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GLOBAL ENVIRONMENT FACILITY

Republic of Ghana

Promoting a Value Chain Approach to Climate Change Adaptation in Agriculture in Ghana (ProVACCA).

GEF/SCCF Terminal Evaluation Report (TER)

Main report and appendices

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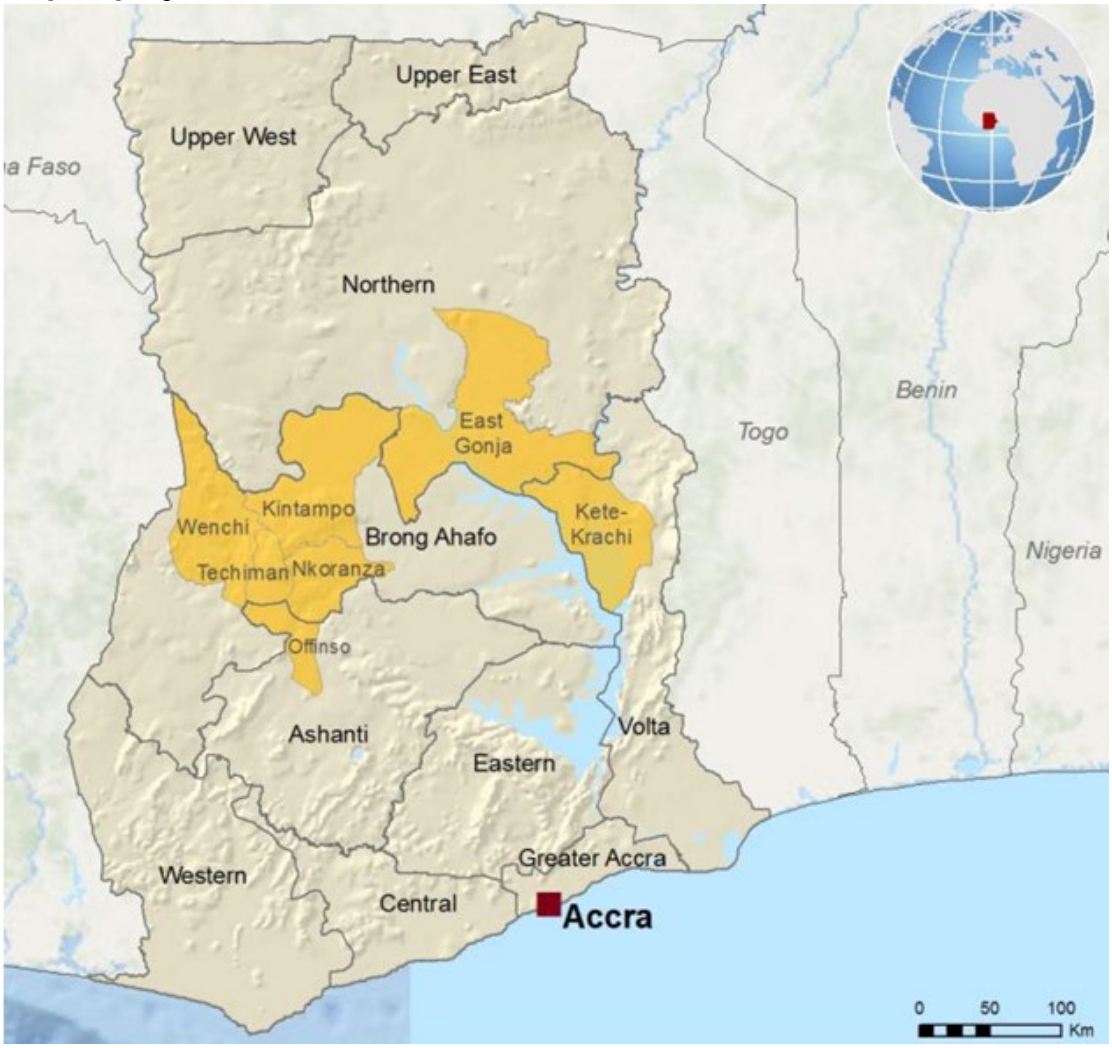


ProVACCA Project districts

Exchange rate start of project

US$1 = GHS 1.9

Exchange rate end of project

US$1 = GHS 4.6

Abbreviations and Acronyms

ACMAD	African Center of Meteorological Application for Development
AWPB	Annual Work Plan and Budgets
AWS	Automatic Weather Station
CBO	Community Business Organisations
CPMT	Country Programme Management Team
DDO	District Development Officer
EIA	Environmental Impact Assessment
EPA	Environment Protection Agency
FFF	Farmer Field Fora
FP	Farmer Practice
GASIP	Ghana Agricultural Sector Investment Programme
GMET	Ghana Meteorological Service
GEF	Global Environment Facility
GoG	Government of Ghana
GHG	Green House Gas
ICM	Integrated Crop Management
IFAD	International Fund for Agricultural Development
LCG	Low Carbon Growth
MoU	Memorandum of Understanding
MTR	Mid Term Review
MEST	Ministry of Environment, Science and Technology
MIF	Ministry of Finance
MOFA	Ministry of Food and Agriculture
M&E	Monitoring and Evaluation
NCCAS	National Climate Change Adaptation Strategy
NPCU	National Project Coordination Unit
NGO	Non-Governmental Organisation
NSC	National Steering Committee
PAR	Participatory Action Research
PCO	Project Country Office
PIR	Project Implementation Reports
ProVACCA	Promoting a Value Chain Approach to Climate Change Adaptation in Agriculture in Ghana
RB-COSOP	Results Based Country Strategic Opportunity Strategy
REP	Rural Enterprise Programme
RTIMP	Root and Tuber Improvement and Marketing Programme
SCCF	Special Climate Change Fund
SNEP	Strategic National Energy Plan
SLWM	Sustainable Land and Water Management
SMART	Specific, Measurable, Achievable and Attributable, Realistic Time-Bound, Timely and Targeted
TER	Terminal Evaluation Report
UNFCCC	United Nations Framework Convention on Climate Change

ProVACCA at a glance

Country	Republic of Ghana	
Project Name	Promoting a Value Chain Approach to Climate Change Adaptation In Agriculture in Ghana (ProVACCA)	

Key Dates

IFAD Approval	Signing	Effectiveness	Mid-Term Review	Original Completion	Actual Completion	
	12-11-2012	12-11-2012	Oct - 2014	June - 2015	31-12-2016	
Original Grant Closing	**Actual Grant Closing**					
	30 June 2017					

GEF/LDCF Financing

Grant	**US$ million**	2.5	**% disbursed**	95.77%		

Actual Costs and Financing (USD '000)

Component	GEF/ SCCF	Co-financing	Beneficiaries	GOVT	Total	Disbursement levels
1	544,300	-	-	-	405,408	74.48%
2	863,000	-	-	-	492,608	57.08%
3	821,700	-	-	-	1,003,037	122.07%
4	271,000	-	-	-	440,004	162.36%
Authorised Allocation		-	-	-	53,226	-

Remarks
The project has consistently been weak in quantifying the in-kind contributions. The in-kind contributions were in the form of tax exemptions for an amount of US$66,722 instead of US$315,000 as per the financing agreement.

Number of Beneficiaries

Total	Direct	Indirect	Women	Men	Youth	
n/a	10,527	10,000+	4,282	6,245	-	

Remarks
Notably there has been no disaggregation of the youth target group.

Project Objective

To promote activities that reduce climate induced risks to the achievement of food security and income generation objectives for the rural communities in Ghana.

Country Partners	
Executing Agency	Ministry of Food and Agriculture (MOFA),
Government Institutions	Ministry of Environment, Science and Technology (MEST); Ghana Meteorological Service (GMET); Business Advisory Centres at the District Assemblies and the District Development Officers (DDOs).
NGOs/civil society	Savannah Agricultural Research Institute, Nyamkpala; the Soil Research Institute, Kwadaso; the Kwame Nkrumah University of Science and Technology, Kumasi; the Koforidua Polytechnic, Koforidua; the Forestry Commission; District Assemblies; the
Other	Private businesses

