-19. Despite these challenges, the project completed most of the planned activities; though, most of them got completed very close to the project closing date. At completion, the project equipped about 90 percent of planned irrigated land (541 ha), implemented an intensive training program, and facilitated market linkages with the PPEs.

D. JUSTIFICATION OF OVERALL OUTCOME RATING

Overall Outcome Rating

32. The relevance of the project's objectives is high, and the operation's objectives were substantially achieved. Although the project had favorable rates of return at completion, it also experienced inordinate delays in implementation. In view of the above, the overall outcome rating is rated *Moderately Satisfactory*.

E. OTHER OUTCOMES AND IMPACTS

33. **Gender:** The project helped to increase the participation of women in the high-value vegetable value chains. Out of the 1,151 beneficiaries, 403 were women. Discussions with the farmer groups confirmed the importance of the project intervention in facilitating meaningful access to water and markets which were major binding constraints for the participation of women in the value chains. Not only did capacity development activities and training allow women to improve their access to water for irrigation and agricultural skills, but it also helped them to understand other topics such as nutrition, health, empowerment, and value addition which are of more interest to women.

34. **Mobilizing Private Sector Financing:** The project supported the PPEs to acquire cold chain supply infrastructure, rehabilitate packhouses, and other processing equipment using matching grants. At project completion, the PPEs contributed US\$587,200, representing 46 percent of the total investment.

35. **Poverty Reduction and Shared Prosperity:** The project targeted smallholder and marginal farmers who are generally among the poor in Ghana. Field missions did not detect cases of elite capture and therefore, it is generally understood that project benefits from irrigation, inputs, and increased incomes due to improved access to markets largely accrued to this population segment.

F. KEY FACTORS DURING PREPARATION

36. **Objectives and activities:** The project objective was generally clear, simple, and realistic, as were the associated activities in support of improving productivity and access to markets.

37. **Design:** Project design was based on a framework of lessons learned on previously developed projects which focused on enhancing agricultural productivity and produce marketing. The project's interventions were mutually reinforcing: irrigation systems development and input/advisory services support to increase productivity, and cooperative action, support to postharvest handling and links to off takers to facilitate produce marketing. To the extent that timely implementation depended on a clear understanding of the technical feasibility of interventions (especially irrigation), as well as the availability of interested produce off-takers (PPEs) yet these were not adequately studied during design, this undermined implementation progress and appears to be a shortcoming in design. The design expectation that PPEs contribute 40 percent of costs and yet take only 39 percent of the vegetable warehousing center profits while farmers contributed 60 percent of the costs (through project grants) and take 61 percent of profits also led to disagreements on profit sharing and delays in implementation.



38. *Readiness for implementation:* By approval, there was an already existing and adequately staffed PIU that had been identified for project coordination. Procurement plans and safeguards documents had also been finalized. However, the suitability of the project sites had not been adequately assessed and this was responsible for some of the implementation delays.

III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME

39. *Delays in project signing:* Although the project was approved on November 4, 2016, it became effective, about 7 months later, on June 15, 2017. This was due to delays in signing the grant agreement by the recipient as there was a change in government which necessitated re-engaging with new leadership of the MOFA.

40. *Changes to project locations:* During implementation, it became clear that some initially selected sites were not suitable for project investments for various reasons such as the inability to identify PPEs willing to off-take from the identified locations because of distance; the unwillingness of the farmers to participate in the project; the unanticipated larger scope of rehabilitation works; and the potential displacement of many farmers due to irrigation development. As a result, a decision was reached to change project sites. Delayed approval of this decision by the Bank's Regional Safeguards affected timeliness of implementation.

41. *Changes to PIU:* At appraisal, the proposal was to rely on the PIU that oversaw implementation of the West Africa Agricultural Productivity Project (WAAPP). However, because of delays in project start-up, the WAAPP closed and there was need to transfer project management to another PIU in charge of the Ghana Commercial Agriculture Project (GCAP). This transition led to further delays in implementation.