Executive summary

i. ***Project overview**. The ProVACCA project is a US$ 2,815,000 project of which the GEF grant constitutes US$ 2,500,000 and US$ 315,000 by the Government of Ghana. The GEF/SCCF project complemented the Root and Tuber Improvement and Marketing Programme (RTIMP) and subsequently after a year extension, also the Ghana Agricultural Sector Investment Programme (GASIP). The project was designed to reduce the vulnerability of the of the food supply system to the negative impacts of climate change with a specific focus to reduce climate induced risks in the cassava value chain to the achievement of food security and income generation for pilot rural communities in Ghana.*

ii. ***GEF/SCCF Goal and objectives**.*

a) ***Goal.** To reduce the vulnerability of the food supply system to the deleterious impacts of climate change.*

b) ***Objective.** To promote activities that reduce climate induced risks to the achievement of food security and income generation objectives for rural communities in Ghana.*

iii. ***Project relevance.** The project was aligned with the Ghana Shared Growth and Development Agenda (GSGDA) 2010-2013 in terms of the strategy to promote energy efficiency, sustainable forest management, mitigation measures in the agricultural sector including education, efficient management practices and improve waste management mechanisms. ProVACCA assists Ghana achieve its long-term goal of Low Carbon Growth (LCG) through assessing the scientific basis of action and linking research, industry and government sectors. The project is also consistent with IFAD's Strategic Framework's Results Based Country Strategic Opportunity Strategy (RB-COSOP) 2010-2015 and the Millennium Development Goals (MDGs) 1 to eradicate poverty and hunger and MDG 7 to ensure environmental sustainability. Project relevance was rated **satisfactory (S)**.*

iv. ***Project effectiveness.** As of project closure on the 30th of June 2017 the project was set to disburse 95.77% a remarkable achievement, which is unfortunately marked by poor performance and delays. Project effectiveness shows a mixed picture with disbursement levels for the four components being respectively 74%, 57%, 122%, 162%. Components 1&2 performed better, but the last two overspent due to delays and cost overruns in the implementation of component 3, which at project closure is still incomplete. As a result of the delays, a one-year extension was granted which drove up the costs of project management and M&E component. Project effectiveness is rated as **moderately unsatisfactory (MU).***

v. ***Project impacts.** The project impacts have been reduced significantly as is described under the theory of change and depicted in annex 3. One of the biggest impacts was meant have been brought about by the biogas energy plant. This activity would have complemented the gasification plant and would have showcased renewable technology for the region in minimising the significant environmental impacts associated with cassava processing as well as minimising GHG emissions. This major activity was dropped to rescue the cassava gasification plant, which remains incomplete, although it looks like IFAD will support the latter's completion. The remaining two components did have satisfactory impacts although these also saw their fair share of amendments such as the abandonment of the Automatic Weather Stations and the vulnerability assessment. Project impacts is rated as **moderately unsatisfactory (MU).***

vi. ***Project efficiency.** Project management and M&E functions were fully co-ordinated and integrated with the management structure of the RTIMP and GASIP, with joint planning processes and sequencing. While the project was found to have complied to a large degree with financial management practices, there were considerable improvements to be made in the quality of project management. Supervision missions have reported a lack of investigation and management responsiveness in addressing and solving problems specifically with regards to the implementation of component 3, specifically with the timely completion of administrative tasks, meeting key deadlines and outputs, procurement, following up on mission recommendations and regular reporting which have contributed to delays in the implementation of component 3.*

vii. *M&E was found to have been adequate and responsive for components 1 and 2, while component 3 reflected less than adequate responsiveness, which placed the implementation of the objectives at risk. The transition from implementation under RTIMP to GASIP also saw a drop in the quality of M&E procedures being applied. During the transition, M&E data was being collected but not inserted into the centralised system that was developed under RTIMP, this point was raised repeatedly by supervision missions, but never acted upon. Progress reports other than GEF Project Implementation Reports (PIR) and supervision mission reports were not available under GASIP, and the project did not make use of a project logframe to monitor and track project implementation. Project efficiency is rated as* ***moderately unsatisfactory (MU)****.*

viii. ***Sustainability.*** *Social sustainability for the project is rated as high for the activities that have been implemented. 91% of those interviewed confirmed two to three fold increases in cassava yields because of improved cassava varieties and 98% were applying some form of acquired knowledge of improved climate smart agricultural techniques. No economic analysis has been conducted on the benefits of the increased cassava yields, although peer-reviewed research has been published on the yield improvements of the climate smart cassava agricultural activities. Component 3 has not been completed, its technical sustainability cannot therefore be assessed, although no provisions seem to have been made to train national engineers in gasification plant repair and maintenance by the Indian suppliers. With regards to environmental sustainability, the main activities to benefit the environment were discontinued or modified. These include the biogas energy plant and the agro-forestry plans that were not implemented and the Automatic Weather Stations which would have provided forecasting services. The project did implement sustainable land and water management techniques that improved productivity by up to 200% and public radio broadcasts to raise awareness about climate change. Sustainability is rated* ***moderately unsatisfactory (MU)****.*

ix. ***Partner performance.*** *The project was implemented by MOFA as IFADs implementing partner in Ghana and has been largely satisfactory. The vulnerability assessment however was not carried out due to a two-year delay in agreeing a MOU with the University of Ghana. Other partners have included the Ministry of Finance (MoF) and the Ministry of Environment, Science and Technology (MEST), the Centre of Environment Health Research and Training as well as the Environment Protection Agency. Further partnerships were sought with the African Center of Meteorological Application for Development (ACMAD) and the University of Cape Coast, Savannah Agricultural Research Institute, Nyamkpala; the Soil Research Institute; the Kwame Nkrumah University of Science and Technology; the Koforidua Polytechnic; the Forestry Commission; and the pilot District Assemblies; the Business Advisory Centres at the District Assemblies and the District Development Officers (DDOs). The GoG contributed US$ 66,722 in tax exceptions which did not meet the agreed contributions to the project of US$ 315,000. Partner performance was rated as* ***moderately satisfactory (MS)****.*

x. ***Lessons learned.***

a) *The baseline contributed to the developing of project strategy, the project also carried out peer-reviewed research that demonstrated the increases in yield and productivity to be had through the application of high yielding cassava varieties and climate smart agricultural practices.*

b) *The gains in knowledge and understanding of cassava climate smart agriculture should be mainstreamed and upscaled.*

c) *This project suffered from unsatisfactory oversight and management of project activities, particularly with timely completion of administrative tasks, in meeting key deadlines and outputs, procurement, following up on mission recommendations and regular reporting.*

d) *The project has lacked the adequate initiative to secure the necessary technical assistance and support services for the implementation of component 3. Under the GASIP project management has also fallen short in terms of monitoring and evaluation.*

I. Introduction

1. The Global Environment Facility (GEF) endorsed the International Fund for Agricultural Development (IFAD) request for the project on 16 December 2012 and made available the grant to IFAD as the Executing Agency to assist the Republic of Ghana in the implementation of the Promoting a Value Chain Approach to Climate Change Adaptation in Agriculture in Ghana (ProVACCA) project. The project was designed to complement the activities under the Root and Tuber Improvement and Marketing Programme **(**RTIMP) to reduce climate-induced risks to food security and income generation activities in rural Ghana by building climate resilience into the cassava value chain. In addition, the project intended to develop innovative solutions to two environmental issues that RTIMP was facing: (i) cassava waste management and (ii) energy demand for cassava processing.
2. The Special Climate Change Fund (SCCF) component was embedded in the RTIMP as component D. Specifically, RTIMP developed linkages within the commodity chain for roots and tubers, enhancing the production through improved technologies, and developed the processing and marketing infrastructure. The programme connected farmers with processors, markets and relevant, effective and sustainable services to increase agricultural productivity and profitability. As explained in the MTR, the project was extended under the Ghana Agricultural Sector Investment Programme (GASIP) due to a slow start to implementation and the relatively short project period (30 months). The MTR further details that the short project implementation period meant that even if there had been no delays in the implementation of the gasification plants and associated investments, the available time would have been insufficient for sufficient capacity development and impact analysis.
3. As per the Finance Agreement between IFAD and the Government of Ghana (GoG), the total ProVACCA project grant was US$ 2,500,000, of which the recipient (GoG) was meant to contribute the amount of US$ 315,000. The project was declared effective on 12th November 2012 and was originally due for completion in June 2015, but it was extended for final completion to 31st December 2016 and closed on 30th of June 2017.

II. Project description

a) Project context

4. The Republic of Ghana has a total area of 238,539 square kilometres. The country shares borders with Togo, Burkina Faso, Cote d'Ivoire and the Gulf of Guinea to the South. Extensive water bodies, including the Lake Volta and Bosomtwi, occupy 3,275 square kilometres, while seasonal and perennial rivers occupy another 23,350 square kilometres. The country is divided into ten administrative regions: Western, Central, Greater Accra, Eastern, Volta, Ashanti, Brong-Ahafo, Northern, Upper East and Upper West.
5. **Land.** About 52 per cent (124,000 km^2) of Ghana is considered agricultural land or land suitable for agricultural purposes, including annual crops, tree crops, bush fallow and other uses, and unimproved pasture, although only 18 per cent is currently being cultivated. Land under irrigation is only 0.5 per cent of agricultural land, or 0.04 per cent of all land.

   Agro-ecological zones. Ghana is divided into six major Agro-ecological zones: The Rain Forest Zone, the Semi-deciduous Forest Zone, the Forest-Savannah zone, Transition Zone, the Coastal Savannah, the Guinean Savannah and the Sudan Savannah zones. The forest zones are characterized by heavy rainfall, well distributed throughout the year, that promotes rapid plant growth resulting in an even tree canopy at 30-40 metres, which often includes some deciduous tree species and emergent trees. The Forest-Savannah Transition zone is an ecotonal area where forest fringes are gradually replaced by a savannah-like landscape with a wide range of tall grasses. In the interior, savannah vegetation forms a continuous grass cover interspersed with fire resistant, deciduous broadleaf trees. The Coastal Savannah zone has undergone changes over the past four decades due to human activity, notably cultivation, firewood extraction and bush burning.