42. *COVID-19:* The emergence of COVID-19 disrupted supply chains which affected the import of parts of the refurbished greenhouses. The pandemic also slowed down project implementation as lockdowns instituted by government undermined implementation progress. In addition, the pandemic has had negative impacts on the horticultural sector in general. For instance, the lockdown of the Accra area implied that market women could not freely move to buy vegetables from the farmers and resell in the local markets during the period. The closure of many hotels and airlines (also because of the lockdown), and suspension of international flights to Europe and other destinations which used to be the main market source for some of the PPEs also resulted in low demand and consequently reduced profitability. Although the project provided additional support to producers in terms of land preparation and mechanization, this relief was temporary. The pandemic is still much around with intermittent surges and appearance of new variants and this might result in income loss on the part of project beneficiaries.

IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME

A. QUALITY OF MONITORING AND EVALUATION (M&E)

M&E Design

43. Overall, the project had good M&E design elements. A baseline was available and specific assessments were planned to measure progress at the various stages of implementation, although some e.g., the MTR did not materialize. The ToC was generally clear, with a direct line of sight between project activities, outputs, and outcomes. The selected indicators in the results framework were generally pertinent to measuring project outcomes and methods to track them were established. During the last year of the project, the team introduced the use of digital technology such as CAPI to collect data.



M&E Implementation

44. For the most part, the M&E arrangement was implemented as planned except for the proposed midterm evaluation of the project which did not take place due to the implementation delays of the project. All indicators were systematically monitored and reported in the results framework. Further, the M&E of the project produced the quarterly progress reports regularly. The M&E team liaised with other M&E teams at community levels to ensure quality of data capture and reporting. The project adopted a participatory approach to the M&E; each project site had a designated manager that fed the M&E team with data on marketing activities needed for M&E activities.

M&E Utilization

45. The M&E of the project was able to produce a progress report, which was always the basis for assessing project performance, identifying aspects of the project that is lagging, and determining the level of support to be provided by the task team during and after implementation support missions. Also, the M&E data provided the basis for the restructuring and guided the direction of project implementation. At a point, the project M&E showed that performance with respect to the capacity building was below target and the rehabilitation of packhouses was lagging. This information prompted the need to intensify monitoring and roll out of the planned capacity building program.

Justification of Overall Rating of Quality of M&E

46. While the M&E system implemented and produced most of its expected results and deliverables, some challenges remained. The project team did not conduct the mid-term evaluation as planned, and the baseline survey got delayed because of the late startup of project activities. Notwithstanding the shortfall, the overall M&E quality is rated as **Substantial**.

B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

47. **Environmental safeguards:** The project was assessed category B for environmental assessment as there were no significant irreversible or long-term adverse environmental impacts anticipated. The requisite safeguard instruments, including an Environmental and Social Management Framework and a Pest Management Plan, to address any negative environmental and social impacts were in place. These were disclosed in-country and on the Bank's operations portal. There were some environmental trainings to staff and beneficiaries. Progress reports on Environmental and Social Management Framework (ESMF) implementation were submitted to the Bank regularly, confirming the compliance of the agreed Environmental Management Plans (EMPs). The measures proposed in the PMP were implemented in a satisfactory manner. Overall, compliance with environment safeguards is rated **Satisfactory**.

48. **Social safeguards:** In addition to the Environmental and Social Management Framework cited above, a Resettlement Policy Framework (RPF) was prepared and disclosed before appraisal. There were several social trainings for staff and beneficiaries early on during project implementation. Sub-projects were systematically screened, and none entailed resettlement. The project also implemented a Grievance Redress Mechanism, although tracking and documentation varied across project sites. Overall, the Social Safeguards' performance of the project is rated **Satisfactory**.

49. **Financial Management:** From the Financial Management (FM) perspective, and throughout the life of the project, the PIU maintained an acceptable level of fiduciary arrangements. With regards to Staffing, the project relied on the GCAP FM team who were well experienced with the Bank's financial rules and procedures. The FM team remained stable throughout the life of the project. This prevented the loss of cumulative knowledge which



was built through on-the-job training and workshops held with the Bank's FM team. With regards to compliance with financial covenants, it was observed that the interim financial reports (IFRs) were largely delayed in submission partly due to the outbreak of the COVID-19 pandemic. Late submissions during Q1 and Q3 of 2020 were considered acceptable by the Bank during the spike of the pandemic. Q4 IFRs were due in February 2021, and these were also submitted after the due date. The final audit for the financial period January 2020-September 2021 was completed and submitted to the Bank on November 12, 2021, because of a delay in signing by the Auditor General. The audit was not qualified, and recommendations were made on the full utilization of some of the projects that got completed close to project closing.