6. **Climate.** The country's warm, humid climate has an annual mean temperature between 26°C and 29°C. Variations in temperature, rainfall, and humidity are influenced by the movement and interaction of the dry tropical continental air mass, or the harmattan, which blows from the northeast across the Sahara, and the opposing tropical maritime or moist equatorial system. The Kwahu Plateau, which marks the northernmost extent of the forest area, also serves as an important climatic divide. To its north, two distinct seasons occur: a) the harmattan, with hot dry days and relatively cool nights from November to late March or April; b) a wet period that peaks in late August or September. To the south and southwest of the Kwahu Plateau, where the annual mean rainfall from north to south ranges from 1,250 millimeters to 2,150 millimeters, four separate seasons occur. Heavy rains fall from about April through late June followed by a relatively short dry period in August. The second rainy season starts in September and lasts through to November.

b) Project objectives

7. The overall project goal was to reduce the vulnerability of the food supply system to the deleterious impacts of climate change. The objective was to contribute to the reduction of climate-induced risks to the achievement of food security and income generation for the rural communities in Ghana by focusing on the improvement and adaptation of the cassava value chain in pilot areas of the country. The project goal was in strong alignment with the objectives set out in the National Climate Change Adaptation Strategy (NCCAS) with specific attention given to the objectives for agriculture and meteorology.
8. The ProVACCA project complemented the activities undertaken under RTIMP and GASIP and those planned for the Rural Enterprise Programme (REP) III. It addressed climate change adaptation needs and aimed to build resilience into the value chain linkages in land and water management, crop production, processing and marketing. The aim was for the project to function as a platform for the value chain actors (researchers, farmers, processors, traders, fabricators bankers, government staff, educators, health staff, NGOs and media staff) to understand the vulnerability of the value chain to the impact of climate change.
9. The SCCF components were fully embedded in the RTIMP and GASIP in a synergetic manner that was to ensure that the SCCF funding covered additional costs associated with the adaptation needs that were identified in the NCCAS and further discussed at all levels (national, regional and grass-roots) during the project formulation phase. This SCCF interventions were articulated around four components:
    i. **Component 1: Awareness raising on climate change and capacity to address impacts along the cassava value chain/other complementary food crop production.** To design and implement a comprehensive capacity building programme targeting both users and beneficiaries in the pilot areas and the wider public, through a broad variety of tools and materials.
    ii. **Component 2: Support adaptation to climate change of cassava production**. To train farmers and address the mitigation risk of cassava production associated with water scarcity. Support the introduction of community agro-forestry to reduce the environmental impact of the cassava value chain and promote sustainable water and soil use.
    iii. **Component 3: Promote innovative adaptation solutions along the agriculture value chain**: To procure small gasification stoves for efficient cassava processing, a gasification plant, a biogas plant, refrigerated and honey production rooms and gasification units for mushroom sterilisation.
    iv. **Component 4: Project management and Monitoring and Evaluation (M&E)**: This component comprised of Project Management and Project Monitoring and Evaluation (M&E).

c) Implementation arrangements

10. **Coordination and execution.** The Project was fully integrated within the implementation structure of the RTIMP and subsequently GASIP projects. The Annual Work Plan and

Budgets (AWBP) were fully integrated into the RTIMP and GASIP reporting, processes and structure. There was full harmonisation and integration between the AWPB of the ProVACCA project and those of the RTIMP and GASIP at national and district/community levels. The National Project Coordination Unit (NPCU) for RTIMP and GASIP projects consisted of an overall coordinator, programme officer, technical and technical specialists. The role of the NPCU was overall coordination, supervision and monitoring and the field activities were implemented by implementing partners such as government agencies, NGOs, CBOs and local media.

11. The project steering committee was the same as the National Steering Committee (NSC) for the RTIMP and GASIP but with additional representation from the Meteorological Department, Energy Commission, Water Resources Commission and the United Nations Framework Convention on Climate Change (UNFCCC) focal point for Ghana. The entry point at district level for the SCCF project were the already existing District Steering Committees responsible for the RTIMP and subsequent GASIP. Portfolio development guidance was provided through the national Country Programme Management Team (CPMT) and consisted of an oversight committee set up for the IFAD projects, which also covered the ProVACCA project and played a crucial part in the project monitoring and evaluation.

12. **PDR logframe:** The logframe developed as part of the PDR was largely well defined and clearly articulated although the activities and key indicator columns were combined under the key performance indicators, making it harder than necessary to distinguish between the two for project staff. The Mid Term Review (MTR) also did not revise the logframe to create more clarity and distinguish between indicators and outputs. In terms of the indicators being Specific, Measurable, Achievable and Attributable, Realistic, Time-Bound, Timely and Targeted (SMART) the fact that there was no distinction between indicators made them somewhat ambiguous although they were generally found to specific, measurable, achievable, attributable, realistic and time-bound.

13. The project did not make use of a logical framework to help it track its achievements and stated outcomes. This had to be created in retrospect during the terminal evaluation process and is reflective of a generally underperforming project in terms of planning and coordination and has been pointed out during the supervision missions.

d) Target groups.

14. Based on the fact that it is the poorest in societies that are most affected by climate change impacts, the target groups for the ProVACCA project were in line with IFAD's and targeted smallholder farming households and in doing so the project was fully aligned with RTIMP targeting approach, although gender was not explicitly targeted, but formed a considerable portion of the beneficiaries. In terms of geographical targeting this was driven by a) social, poverty and demographic indicators b) locations of identified environmental stress such as land and water pollution caused by cassava waste disposal, land degradation, unsustainable firewood collection and pollution related health problems.

15. The beneficiary target groups were selected from those already involved in the RTIMP project and was based on a participatory process involving the SCCF project officer, RTIMP team and regional and local partners. The main target groups were:

    i. Asset-poor, food-insecure and labour-deficient farm households wanting to improve the productivity and quality of their cultivation of R&T crops for food-security and/or income generation;

    ii. Small-scale R&T processors, both individually and in groups, whose incomes are depressed by lack of access to improved technologies, equipment, skills, capital, and markets;

    iii. Asset-poor operators in the R&T commodity chains (e.g. informal traders and wage-workers) with interest and dynamism to become viable micro/small entrepreneurs.

III. Evaluation of project relevance.

a) Relevance vis-à-vis the external context.

16. Ghana is a Party to the UNFCCC, for which GEF is an operating entity. The ProVACCA strategic project objectives were designed within the overall framework of the UNFCCC and to this end it addresses the objectives outlined in the NCCAS. The impact of climate change and mitigating the impact of climate change on vulnerable rural communities and natural resources base was an integral part of the project and is in line with the RTIMP to contribute to the overall goal of empowering the rural poor to increase their food security and livelihoods in project districts.

17. The project is aligned with the Ghana Shared Growth and Development Agenda (GSGDA) 2010-2013 in terms of the strategy to promote energy efficiency, sustainable forest management, mitigation measures in the agricultural sector including education, efficient management practices and improve waste management mechanisms. ProVACCA aimed to assist Ghana achieve its long-term goal of Low Carbon Growth (LCG) through assessing the scientific basis of action and linking research, industry and government sectors. The project is also consistent with IFAD's Strategic Framework's Results Based Country Strategic Opportunity Strategy (RB-COSOP) 2010-2015 and the Millennium Development Goals (MDGs) 1 to eradicate poverty and hunger and MDG 7 to ensure environmental sustainability.

b) Design changes

18. The ProVACCA design changes have been largely characterised by adapting to shortcomings in project implementation rather than technical adjustments and improvements. The main change has been that of discontinuing the implementation of the biogas energy plant. This would have been one of the project's environmental sustainability pillars, however it had to be discontinued to compensate for delays and cost overruns in the implementation of the gasification plant. Another activity that had to be removed was the climate change vulnerability assessment because of the two year delay caused by the University of Ghana in agreeing the MoU; the Automatic Weather Station (AWS) was abandoned because of under-budgeting and sustainability questions surrounding farmers paying for the forecasting services and was replaced with simple rain gauges. The international study visits to Congo, Nigeria and Benin have been scrapped due to problems with travel permits being issued, this was replaced with providing support for the publication of one and possibly more peer reviewed research papers and other studies on mainstreaming climate change adaptation and environmentally friendly productivity gains into cassava production.

19. Project relevance was rated as satisfactory (S).

IV. Evaluation of project effectiveness

a) Physical delivery and final products.

20. The GEF/SCCF intervention is articulated around four components: (1) Awareness raising on climate change and capacity to address impacts along the cassava value chain/other complementary food crop production; (2) Support adaptation to climate change of cassava production; (3) Promote innovative adaptation solutions along the agriculture value chain; (4) Project management and Monitoring and Evaluation (M&E). The overall project goal is to reduce the vulnerability of the food supply system to the deleterious impacts of climate change. The specific objectives were to promote activities that reduce climate change-induced risks to the achievement of food security and income generation objectives for the rural communities in Ghana.

21. As a measure of success the project disbursed 95.77% at closure on 30 June 2017, which is a remarkable achievement considering the reported poor planning and coordination. Disbursement levels and the indicator and achievement logframe in annex 1 show that the project has struggled in implementation. The main problem has been in relation to component 3 where many of the activities have not been implemented yet or have been abandoned.

Despite the more satisfactory components 1&2 the overall disbursement levels paint a mixed picture as the four components disbursed respectively 74%, 57%, 122%, 162%.

Component 1: Awareness raising on climate change and capacity to address impacts along the cassava value chain/other complementary food crop production.

22. The component primarily focused on awareness raising and capacity building of all cassava related stakeholders including government, research/academic, health sector, NGO and media, to address climate change impacts and implement adaptation measures. Specifically to increase awareness of small producers, make meteorological data available for agricultural planning and ensure stakeholders at regional, district and community levels have the necessary understanding of climate change impacts, vulnerabilities and adaptation options.

Outcome 1.1 Increased awareness and capacity of small producers, formal/informal organizations of growers, processors and traders about CC impacts and adaptation on agriculture value chains and livelihoods.