50. **Procurement:** Project procurement performance progressively improved throughout implementation, notably thanks to the close involvement and guidance provided by the Bank Task Team to the PIU staff. Although the PIU had prior experience with the World Bank's procurement guidelines, the Task Team provided training to PIU staff on procurement requirements through the GCAP. Moreover, as a mitigation measure against procurement capacity issues within the implementing agency, all contracts were subject to prior review. While the PIU managed to file procurement documents relatively well, significant exchanges were often needed between the Task Team and the PIU to bring the documents up to the Bank's standards. At the beginning of the implementation of the project, the large number of contracts to be processed overwhelmed PIU. However, they quickly learned how to successfully implement good contract management practices. The PIU submitted regularly updated procurement plans to the Bank. No mis-procurement was declared in the project, and no integrity, corruption, or complaint case was reported. Overall, procurement was rated **Moderately Satisfactory**.

C. BANK PERFORMANCE

Quality at Entry

51. The overall Quality at Entry is rated **Moderately Satisfactory**. The Bank team employed due diligence in basing the project on a solid diagnostic foundation of Ghana's development priorities, which remained highly relevant throughout the project period. The project design also relied heavily on the GCAP which is also rehabilitating and modernizing irrigation projects in Ghana. These provided a wealth of detailed knowledge and experience that informed the GPVVCP approach and scope, which differed from the previous projects as it employed an integrated approach that went beyond irrigation to include marketing and capacity development. However, project's proposals on irrigation had not been underpinned by sufficient suitability assessments as well as technical feasibility designs. This led to changes in project sites as some were deemed unsuitable for horticultural production due to high levels of contamination of water resources by sewerage and to challenges in achieving acceptable pump energy efficiency and sufficient equity flows of water across the system. Another shortcoming in the quality at entry relates to the underestimated cost and level of effort associated with installing comprehensive small-scale irrigation systems. This led to dropping some of the activities on some sites during the project restructuring. Additionally, there misunderstandings between pre-selected PPEs and the expectations of their contribution vis-a-vis the management and profit-sharing arrangements. This could have been avoided if the team had done more background studies and consultations as part of project preparation.

Quality of Supervision

52. The World Bank team showed a high level of commitment to the project. The task team conducted an average of two supervision missions a year, and one technical mission, showing timely and dedicated attention in addressing technical, safeguards and fiduciary issues. The supervision missions consistently comprised of high-level engineering and irrigation experts from the Bank and GIDA, agronomy, social and environmental safeguard, and M&E experts. The project suffered from frequent changes in Task Team Leaders (TTL), with three TTLs over a four-



year period from design to project completion. However, this turnover was mitigated by the fact that there were no changes to other core team members which offered stability to project implementation. Therefore, the overall Quality at of supervision is rated **Moderately Satisfactory**.

Justification of Overall Rating of Bank Performance

53. Overall Bank performance is rated **Moderately Satisfactory** based on moderately satisfactory rating for both quality at entry and quality of supervision.

D. RISK TO DEVELOPMENT OUTCOME

54. Sustainability of project outcomes hinges on the continued functioning of the irrigation systems developed under the project, farmers' access to input, as well as continuation of off-take partnerships between farmers and PPEs. While WUAs, with the support of GIDA are positioned to manage the irrigation schemes, this must be backed up by farmers' willingness to pay adequate water user fees to support routine operations and maintenance. As observed elsewhere, this is usually a daunting challenge that could undermine sustainability of the irrigation schemes. This calls for continued support for farmers and provision of services that make their operations more profitable to increase incentives to pay water user fees. The revolving fund mechanism established to support access to inputs is designed to ensure sustained access to input financing. At completion, farmers were already remitting deposits into the fund, which should stay operational with adequate oversight. This will include ensuring that farmers selling their produce outside the project arrangement pay back the money they access from the fund. Continuation of off-take partnerships between farmers and PPEs is contingent on continued profitability which should partly be guaranteed by improved productivity, quality assurance and access to markets. There will however continue to be a need for more support and nurturing of these partnerships for which the requisite government agencies will have to fulfill their roles.

V. LESSONS LEARNED AND RECOMMENDATIONS

55. *Identification and selection of project sites should be based on a clear understanding of their technical suitability.* Support to irrigation was a key investment underpinning the project's theory of change. During implementation, it became clear that sites selected at appraisal were, for several reasons, not suitable for the desired irrigation schemes development. An assessment of the suitability of these sites as part of appraisal would have led to more informed decisions on site selection and enhanced the timeliness of implementation.

56. *The introduction of new technology should recognize the capacity context of beneficiaries:* The introduction of solar irrigation pumps was innovative, and it provided cheaper and reliable water sources to farmers while cutting carbon emissions. By so doing, it launched the agricultural sector onto a greener pathway by displacing options like diesel/petrol pumps. While it depends on the sun which is readily available, however, ensuring equitable access is not as straightforward as it seems. This perhaps may have informed the challenge experienced on one of the project sites where the pump could not irrigate the farms as expected thereby calling for irrigation scheduling which is completely alien to beneficiaries. The application of irrigation pump technology should therefore be context-specific and should be accompanied by technical assistance. Although farmers are now operating the system themselves, further capacity building may be needed to sustain its efficient use.



57. *Revolving funds, if adequately managed, can help overcome small-holder farmers' challenges to access to input financing in a sustainable way.* Horticulture production is input intensive, requiring access to finance, especially for effective smallholder participation in the value chains. The revolving fund established by the project represents a viable mechanism to address farmers access to input financing, with limited fiscal impact on public resources.



ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS

A. RESULTS INDICATORS

A.1 PDO Indicators

Objective/Outcome: Increase access to markets for beneficiary vegetable farmers

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Indicator Two: Increase in Marketed sales through improved access to high value markets	Percentage	20.00 06-Jun-2016	40.00 31-Dec-2020	0.00	33.50 31-Dec-2020

Comments (achievements against targets):

This target was substantially achieved at 84 percent of target. Sales data were recorded over the 12- month period to high-value markets provided by the PPEs & the Business Manager, who was engaged by the project to facilitate sales for the farmers.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Indicator Three Reduction in vegetable post-harvesting losses among participating	Percentage	16.00 06-Jun-2016	8.00 31-Dec-2020	0.00	6.00 31-Dec-2020



farmers					
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Comments (achievements against targets):

This target was achieved and surpassed at 133%. The estimated baseline for post-harvest loss was 40% at appraisal, and project was expected to half this figure to 20%. However, the baseline recorded during implementation was 16.2% among the selected locations. Half of the baseline status would be 8%, hence the end target was 8%. The production survey recorded post-harvest loss of 6%, which is less than half of the baseline figure.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Indicator Four: Increase in income level of farmer cultivating vegetables under the project	Percentage	5405.00 06-Jun-2016	20.00 31-Dec-2020		14.00 31-Dec-2020

Comments (achievements against targets):

This target was achieved at 70 percent. In 2020, due to the interruptions by COVID- 19, business in general was at an all-time low, and this affected sales and incomes of farmers. Some PPEs (especially those in the catering industry) lost markets, which reflected in lower than expected off-take from the farmers.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Direct project beneficiaries	Number	0.00 06-Jun-2016	900.00 31-Dec-2020	0.00	1151.00 31-Dec-2020
Female beneficiaries	Percentage	0.00 06-Jun-2016	40.00 31-Dec-2020		35.00 31-Dec-2020



Comments (achievements against targets):

The project reached 1,151 beneficiaries, exceeding the end target of 900. The target for female beneficiaries was 40% (of 900), which is 360. The project reached 403 females, which is more than the targeted number of 360. Out of the total 1,151 beneficiaries, 35% were women. The project observed that the women tended to engage more in the post-production side of the vegetable value chain – such as processing and sales.

Objective/Outcome: Improve Productivity of vegetable farmers

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Indicator One: Improvement in yield of vegetables among the participating smallholder farmers	Percentage	50.00 06-Jun-2016	80.00 31-Dec-2020	0.00	71.00 31-Dec-2020

Comments (achievements against targets):

This target was substantially achieved at 89 percent of target. The training on improved technology, starter kits, access to irrigation and extension services contributed to the level of achievement recorded.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Indicator Three Reduction in vegetable post-harvesting losses among participating farmers	Percentage	16.00 06-Jun-2016	8.00 31-Dec-2020	0.00	6.00 31-Dec-2020

Comments (achievements against targets):



This target was achieved and surpassed at 133%. The estimated baseline for post-harvest loss was 40% at appraisal, and project was expected to half this figure to 20%. However, the baseline recorded during implementation was 16.2% among the selected locations. Half of the baseline status would be 8%, hence the end target was 8%. The production survey recorded post-harvest loss of 6%, which is less than half of the baseline figure.