23. **Capacity building.** This outcome focused on the delivery of a climate change capacity building programme and awareness raising campaign and has broadly met its objective. The project met its target of training 25 RTIMP, Ministry of Food and Agriculture (MOFA) and extension research staff over two training sessions in assessing and mapping climate related vulnerabilities using GIS, identifying and implementing adaptation options, monitoring and reporting on climate impacts. The project had aimed to deliver a number of consultation sessions spread out with four in each of the first three years for a total of 12. The exact number of consultations has not been reported however 322 stakeholders, of which 218 male and 104 female have been trained. These groups comprised district administrators, planning officers, agricultural officers, cassava famers, processors and traders at the district level.

24. **Media/awareness campaign.** The project met the objective of developing an unspecified number of community climate change awareness raising materials. 4 musical jingles were produced in four languages, Ewe, Twi, Gonja and English; 20 interactive radio programmes were broadcast in 3 regions of Brong Ahafo and the northern and Volta regions; The project had budgeted for public awareness campaigns in the form of 10 community announcers and an information van, however this never materialised.

25. It is not clear how many of the planned 10 trainers of trainers received training for mainstreaming climate change adaptation into professional activities, but 132 Farmer Field Fora (FFF) leaders were trained in 7 districts in 3 agricultural zones under this activity. This directly resulted in the training of 2193 women and 3318 men in 163 communities to help them understand the potential impact that climate change will have on their livelihoods.

26. **Vulnerability Assessment.** One of the main objectives of this outcome was to enable the team to shape a capacity building and awareness-raising programme and one of the pillars was the vulnerability assessment which was not implemented. The required GPS equipment to carry out the vulnerability mapping was borrowed from the RTIMP project, but the GIS equipment was procured and pilot districts were supported to develop climate change vulnerability indicators, which were to be used for the mapping. Plans were made for trainees to carry out mapping in 21 communities, and the University of Ghana was approached in 2013 to agree on a Memorandum of Understanding (MoU) for the implementation of the vulnerability mapping. The MoU however was never signed, due to apparent delays from the University of Ghana. There are records of the issue having been followed up in 2014 but this was not met with a positive response until 2015 at which point it was too late to carry out the vulnerability mapping. No IFAD supervision missions or project progress reports have raised this as a concern or addressed it.

27. **Non-formal educational activities.** This activity has concentrated on awareness raising in 6 schools in 3 agro ecological zones. More than 250 children have been made aware of the potential implications of climate change on food supply systems and human existence. They have been sensitized on reducing environmental degradation and climate change. These schools have established tree nurseries and 11,600 seedlings were produced and planted,

5,000 *tectonagrandis* (teak), 5,600 *cassia seamia* (cassia) and 1,000 mango. Four woodlots of at least 1ha were established and fenced and around 1,500 trees were planted around 6 school compounds.

28. **Study visits.** The project had planned to support experience sharing regional study visits to Congo, Nigeria and Benin to share the positive lessons learned from the project. This was however not achieved and the activity has been replaced with knowledge generation and sharing in the form of research and published papers. Under GASIP 6 knowledge papers were completed in the climate resilience of cassava production, of which one was published in the journal of applied sciences[1].

Outcome 1.2 Climate meteorological information is made available to inform agricultural investments and planning.

29. **Automatic Weather Stations (AWS).** The aim of this outcome was to support farmers in the project area and meteorological staff from the national and regional/district meteorological stations with the aim to increase the availability of reliable meteorological information at the local level. Initially action had been taken to procure 16 weather stations and it also aimed to support the development of weather based forecasting for crop operations, pest and disease for better local decision-making and disaster risk reduction, the Ghana Meteorological Service (GMET) however advised that the budget availability for the AWS was inadequate. During the MTR doubts were raised of the actual benefits to the target group in the form of information based agricultural planning and the sustainability of the model requiring farmers to pay for the meteorological service. The MTR recommendation was to reduce the number of AWS to one per district, this activity was ultimately abandoned in favour of 80 weather gauges and the training of 10 MOFA staff in the their operation. The weather gauges were added late and there were therefore no means of understanding their effectiveness.

Component 2: Support Adaptation to climate change cassava production.

30. Climate change predictions estimate a reduction in cassava yields because of the rain-fed nature of the Ghanaian agricultural sector. In response to the forecasts and in line with Ghana's NCCAS, the emphasis is on developing land and water management techniques to reduce climate change risk to livelihoods and food security. Integrated Sustainable Land and Water Management (SLWM) contributes to environmental and social resilience and helps reduce the negative impacts of climate change on the agricultural value chain and food security. The aim of this component was to enable land users to assess the environmental problems affecting their land, understand the interaction of the natural resource base and climate variability and prepare land management plans.

Outcome 2.1: Cassava production is more resilient to climate change impacts and its quality is maintained despite the risk of deterioration associated to climate impact.

31. **Climate resilient cassava.** The aim of this activity was to climate proof cassava-related agriculture through training and capacity building to strengthen production and improve techniques, capacity and means through a number of activities to be implemented in the four pilot regions (Ashanti, Brong-Ahafo, Northern and Volta regions). The overall aim was to increase resilience of cassava production through the introduction and testing of climate resilient varieties. To this end a study[2] was conducted that identified high-yielding and drought tolerant cassava varieties which were specific to the different ecologies. Fourty-nine FFF's of the originally planned 32 were set up in 7 districts.

32. The demonstration plots were 1ha in size and were donated by the local communities for the yearlong trials. The trials intended to compare the growth performance and yields of three improved cassava varieties and two local varieties for their drought tolerance. In total 14

[1] Boasiako Ohene Antwi et.al (2016) Drought Assessment for Reduced Climate Impact on Cassava Production. Journal of Applied Sciences. ISSN 1812-5654
[2] Evaluation and selection of different cassava varieties for climate change adaptation in Ghana

improved varieties and 40 local varieties were used. Nine out of the 14 improved varieties gave yields above 20 t/ha while 14 of the 40 local varieties used achieved that threshold. They also assessed the effectiveness of some moisture and soil conservation practices on the growth performance and yields of the crops. Specific themes of the trials were soil fertility management (inorganic and organic fertiliser application), soil water conservation (ridging, bunding, tied ridges and mounds and mulching), selection of drought tolerant cassava varieties and demonstration of agroforestry systems. Each field contained three trial plots. These were Farmer Practice treatments (FP) to test farmer soil fertility practices; Participatory Action Research treatment (PAR) to combine farmer techniques and researcher techniques; and Integrated Crop Management (ICM) solely dedicated to researcher's best practices.

33. The activity also produced 2,500 brochures in English that have been distributed across the 7 districts in agroforestry, good soil management practices, project background information, and steps to improve cassava productivity. The FFF trials trained 2,832 people (the aim was 200) of which 40% were women, where they employed land preparation techniques such as ridging and bunding, mounds and tying of the mounds for soil moisture conservation and mulching. The foreseen 8 types of agricultural equipment were not procured or distributed, with no explanation given as to why.

34. **Regional knowledge sharing.** Initially a training curriculum had been developed in partnership with the African Centre of Meteorological Application for Development (ACMAD) based in Niger. The curriculum covered topics such as climate data rescue and management tools and products, climate monitoring, prediction tools and products and climate change scenario, impact, vulnerability and risk assessment tools and products. Before this meteorological activity was abandoned a second training programme was being developed with the Physics Department of the University of Cape Coast, Ghana on climate modelling.

35. Although not clear from which authority, an absence of authorisation for regional travel for the participants (farmers, research and extension workers) meant the project was not able to fulfil the aim to organise a regional workshop for Central and West African countries to discuss cassava varieties and related environmental, health, social and economic implications. All activities under output 2.1.2 were consequently replaced with 14 exchange visits that were implemented during the last two years of the extended project. The exchanges involved 610 farmers, but information is limited due to reporting problems under GASIP.

36. **Soil testing.** Soil testing is necessary to make informed decisions on fertilizer and soil management techniques and determines the amounts of fertilizer required for profitable crop production. Therefore 64 soil fertility kits were procured of which 56 were distributed, while the remaining 8 were used for training purposes. The capacity of 32 trainers was built in soil fertility testing and soil management. Training was provided in understanding the importance of soil tests in agricultural productivity, particularly in building resilience to climate change. Various soil management techniques to sustain farm production were also imparted as well as teaching them how to train others within the communities. The activity saw a total of 956 farmers trained of which 42% (402) were women. The project demonstrated that farmers were able to understand that the training on climate change had impacts on their agricultural production and they were also able to link deforestation and land degradation in their localities with decreased soil fertility and reduced yields.

37. **Meteorological forecasting**. Activities under this outcome were tied to those under output 1.2.1 and the construction of the AWS, which were abandoned due to under budgeting and sustainability concerns and replaced at the last minute with rain gauges[3]. Consequently, meteorological forecasting for the prevention of diseases and pests have also been discontinued.

Outcome 2.2: Risk to cassava production associated with water scarcity mitigated.

38. **Water harvesting.** A training programme on water harvesting techniques and systems was conducted for 25 among agricultural officers, researchers and district planning officers to train them as trainers of trainers. The training included the need for water harvesting, the

[3] See paragraph 29.

hydrologic cycle and rain-fed agriculture, simple rainfall – runoff computations, in-situ water harvesting under rain-fed conditions, pre-conditions for rainwater harvesting, designing a rainwater harvesting system, available materials and costs, water extraction devices, description of some rainwater reservoir designs, maintenance of the system, integrated watershed management among others. Three training sessions were held for local stakeholders in PY2 and a further three in PY3 but it was not reported how many beneficiaries were trained in water harvesting as a result of this activity. Water harvesting equipment foreseen by the project design to be installed in two pilot areas were also not procured, no hard activities have been implemented in water harvesting.