A.2 Intermediate Results Indicators

Component: Component 1 and 2

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Area provided with new/improved irrigation or drainage services	Hectare(Ha)	0.00 06-Jun-2016	601.00 31-Dec-2020	0.00	541.00 31-Dec-2020
Area provided with improved irrigation or drainage services	Hectare(Ha)	0.00 06-Jun-2016	601.00 31-Dec-2020	0.00	541.00 31-Dec-2020

Comments (achievements against targets):

Indicator was 90 percent achieved .

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
IR2. Irrigation Infrastructure developed and operational	Number	0.00 06-Jun-2016	10.00 31-Dec-2020	0.00	15.00 31-Dec-2020

Comments (achievements against targets):

The end target was 10, and the project developed 15 at the Michel Camp and Angorsikope project sites.



Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Water users provided with new/improved irrigation and drainage services (number)	Number	0.00 06-Jun-2016	660.00 31-Dec-2020	0.00	1151.00 31-Dec-2020
Water users provided with irrigation and drainage services - female (number)	Number	0.00 06-Jun-2016	360.00 31-Dec-2020	0.00	403.00 31-Dec-2020

Comments (achievements against targets):

This target was achieved and exceeded. All project beneficiaries were provided with improved irrigation and drainage services

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Farmers trained	Number	0.00 06-Jun-2016	1000.00 31-Dec-2020	0.00	1151.00 31-Dec-2020

Comments (achievements against targets):

Target achieved and surpassed. The intensive training program developed and the collaboration with relevant stakeholders contributed to the level of achievement.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
IR5. Targeted farmers who are	Percentage	0.00	95.00	0.00	100.00



part of functional farmer groups (with at least 40% female)		06-Jun-2016	31-Dec-2020		31-Dec-2020
Comments (achievements against targets): All beneficiaries are part of a functional WUA					
Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
IR6. Farmer days of training via farmer field school approach	Number	0.00	180.00	0.00	216.00
		06-Jun-2016	31-Dec-2020		31-Dec-2020
Comments (achievements against targets): The AEAs visit the farms at least, two times a week, with some visiting daily. 216 FFS days were achieved, exceeding the target of 180.					
Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Farmers with improved skills in vegetable production	Number	0.00	748.00	0.00	1151.00
		09-Sep-2016	31-Dec-2020		31-Dec-2020
Comments (achievements against targets): The end target was 748, and the project team trained 1,151 farmers at the project locations and other vegetable farm clusters within the host districts.					
Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion



Agricultural Officers with improved skills in vegetable production	Number	0.00 09-Sep-2016	15.00 31-Dec-2020	0.00	18.00 31-Dec-2020
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Comments (achievements against targets):

The project brought the AEAs and other agric officers in the target district together for a 5-day residential workshop. They were taken through practical on-field sessions to help them appreciate the topics treated during the workshop. The project team provided support to the AEAs when they started training the farmers, to ensure that they were on the right path. A whatsapp platform was set up for the AEAs, and experts from academia and industry, who facilitated trainings for the AEAs and the farmers were added to the platform.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Greenhouse established	Number	0.00 09-Sep-2016	10.00 31-Dec-2020		10.00 31-Dec-2020

Comments (achievements against targets):

The project team facilitated the installation of the 10 greenhouses on the Dawhenya Irrigation Scheme for women farmers. Installation of the 10 greenhouses were completed at the end of June 2021.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Utilization/adoption of improved production practices/technologies by project beneficiaries	Percentage	0.00 09-Sep-2016	80.00 31-Dec-2020		82.40 31-Dec-2020



Comments (achievements against targets):

82.4% of all farmers responded to our survey indicated that they had adopted at least one technology.