Outcome 2.3: Agro-ecosystem resilience to climate change strengthened.

39. This outcome focused on land management practices, particularly on agro-forestry to increase the resilience of crops to the adverse effects of climate change, through participatory processes aimed at testing and demonstrating sustainable land management practices.

40. **SLWM.** The sustainable land and water management aspect of this outcome aimed to target at least two farms in each target district within the three agro-climatic zones and for at least 100 farmers. The ultimate aim was to improve soil and moisture conditions in the 64 demonstration sites. The activities have been fully integrated into the 49 FFF developed which benefitted 2,832 farmers under outcome 2.1 on cassava production and climate resilience. This has been reported on under said outcome, but in summary the project noticed marked improvements in yield, quality and survival rate of cassava as well as improved soil moisture levels.

41. **Agro-forestry.** The project design supported the development and implementation of 32 community developed agro-forestry plans in order to increase the beneficiary revenue diversification rate by 80%. This was to be achieved by PY3 and with at least 50% of participants reporting reduced impacts of adverse climatic events on their crops. The project carried out a study[4] on farmer perceptions of agroforestry which showed an interest by 55% of farmers to engage in profitable agroforestry (fuel wood, timber, and fruit trees) but also because of a recognition that trees provide soil cover against erosion, mulch for moisture conservation and improve texture and general soil fertility. Despite this, they remained hesitant to invest in community forestry plans due to the unavailability of land, and inadequate land tenure rights for the length of time required to make the trees profitable and a general negative perception by land owners of trees as a profitable activity. The project consequently did not develop community agro-forestry plans, and instead focused on supporting 100 farmers (13 women) in planting trees along the border of plots of land. Six communities were supported in the planting of indigenous trees for crop shade, to improve soil structure and fire barriers (Terminalia Superba, Khaya Anthoteca - Mahogany, Triplochiton Scleroxylon and Cassia Seamia).

Component 3: Promote Innovative adaptation solutions along agricultural value chain.

42. Cassava processing has a significant environmental impact due to the high demand of diesel and fuel wood that is also very inefficiently combusted; the production of waste in the form of cassava peels and waste water with cyanide concentrations also have negative environmental impacts on surface and ground water tables. The project proposed to introduce an innovative and more efficient gasifier and biogas plants with the aim to reduce Green House Gas (GHG) emissions from inefficient wood-fuel and cassava waste burning, and reduce the environmental impact of toxic waste water. The project had been granted a one-year extension but the objective remains incomplete at project closure.

Outcome 3.1 Successful adoption of innovative adaptation solutions that contribute to adaptation in the targeted area and subsector.

[4] Olivia Agbenyega et. al. Farmer Perceptions of the potential of agroforestry as a climate change adaptation strategy for cassava production in selected districts in Ghana. ProVACCA.

43. **Biogas and gasifier plants.** At project closure neither the biogas or gasification plants have been successfully implemented or made fully operational. This component has been beset by delays from the start, with bids yet to be received by the MTR stage in 2014 for the biogas pilot plant or for the mechanised roasters. The procurement processes of some additional electro-mechanical equipment had also not yet been initiated. The MTR reported faults in the procurement processes with incorrect procedures being followed as well as a lack of transparency, which was exacerbated by delays in advertising and the evaluation of bids. This was followed by an inadequate response to the advertised bids for the specialised gasification plant equipment as well as no bids having been received for the biogas plant.

44. Based on the recommendations of an international consultant in 2015, the project abandoned the biogas plant and wastewater treatment capacity to ensure sufficient funds were available to complete the gasification plant. The procurement and installation of the gasification power plant, and the 5 motorized roasters were delivered but were delayed beyond the original completion date as a result of (a) a disagreement over the timing of payment and of a Letter of Credit for the gasification power plant between the Indian supplier and the project; and (b) miscommunication with the Brazilian supplier for the supply of 5 roasters of a 2.0m diameter, instead of the stipulated 3.6m. The latter led to the cancellation and re-launching of the procurement process in June 2015. It was observed by the 2015 supervision mission that many of the problems could have been avoided or minimised had there not been a lack of investigation, management responsiveness and problem solving for the implementation of component 3. The activities that have been achieved as of project closure are the securing of the beneficiary land, a roasting shed, a borehole and water distribution system, a warehouse, the installation and the Environmental Impact Assessment (EIA) of the gasification plant (but is yet to be tested) and the 5 mechanised roasters, although without the required burners which IFAD has committed to integrating into other projects to ensure completion. The project has also trained cassava processors in business management and group dynamics in partnership with the Business Advisory Centre of IFADs REP.

Outcome 3.2: Diversified livelihoods and socio-economic impacts of climate change mitigated.

45. **Alternative livelihoods.** To improve farmer climate adaptation capacity the project had planned to support farmers with mushroom and honey production capacity with better production and storage capacities, as well as reduced firewood consumption through the testing of a mix of cassava peels and manure. Unfortunately this activity was ultimately abandoned before the MTR stage to redirect the finances towards the gasification plant.

b) Results and impacts of the project.

46. The challenges the project faces in measuring the impacts in terms of the overall SCCF goal and objective are characterised firstly by a baseline assessment upon which to measure project impacts. It is for example not possible to measure the project's impact on food insecurity because there is no working definition or a working figure. The baseline uses a broad reasoning to explain why it is difficult to produce one citing food production, climate change and social safety nets. Secondly, the commissioned impact assessment, also referred to as thematic study, carried out at project closure did follow-up data generated at baseline, but both baseline and impact assessment did not measure project indicators such as household data on income level and expenditure levels on food, the number of months a year farmers have difficulty in accessing food and to what extent they are reliant on off-farm food sources.

47. **Impact findings.** The thematic (impact) study does however examine some of the same results presented in the baseline assessment. Among the 245 farmers and processors interviewed, climate change awareness remained largely unvaried, although high at 94% over the 92% in the baseline. 93% of those interviewed showed awareness of reduced cassava crop yield from climate change, which is up from 84% in the baseline; awareness of the risk of prolonged drought from varying rainfall patterns was lower than in the baseline, respectively 44% and 84%. With respect to the numbers of farmers implementing climate smart

agricultural techniques, 91% of those interviewed confirmed 100% to 200% increases in crop yield p/ha for all improved cassava varieties. Of those surveyed the preferred climate smart techniques that have been adopted were 41% mulching (up from 18.6% in the baseline), 28% carried out ridging, 13% appropriate fertiliser use, 10% bunding, 8% water harvesting techniques, 4% used mounds and 2% cassava spacing, 1% stem handling techniques and 0.8% planting across slopes. What these results show when compared to those peer-reviewed and published by the project (see below), is that with the exception of mulching, the project has not been able to encourage large scale adoption of the most successful climate smart techniques.

48. **Building climate resilience into cassava production.** The project carried out a number of studies throughout project implementation, one of which was peer reviewed and published, and gives an idea of the impact climate smart agriculture can have on productivity. These results are limited to component two and part of component one in building climate resilience into cassava production because component three was not successfully completed.

49. Published [5] results on the gravimetric analysis carried out on mulching for soil moisture reported that the mulched ridges showed greater moisture retention versus the control soils. Drought conditions can hereby be mitigated against as mulching provided greater protection against high temperatures and wind speed and absorbed atmospheric dew at night. The research also demonstrated that while mounds are less resistant to cassava root development and result in improved cassava tolerance to drought conditions, the use of ridges increased biomass (t/ha), root yield (t/ha) as well as harvest index across four different cassava varieties (Biambase, Bankyehemaa, Nyerikobga, Filindiakong).

50. Separately, field assessments from the 2014 FFF showed that improved varieties had higher establishment rates (between 90 to 95% survival rates) and performance vigour compared to the local varieties (survival of 70 to 75%). The improved varieties mostly had no signs of pest and disease as opposed to the local varieties with the former mostly demonstrating branching at an early developmental stage which enabled them to form canopies early and hereby reduce the proliferation of weeds. Conversely in the case of the local varieties, they grew taller than the improved varieties at an early stage, but had fewer branches hereby increasing weed proliferation. The improved varieties also had higher average yields of between 23-27 mt/ha across the three ecological zones while local varieties had an average of 17-23 mt/ha.

51. **Technical efficiency.** Field studies confirmed previously published research that increased cassava production (t/ha) was positively correlated to increases in farm size. Other positive factors were the use of family labour which increased output by 0.315 t/ha and saved money on hired workers, the use of hired workers were not found to have had a significant impact on yield outputs. The study estimated the technical efficiency of cassava farmers across the agro-ecological zones, which ranged from 3.8% to 90.5%. The largest proportion of farmers (33%) had a technical efficiency score of less than 50%. The average farmer however produced 54% of their output potential given the current level of technology. Improved methods of production would make up for the productivity gap.[6]

52. **Soil fertility.** The project also studied the effect of different types of fertility management techniques on the yield output of cassava production. The study was carried out on farmer groups in the seven districts within the forest, forest-savannah transition and guinea savannah zones. Cassava had been planted on a number of different methods, on mounds, ridges and on flat ground, and two types of fertiliser had been applied, Nitrogen Phosphorus Potassium (NPK) 15 15 15 and poultry manure. The results showed that cassava yield was higher on poultry manure treated plots than NPK applied plots, also NPK plots were also less effective against drought conditions. Fertilized mounds yielded higher than on non-fertilized mounds, ridges produced higher yields than mounds which is also reflected in other research published by this project.[7]

[5] Boasiako Ohene Antwi et.al (2016) Drought Assessment for Reduced Climate Impact on Cassava Production. Journal of Applied Sciences. ISSN 1812-5654
[6] Technical Efficiency of Cassava Farmers in the Three Agro-ecological Zones in Ghana: A Scholastic Frontier Approach.
[7] F.M. Tetteh et.al. Responses of different cassava varieties to soil fertility management options for climate change adaptation.

c) Targeting and outreach

53. ProVACCA targeting and outreach was in line with IFAD's mandate to target rural people living in poverty and experiencing food insecurity in developing countries. Considering that component three was not completed, the project managed to reach 10,527 direct beneficiaries of which 6,245 were male and 4,282 were female, the data was not disaggregated by age for youth. The project sensitised 5,515 farmers in climate change awareness, 610 received farmer-to-farmer exchange visits, 620 school children received climate change awareness and tree planting training. 2,832 farmers received training through 49 FFF's and over 950 were trained by trainers in soil fertility testing. RTIMP and ProVACCA were designed to reach out to the most vulnerable groups in the project areas, and were fully aligned in terms of targeting and strictly followed the targeting criteria.

d) Innovation, scaling up and theory of change.

54. **Innovation.** The major innovation in this project was meant to have been the introduction of the biogas energy plant. This activity was aimed at reducing waste from the cassava processing chain in the form of cassava peels but also to use sawdust to generate energy and operate the cassava gasification plant instead of diesel and firewood. The combined gasification and biogas plants would have been able to generate energy in the form of electricity, hot air and gas. The energy that is to be generated by the gasification plant would need to be utilised immediately while the that of the biogas plant would have been stored and utilised when required. This would have been a major innovation for Ghana, and had it been implemented, which it was not, it would have been a regional showcase of this technology[8]. The project did however introduce innovative high yielding cassava varieties that have been demonstrated in peer-reviewed research to have increased yields and productivity.

55. **Scaling up.** The activity that shows greatest promise for scaling up is that of climate smart agriculture. The research produced verifiable results in terms of yield increases and productivity gains directly attributable to methods of conservation agriculture that conserve water and minimise soil erosion, the output increased two to threefold. These are very clear results that deserve to be upscaled. It would be advisable for the future projects to work with higher level agricultural research institutions to develop curriculums in partnership with FAO and MOFA on the basis of the research that has been conducted. MOFA trainers would need to be trained in these techniques and they would need to be widely implemented through all FFF.

56. **Theory of change.** The theory of change is presented in annex 3 and depicts the causal pathways from the identified problems through the activities to be implemented and the desired outcomes and impacts. In view of the changes that the project has undergone, annex 3 also shows the reduced impact that the project will have as a result. It shows the same theory of change with the same identified problems and the same effects but without component 3. The effects of the gasification plant not having been completed and the biogas plant having been abandoned is shown to have a drastically reduced ultimate impact. The gasification plant seems to be on track for completion through the support of IFAD, however remains incomplete at project closure. The biogas plant has been completely removed, therefore the goal of building climate resilience into the cassava value chain, as well as reduced environmental impacts and improved environmental health have all been removed from the overall impact of the project. By removing the bioenergy plant this project will go from being more climate neutral to being a net contributor in terms of GHG emissions. The project has also not been able to make a significant contribution to reducing deforestation because of underlying problems related to land tenure and land owner scepticism to the profitability of agro-forestry projects. The abandonment of the alternative livelihood schemes of honey and mushroom farming have also reduced the project's impact in building resilience to climate change, food security and poverty reduction.

[8] Please refer to paragraph 42 for further information relating to this technology.

57. Project effectiveness is rated as moderately unsatisfactory (MU).

V. Evaluation of project efficiency

a) Project costs and financing.

58. The exchange rate was unstable during the project's implementation period where the Ghana cedi suffered a 120% depreciation against the US Dollar. It varied from US$1/GHc 1.935 at the start of the project to GHc4.26 at project close (30/06/17).

Table 1 Amounts allocated and disbursed in US$

I	IFAD / ProVACCA DISBURSEMENT	
a	Project allocated amount	2,500,000
b	Amount disbursed by IFAD as at 30 June 2017	2,394,283
c	Amount outstanding as at 30 June 2017	105,717
d	Execution rate	95.77%
e	LDCF/GEF advance to project	600,000
f	Amount recovered	546,774
g	Outstanding	53,226
II	GoG DISBURSEMENT	
a	Project allocated amount	315,000
b	Amount disbursed by GoSL as at 30 June 2017	-
c	Amount in tax exemptions	66,722
d	Amount outstanding as at 30 June 2017	248,278
e	Execution rate	21.12%

59. **Total project costs & disbursements.** The overall project budget was US$2,815,000 of which the GEF/SCCF grant was of US$2,500,000. The GoG was to contribute US$315,000 in cash and in-kind contributions in the form of tax exemptions to be derived from the GoG counterpart financing made available through the RTIMP project. The total amount received in the form of tax exemptions was of US$66,722 (21.12%). The project had received a US$600,000 advance of which 546,774 has been refunded, the remaining US$53,226 is traceable to bank accounts to be refunded to IFAD. As of 30th June IFAD was set to disburse 95.77% of the funds made available.

Table 2 Disbursement by category in US$ as at 30 June 2017

#	Category	Loan Allocation	IFAD Disbursement	Disbursement %	Project loan Utilisation	Predicted Available Balance
I	Vehicle & Equipment	1,010,000	954,463	94.50%	954,463	55,537
II	Materials & Supplies (Agric. Inputs)	240,000	219,969	91.65%	219,969	20,0131
III	Technical Assistance & Studies	300,000	269,518	89.84%	269,518	30,482
IV	Training & Workshops	620,000	619,754	99.96%	619,754	246
V	Salaries & Allowances	190,000	188,973	99.46%	188,973	1,027

VI	Operating Costs	90,000	88,380	98.20%	88,380	1,620
VII	Unallocated	50,000				50,000
	Total	2,500,000	2,341,057	93.64%	2,341,057	158,943
	Authorised allocation		53,226	-	53,226	-53,226
	Total	2,500,000	2,394,238	95.77%	2,394,283	105,717

60. Key expenditures for the project were reallocated in consultation with IFAD's Mid Term Review Mission in 2014 as follows: Capital/Investment Costs US$2,170,000 (Vehicles and office equipment; Materials and Supplies; Technical Assistant, Professional Services and Studies; and Training Workshop, farmers and Entrepreneurs) and recruitment cost - US$330,000 (Salaries and allowance; Operating Cost; and Unallocated). The cost breakdown by category is displayed in table 2 these include:

i. **Category 1, Vehicle & Equipment:** The disbursement of US$ 953,463 represents 94.5% of the total allocation and includes the costs related to the supply and installation of the Gasification Plant and 5 Mechanised Roasters, and the cost of civil works for the Roaster and Storage Sheds, which totalled US$ 842,943. US$ 111,518 was spent on procurement of a project vehicle, drilling of the borehole, the water distribution systems.

ii. **Category 2, Materials and Supplies (Agri. Inputs):** The disbursement of US$ 219,969, which represents 91.65% of the total allocation, includes the establishment of demonstration fields, fencing, supply of planting materials, rain gauges and soil fertility tests.

iii. **Category 3, Technical Assistance & Studies:** The disbursement of US$ 269,518 (89.84%) for consultancy services for financial audits, Environmental Assessment of the Gasification Plant.

iv. **Category 4, Training & Workshops:** The disbursement of US$619,754 (99.96%) included sensitisation activities, the establishment of the FFF fields, validation workshops, cassava yield activities and trainers (Extension workers; researchers; municipal planning; RTIMP staff) climate change adapted water harvesting system and techniques.

v. **Category 5, Salaries & Allowances:** US$ 188,973 (99.46%) was disbursed for salaries and allowances for three ProVACCA staff members namely Project Officer, Accounts Officer and Driver.

vi. **Category 6, Operating Costs:** US$ 88,380 (98.20%) was disbursed for quarterly, biannual and annual monitoring activities, office running expenses, utilities, vehicle operation and maintenance and other office equipment.