Unlinked Indicators

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Warehousing system/pack houses in place and functional	Number	0.00 09-Sep-2016	2.00 31-Dec-2020	0.00	7.00 31-Dec-2020

Comments (achievements against targets):

The project was restructured in 2020, and the warehousing system (as indicated in the PAD) was changed to the construction of vegetable pack houses - with no shareholding and profit-sharing arrangements. The project has completed 7 vegetable pack houses at three project locations and 4 PPE locations. The executives of the farmers associations have been given the responsibility of managing the on farm pack houses constructed for farmer organization to perform first level cleaning and sorting on the farm.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Commercial partnerships of market contracts signed between producer groups and aggregators	Number	0.00 09-Sep-2016	3.00 31-Dec-2020	0.00	14.00 31-Dec-2020

Comments (achievements against targets):

Seven (7) PPEs were engaged by the project to provide markets to the farmers. A total of 14 agreements have been signed by PPEs and farmers as at the end of June 2021. GCAP is continuing to establish more linkages between PPEs and farmers for specific vegetables.



Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Producer groups and entrepreneurs trained in agribusiness skills	Number	0.00 09-Sep-2016	12.00 31-Dec-2020		12.00 31-Dec-2020
<p>Comments (achievements against targets): The project organized training for PPEs and farmers on business and financial planning, production planning and other management issues. Seven PPEs and 5 farmer associations were trained.</p>					

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Fresh vegetables processed and sold by the packhouses/warehousing center	Tones/year	0.00 09-Sep-2016	222.00 31-Dec-2020		332.24 31-Dec-2020
<p>Comments (achievements against targets): This indicator measured vegetables sold through pack houses constructed by the project at the farms and at PPEs location. As at the end of May 2021, the target of 222MT had been exceeding, with sales reaching 332.24MT and valued at GHS100,109. Over a period of approximately 12 months, sales through PPEs have accounted for approximately a third of all sales.</p>					



B. ORGANIZATION OF THE ASSESSMENT OF THE PDO

Objective/Outcome 1: Increase in productivity	
Outcome Indicators	<ul style="list-style-type: none"> At least 30 percent improvement in the yield levels of vegetable crops cultivated by smallholder farmers.
Intermediate Results Indicators	<ul style="list-style-type: none"> Area provided with new/improved irrigation or drainage services Irrigation Infrastructure developed and operational Water users provided with new/improved irrigation and drainage services Farmers trained (Number, Custom) Targeted farmers who are part of functional farmer groups (with at least 40% female) Farmer days of training via farmer field school approach Farmers with improved skills in vegetable production Agricultural Officers with improved skills in vegetable production Greenhouse established Utilization/adoption of improved production practices/technologies by project beneficiaries
Key Outputs by Component (linked to the achievement of the Objective/Outcome 1)	<ul style="list-style-type: none"> Rehabilitation /building of irrigation infrastructure completed supplying 541 Ha of land supply of certified seeds 1151 farmers trained on good agricultural practices Building of packhouses at Michel camp, Asokwa and Angosikorpe Building of 6 toilet facilities Four Water User Association have been formed 15 irrigation infrastructures built and functional 10 greenhouses provided to entrepreneurs for the cultivation of high-value crops under controlled environments.
Objective/Outcome 2: Improved market access	
Outcome Indicators	At least 20 percent increase in marketed sales through improved access to high value markets.



Intermediate Results Indicators	<ul style="list-style-type: none">• Warehousing system/pack houses in place and functional (Number, Custom)• Commercial partnerships of market contracts signed between producer groups and aggregators (Number, Custom)• Producer groups and entrepreneurs trained in agribusiness skills• Fresh vegetables processed and sold by the packhouses/warehousing center• Greenhouse established
Key Outputs by Component (linked to the achievement of the Objective/Outcome 2)	<ul style="list-style-type: none">• Formation of 4 farmer groups/WUAs• Seven PPEs selected and off taking arrangements with farmers established• Cold chain and processing equipment (4 reefer containers, 4 reefer van and 2 wrapping machines, and 3 churning tanks)• 100 percent of farmers part of WUAs/ functional farmer groups• Seven vegetable warehousing centers established and supplying fresh vegetables to the supermarkets and the hospitality industry• 14 commercial partnerships or market contracts signed between producer groups and aggregators