Table 3 Disbursement by component in US$ 000

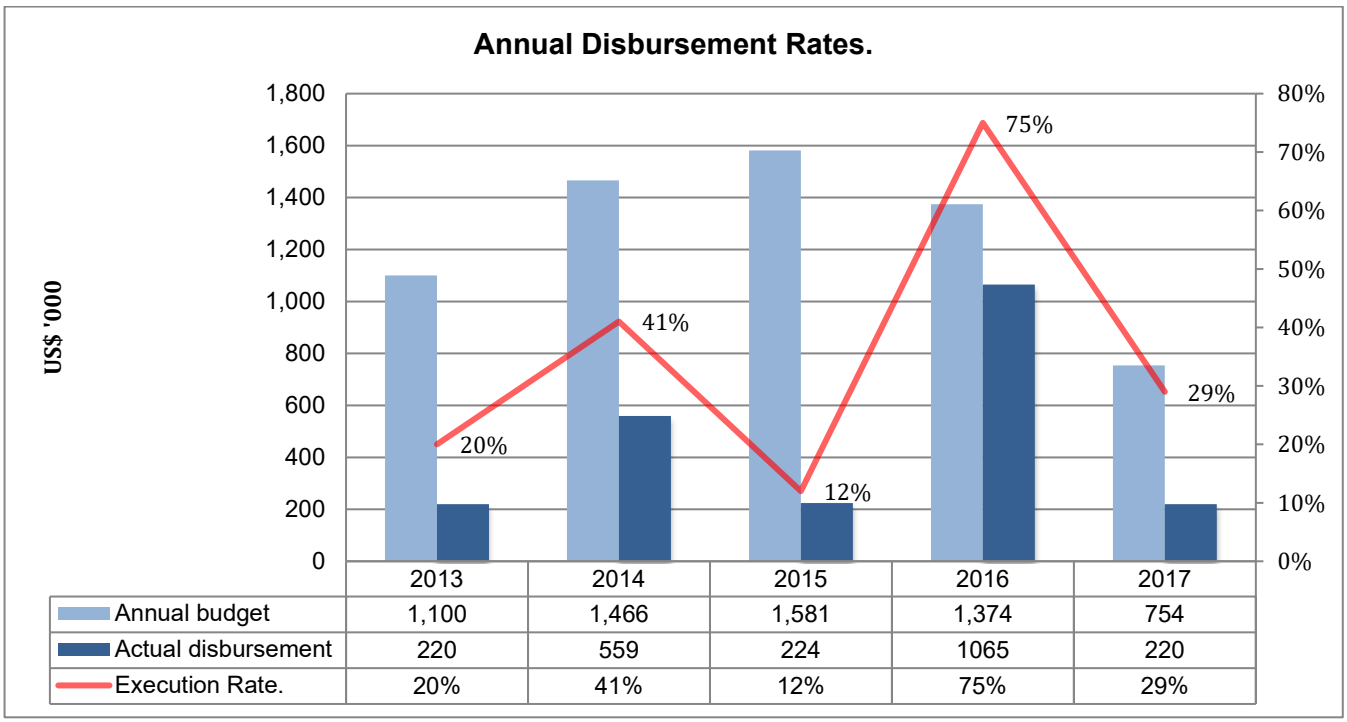
#	Component	Grant Allocation	IFAD Disbursement	Project loan Utilisation	Disbursement %	Predicted Available Balance
1	Awareness raising to CC and capacity to address impacts along cassava value chain	544,300	405,408	74.48%	405,408	138,892
2	Support adaptation of cassava production to CC	863,000	492,608	57.08%	492,608	370,392
3	Promote innovative adaptation solutions along the agric. value chain	821,700	1,003,037	122.07%	1,003,037	(181,337)
4	Project Management and M&E	271,000	440,004	162.36%	440,004	(169,004)
	Total	2,500,000	2,341,057	93.64%	2,341,057	(53,226)
	Authorised Allocation		53,226	-	53,226	
Total		2,500,000	2,394,283	95.77%	2,394,283	105,717

61. **Project Costs per Component.** ProVACCA project cost allocations under the four components were component 1) US$ 544,300; Component 2) US$ 863,000; component 3) 821,700 and 4) 271,000. The actual distribution produces a mixed picture with disbursement levels respectively at 74.48% and 57.08% for the first two components. The remaining components that overshot their projected costs were component 3 because of the high cost of construction work for the roaster shed, warehouse, and the problems surrounding the installation of the gasification plant and 5 mechanised roasters which cost US$ 842,943. An additional US$ 111,519 was spent on vehicle purchase, drilling of the borehole, and water distribution systems. Other unexpected expenses include the construction of a fermentation bay, drains and plant transportation from the port.

62. **Project Management and M&E.** The project overran in component 4 largely because of the one-year project extension beyond the original 3 years. The original project completion date was 31 December 2015 but it officially closed on the 30th of June 2017 and the extension resulted in an increase in staff, operations and maintenance costs.

63. The AWPB disbursement rates in figure 1 below, have largely been below average, mainly caused by the lengthy delays in implementing component 3. The average disbursement rate over the four years has been of 36.32%. The project got off to a slow start with 20% disbursement in PY1, this marginally improved by PY2 with a disbursement of 40% and subsequently decreased to 14% for the third year of implementation. The initial low disbursement rates are directly related to the difficulties encountered in the procurement of the Gasification Plant, Mechanised Roasters and civil work, although this picked up in 2016 to 75% despite the component still not being completed.

Figure 1 Planned vs actual AWPB disbursement rates



	2013	2014	2015	2016	2017
Annual budget	1,100	1,466	1,581	1,374	754
Actual disbursement	220	559	224	1065	220
Execution Rate.	20%	41%	12%	75%	29%

b) Quality of the project's management

64. The Project Management and M&E functions were fully co-ordinated and integrated with the management structure of the RTIMP and GASIP, with joint planning processes and sequencing. Consequently the ProVACCA project was managed as part of the RTIMP and subsequently GASIP across all supported activities, the reporting showed that implementation varied when ProVACCA was managed across the two projects. The supervision mission reports clearly state that efforts were made by the projects to implement the various supervision mission recommendations. They also however report of a lack of investigation and management responsiveness in addressing and solving problems specifically with regards to the implementation of component 3 which have led to delays and cost overruns. The shortcomings have been identified particularly with the timely completion of administrative tasks, meeting key deadlines and outputs, procurement, following up on mission recommendations and regular reporting. There was an identified need for greater detailed planning of activities in order to improve implementation and the need to recognise the urgency and priority of the tasks to be undertaken. Project management was therefore rated as moderately unsatisfactory (MU).

65. **Monitoring and evaluation.** The quality of M&E was mixed between the implementation of ProVACCA under RTIMP and GASIP. The MTR reports that under the former there were very few activities to monitor and report on, M&E was found to have been adequate and responsive for components 1 and 2, while component 3 reflected less than adequate responsiveness, which placed the implementation of the objectives at risk. The dissatisfaction of project M&E by the supervision missions extended to the transfer of ProVACCA from RTIMP to GASIP. The 2016 supervision mission reported that the planned updating of the M&E system under GASIP had not been done since RTIMP had been closed. It finds that the project indicators were being tracked, but the entry of the data into the central system that had been established by RTIMP was not being carried out. During the 2016 supervision mission it had been agreed that the Central Zone M&E Officer for GASIP would provide relevant support, however by June 2017 this had not been implemented. The Terminal Evaluation Report (TER) June 2017 mission also found that the project had not kept a logframe to monitor project implementation, this was completed retroactively at request of the final mission prior to closure. Based on the reports provided to the June 2017 TER mission,

regular project progress reporting under GASIP appears not to have been carried out. The mission found a clear reliance by the project on GEF Project Implementation Reports (PIR) as the only measure of project reporting instead of progress reports as well as a reliance on the supervision mission reporting.

66. **Baseline.** A baseline has been conducted through a consulting firm and produced some interesting results that guided project strategy. These included information on the high level of climate change awareness by farmers and the low integration of climate smart agriculture technologies; the identification of the main barriers to climate change adaptation; the lack of integration of climate mainstreaming into the district level development agenda and historical rainfall data confirming rainfall variability and the degree of post-harvest losses. Notably however it did not produce baseline household data on food insecurity levels, it was not able to provide updated figures on household income level and expenditure on food, which would have served as an indicator of food insecurity.

c) Quality of the financial management.

67. The RTIMP financial systems and internal controls have been applied for the management of the GEF Grant. Similarly, the Scala accounting software, used for the IFAD projects were also utilised for the GEF grant financial data capturing, accounting and financial reporting. The guidelines, procedures and internal controls, have been considered adequate. The MTR mission observed however that budget provisions were not entered in the accounting systems, and this did not facilitate automated budget performance reporting. The result is that there was no detailed budgetary performance report on activities implemented during the quarter, and six months reporting periods, in terms of their actual individual activity costs as compared with the budgetary provisions.

68. **Accounting.** The Project Country Office (PCO) has been found to maintain a performing accounting system under the Scala accounting software, with adequate articulated Chart of Accounts. The financial information was generated at quarterly intervals and at financial year-end, despite the said gap in budgetary reporting performance. Audits were regularly carried out and the recommendations from the 2016 supervision mission have been applied, namely that the 2016 and 2017 audits be carried out by the Ghana Audit Office, with direct affirming unqualified opinions, instead of in general terms.

d) Partner's performance.

69. The project worked in partnership with MOFA as the implementing agency through which MoUs were developed among other things, for the installation of the gasification plant and the mechanised roasters. Other partners have included the Ministry of Finance (MoF) and the Ministry of Environment, Science and Technology (MEST). The project also partnered with the Centre of Environment Health Research and Training as well as the Environment Protection Agency (EPA) to conduct and approve the EIA required for compliance with the Ghana Environmental Assessment Regulation (LI 1652) 1999. Meteorological station specifications were developed together with the GMET; partnerships were sought with the ACMAD and the University of Cape Coast for meteorological curriculum development and climate modelling. Further research and training partnerships were developed with the Savannah Agricultural Research Institute, Nyamkpala; the Soil Research Institute, Kwadaso; the Kwame Nkrumah University of Science and Technology, Kumasi; the Koforidua Polytechnic, Koforidua; the Forestry Commission; and the pilot District Assemblies; the Business Advisory Centres at the District Assemblies and the District Development Officers (DDOs).

70. The GoG did not meet its agreed contributions to the project of US$ 315,000 as per section B of the financing agreement between the GoG and IFAD. The project has registered a total of US$ 66,722 in tax exceptions that have been facilitated by MOFA, which constitutes 21% of the agreed amount.

e) Quality of IFAD supervision and implementation support.