ANNEX 2. PROJECT COST BY COMPONENT

Components	Amount at Approval (US\$M)	Actual at Project Closing (US\$M)	Percentage of Approval (US\$M)
Farmer Managed Irrigation Systems Development	0.71	0.95	100
Farmer Capacity Development and Support for Productivity Improvement	0.55	0.58	100
Improving Post-Harvest Handling and Market Access	2.02	0.80	100
Monitoring and Evaluation, and Knowledge Dissemination and Project Management and Administration	0.37	0.52	100
Total	3.65	2.85	100.00



ANNEX 3. EFFICIENCY ANALYSIS

1. The methodology for efficiency analysis closely follows the approach employed at appraisal, using updated prices and project costs at completion. In addition, the study employed qualitative interviews of key informants and focus group discussions (FGDs) to complement the quantitative analysis. To re-estimate the project impact at project closing, some parameters were adjusted; also included were areas improved with irrigation, project interventions, and the overall actual project costs. Also, some of the original assumptions used for estimating the expected benefits were revised and updated. The project life cycle was also increased from five to six years through restructuring to make room for the loss in the first year's production since the full benefits of the project were not fully utilized. The team anticipates a 15% (against 10% forecasted at project appraisal) increase in yield annually during the project cycle given that without the full utilization of all the interventions, the project witnessed a significant increase in yield. The benefit-Cost ratio was estimated for each of the project sites but was reported in aggregates

2. The benefits stream estimated for the project were derived from production and productivity increases; land gains for production (due to the MOU signed with landowners); reduced irrigation costs because of the use of solar pump compared to the diesel-powered pump; water quality and health improvements; change in the cropping pattern and cropping intensity; enhanced water productivity; and reduction in post-harvest losses as well as provision for a ready market.

Benefit-Cost Analysis (BCA)

3. To estimate the CBA for all project sites, the aggregate volume of production based on the main agricultural activities of all project sites was computed. In all, the survey estimated that 175.84 hectares were cultivated in all project areas cropping ten major vegetables namely lettuce, spring onion, onion, cabbage, okra, tomatoes, chilli pepper, sweet pepper, cucumber and turia. The aggregate volume of production was extrapolated from the survey sample reports of a total of 575.84 hectares. Collectively, farmers in these sampled project areas produced 403.84 tons in total for the year 2020 involving 119 farmers of which 34 are females (29%). The aggregate volume of yields produced from all project sites saw mix grill of outcomes like trends that emerged from the individual project sites (Table 1). Tomatoes and onion outperformed project targets with improvement in yield by 134% and 113%, respectively; while the rest of the crops experienced negative outputs ranging from 19.7% to 41.05%.

Table 1. Aggregate yield performance

Vegetables	Ha Cultivated	Yield/ha (With)	Yield/aa (Without)	Percentage change
Tomatoes	40.55	2.16	0.92	134.78
Okra	39.50	1.76	-	
Lettuce	35.95	1.68	2.85	-41.05
Cabbage	7.81	10.46	-	
Chilli Pepper	21.43	0.53	0.66	-19.70
Spring Onion	22.99	3.24		
Onion	1.62	2.37	1.11	113.51
Turia	1.82	2.84	-	
Sweet Pepper	1.65	1.58	2.32	-31.90
Cucumber	2.52	3.04		



4. **Project Cost.** The estimated cost was quantified based on the findings of field surveys conducted at all project sites and evaluations of the profits for all selected major crops were also ascertained. Farmers benefited from relatively cheaper farm inputs such as seeds, fertilizer, pesticides, herbicides, and so on through project supplies, and that reflected in the total cost build-ups for the period under review. However, labour remains the largest cost center in the productions of these major crops at all project sites. Table 2 presents the aggregate cost for all project sites for the period under consideration

Table 2: Cost associated with the production of various crops

Vegetables	Land Preparation (mechanized)	Seeds	Labour	Fertilizer	Manure	Herbicides	Pesticides	Total Cost - Crop 1
Tomatoes	15,330	17,490	22,860.00	10,654	5,670	1,150	4,100	78,050
Okra	6,500	4,025	53,583.00	3,785	260	2,692	1,232	66,042
Lettuce	12,340	6,893	12,006.00	2,394	4,162	842	3,308	43,490
Cabbage	18,750	3,860	4,944.00	1,447	1,870	354	2,663	37,038
Chilli Pepper	7,692	3,910	12,180.00	2,594	3,669	1,425	410	30,256
Spring Onion	16,980	10,296	11,640.00	2,260	2,848	560	797	44,963
Onion	4,025	3,100	3,600.00	1,800	580	544	1,250	15,861
Turia	1,465	1,680	5,400.00	120	710	188	315	11,403
Sweet Pepper	700	250	700.00	300	350	-	350	2,800

Source: Borrower's completion Draft Report 2021

Results

5. The Cost and benefit analysis was employed to assess the efficiency of the project. The benefit-Cost ratio was calculated from the 2020 crop survey for all major crops cultivated from all sites that benefited from the project. The results suggest an impressive Benefit-Cost ratio ranging from 3.63 to 11.95 for all major crops except onion which registered a Benefit-Cost ratio below 1. Largely, this signifies favorable margins in the productions of these vegetables. Lettuce registered the largest Benefit-Cost ratio of 11.95 as against appraisal ratio of 4.59, and onion registered the least ratio of 0.71 as against appraisal ratio of 4.77. Also, the results indicate that the total Benefit-Cost for Tomatoes, Okra, Cabbage, Chilli Pepper, Spring Onion, Sweet Pepper was 8.6, 4.6, 6.33, 3.63, 4.97, and 7.54 respectively, as against the appraisal Benefit-Cost ratios of 4.58, 5.04, 4.95, 7.64, 6.08, and 5.77, respectively. A striking feature of the Benefit-Cost ratio is that onion which saw significant growth in yield, 113.51%, seems not to be profitable; however, the most profitable vegetable; lettuce registered a decline in production (41.05%) relative to the baseline data. Turia, one of the exotic vegetables introduced during the intervention registered a 6.79 benefit-cost ratio, an indication of one of the reasons for easy adoption by the farmers. Conclusively, it can be asserted that vegetable production in all project sites has been profitable and as such, the project objective of reducing the level of poverty of participating farmers through the intervention seems to be on course (Table 3).

Table 3: Benefit-cost ratio of all vegetables

Vegetables	Cost per Kilo (Unit)	Farm price per basket (Unit)	Sales (Unit)	Total Cost (Unit)	Gross Profit (Unit)	Benefit/Cost Ratio
Tomatoes	21.42	123	488,064	78,050	410,014	8.60
Okra	194.03	70	303,590	66,042	237,548	4.60
Lettuce	166.40	400	320,800	43,490	277,310	11.95
Cabbage	21.64	400	136,200	37,038	99,162	6.33



Chilli Pepper	408.14	1,000	110,900	1,796,656	1,685,756	3.63
Spring Onion	84.49	150	223,500	44,963	178,537	4.97
Onion	40.83	350	11,200	15,861	- 4,661	0.71
Turia	194.03	15	77,400	11,403	65,997	6.79
Sweet Pepper	10.34	325	21,125	2,800	18,325	7.54

Source: Borrower's completion Draft Report, 2021

Internal Rate of Return

6. At completion, the internal rate of return (IRR) of the Michel Camp, Angorsikope, Hipko and Asokwa sites investments are 96.5%, 36.8%, 251.9% and 236.1%, respectively (against 1,325.1% and 1,325.1% at appraisal). The project IRR at completion is 54.1 percent (against 1,325.1 % at appraisal), calculated based on the aggregated economic cash flows of the four sites. The project, therefore, remains economically viable at completion as a whole and by sites though the numbers fall short of the appraisal values. This is, once again obvious given the fact that at the time the consulting team was undertaking the field survey, the project was working hard to install the water pumps at Angorsikope and Michel Camp for instance, a major component that defined the success of the intervention. Table 4 provides a comparison of the EIRRs at the completion of various sites.

Table 4: Comparison of IRRs

Investment Analysis	Michel Camp	Angorsikope	Hikpo	Asokwa	All sites
Benefit-Cost Ratio	2.03	1.30	17.74	16.77	1.59
Breakeven	5 years 11months	6 years 4months	7months	7months	6 years 7months
Payback Period	6.57	6.40	0.50	0.60	6.60
NPV	3,887,271.40	985,579.07	16,204,223.25	4,996,295.88	1,752,863.81
IRR	88.9%	30.6%	246.1%	230.8%	45.1%

Source: Borrower's completion Report