71. Overall, IFAD provided adequate support through project design, supervision missions and implementation with a country presence. Under RTIMP supervision missions occurred regularly and jointly with IFAD and the GoG on an annual basis. They typically comprised between 5 and 8 experts, covering both RTIMP and ProVACCA activities. In 2014 a MTR was carried out only for ProVACCA and after which all supervision missions were solely dedicated to the GEF/SCCF project. There were no delays in fund transfers from IFAD and the PCR finance review has determined that the project office largely complied with financial procedures. As mentioned under the quality of project management section (Vb) supervision missions report of a lack of investigation and management responsiveness in addressing and solving problems specifically with regards to the implementation of component 3 which have led to delays and cost overruns.

72. Project efficiency is rated as moderately unsatisfactory (MU).

VI. Evaluation of sustainability

73. The project design had a post-project sustainability strategy which focused around 2 main pillars, namely capacity building of small holder farmers and of government institutions and improvements for beneficiaries in production and processing. This was to be achieved through new technologies such as climate smart agriculture and multiple sustainability benefits for the bioenergy plant, which was abandoned.

74. **Social sustainability.** Social sustainability for the project is rated as high for the activities that have been implemented. The beneficiaries have been shown to have developed the necessary skills in adopting resilient, high yielding cassava varieties as 91% of those interviewed in the impact study, confirmed two and three fold increases in crop yield p/ha for all improved cassava varieties. Climate smart agricultural techniques have been adopted to varying degrees such as mulching, ridging, appropriate fertiliser use, bunding, water harvesting techniques and stem handling techniques. The impact study has shown that around 98% of those surveyed indicated substituting their traditional approach with some form of climate smart approach although the adoption rate per technique was overall low.

75. **Economic and financial sustainability.** The economic sustainability of cassava production cannot be verified because the project did not aim to analyse the economic benefits of the increased cassava yields. The study conducted on the technical efficiency of cassava showed that farm size was the most important factor of production in ensuring increases in output t/ha. Yet one of the farmers main concerns raised in the impact study were the limitations to expansion. Farmers felt that they have been inhibited by a lack of ploughing capacity, inadequate farm labour and supply of planting materials. While the project did a good job of developing innovative and climate smart agricultural techniques, in terms of economic and financial sustainability there is room for upscaling these yield improving techniques into increased production levels in the value chain.

76. The project had foreseen the introduction of rural financing mechanisms such as micro-finance schemes and innovative capital subsidy schemes but only for cassava processing groups for component 3 that has not been completed. The project has been training cassava processors in business management, but at the time of closure the final analysis of the processing groups activities had not been completed.

77. **Technical sustainability.** The technical sustainability of the gasification plant has not been analysed in view of the fact that they have as yet not been fully implemented. It is however predicted to be low on the basis that the gasification plant and roasters (the burners have as yet not been purchased) have been procured from India and Brazil and the installation engineers have had to be flown in from India, with no apparent training having been foreseen to train local capacity in repair and maintenance.

78. **Institutional sustainability.** Institutional sustainability is rated as low. Many of the activities that the project has implemented with the exception of the gasification plant were intended as standalone activities, whose sustainability depended solely on local stakeholder involvement. There has been no indication of any post-project involvement by MOFA to continue the

activities or to upscale the climate smart agriculture trained extension workers and FFF programmes. With regards to the gasification plant**,** one of the other main concerns, had the plant been completed on time, was post-project ownership which in June 2017 had not yet been satisfactorily addressed.

79. **Environmental sustainability and climate change.** The main focus of ProVACCAs environmental sustainability lay in the bioenergy plant, which has been abandoned to redirect funds to the much delayed gasification plant. The bioenergy plant as it was originally envisioned, aimed to contribute to the Strategic National Energy Plan (SNEP 2006-2020) and the Bioenergy Policy of Ghana. It would have promoted the use of agricultural waste as bioenergy, contributing to energy security, minimising environmental impacts of energy production such as GHG emission reduction, and wastewater treatment. Because of its abandonment the major environmental sustainability element of the project has been removed.

80. The project also aimed to develop agro-forestry plans, which did not materialise. The reasons were because of land availability, land tenure rights for the length of time required to make the trees profitable and a general perception by landowners against trees as a profitable activity. Through the non-formal educational programme with school children, the project did plant 11,600 seedlings produced and planted (Cassia= 5,600, Teak= 5,000, Mango=1000). A further 100 farmers were supported in planting trees along the border of plots of land.

81. The project has produced published research on mainstreaming climate change into cassava production by researching improved cassava varieties as well as SLWM techniques to improve soil moisture and fertility levels, hereby increasing productivity by up to 200%. Farmers were also sensitised in climate change awareness and radio jingles and 30 interactive radio programmes have been developed and broadcast to increase general awareness about climate change.

82. Project sustainability is rated as moderately unsatisfactory (MU).

VII. Lessons learned.

83. **Knowledge.** The baseline study that was conducted at the start of the project evidenced some interesting findings that gave strategic direction to the project. These included a) That most farmers in the value chain had already heard about climate change although few were implementing climate resilient techniques; b) The main barriers to small scale farmers adopting climate smart agriculture included a lack of knowledge, inadequate technical support, poor access to inputs and credit and unfavourable market structure; c) That at district level, climate change had been identified as a key developmental challenge but the District Medium Term Development Plans did not integrate climate change into their development agenda; d) Rainfall patterns over a 30 year period had been shown a high degree of variability in when the start and end of the rains occurred, the length of the rainy season and increases in minimum and maximum temperatures.

84. The project also contributed to the scientific knowledge surrounding climate smart agricultural innovations. Research published by the project has shown that a) Daytime temperatures and wind speed are major climate stressors that cause high moisture losses and could be reduced by any type of soil cover; b) Soil-water-conserving tillage practices and planting within defined onset and cessation of the rainy season enhanced the resistance of cassava to climate stressors; c) Separating normal drought assessment criterion into positive and negative components removed the limitations of Standardised Precipitation Index for drought assessment in dry areas of Ghana. Other research yet to be published at the time of writing the TER contributed to the scientific knowledge of cassava yield increases by the use of mounds and ridges as well as different types of fertilisers. The research showed that cassava yield was also higher on ridges than mounds; on ridges, cassava yield was higher on poultry manure treated plots than NPK 15:15:15 fertiliser; NPK also was less effective due to drought applied plots; and that the use of fertiliser (NPK or organic) can be used to compensate for inconsistent rainfall, mulching will also improve and sustain cassava production.

85. **Project strengths and weaknesses.** The project has to a large extent been found to have successfully implemented components one and two a fact that has been recognised by all the supervision missions, overall the project has also been found to have followed financial procedures and processes with the exception of budget performance reporting as reported under quality of financial management. The project has however demonstrated to have had significant weaknesses that have led to the less than satisfactory performance in the implementation of component 3 both when implemented under RTIMP as well as GASIP. These include unsatisfactory oversight and management of project activities, particularly with timely completion of administrative tasks, in meeting key deadlines and outputs, procurement, following up on mission recommendations and regular reporting. The project had needed greater detailed planning of activities and greater recognition of the urgency and priority of the tasks to be undertaken. The project has also been found lacking in adequate initiative to secure required technical assistance and support services for project implementation. Under the management of the GASIP project, management has also fallen short in terms of monitoring and evaluation and this has been recognised and reported on in the supervision missions. The established system of inputting M&E data centrally under RTIMP was not continued under GASIP despite repeated requests to do so by supervision missions. M&E reporting has hereby suffered and consequently project implementation. The project has also not implemented basic project implementation processes recommended by GEF such as the use of project implementation logframes to monitor and report on project implementation.

86. **Replication.** The aspects of the project that are worthwhile replicating and upscaling in light of the scientific research published by the project is the mainstreaming of the gains in knowledge and understanding that have been made in terms of cassava climate smart agriculture throughout all of IFAD operations as well as MOFA.

VIII. Conclusions and recommendations.

87. **Conclusions.** The overall results to be drawn from the implementation of the ProVACCA project are mixed. The project has largely successfully implemented two of the three components. The exceptions were the Automatic Weather Stations and climate forecasting which have been replaced with simple weather gauges and the vulnerability assessment, which would have been fundamental for the needs assessment required for the capacity building programme and was also abandoned. The project did carry out the baseline assessment, which informed project strategy and among other things identified a need for the target groups to develop their capacities in climate smart agriculture. The project has delivered peer-reviewed research that demonstrated the validity of climate smart agriculture and high yield varieties of cassava in improving cassava productivity and yield p/ha. There are however no apparent plans to mainstream this knowledge into a broader approach for mainstreaming climate resilience and for improved cassava productivity and yield more broadly.

88. The impact assessment showed an overall high beneficiary knowledge application rate (98% of those surveyed), although the individual adoption rate for the techniques demonstrated to increase yields such as mulching, ridges and organic fertiliser have been low. There has however been a high level of appreciation of the two to three fold increases in cassava yields that the improved cassava varieties provided (91% of those surveyed). Overall the project reached 10,527 direct beneficiaries of which 6,245 were male and 4,282 were female, the data was not disaggregated by age for youth. The project sensitised 5,515 farmers in climate change awareness, 610 received farmer-to-farmer exchange visits, 620 school children received climate change awareness and tree planting training. 2,832 farmers received training through 49 FFF's and over 950 were trained by trainers in soil fertility testing. The project also had a radio broadcast awareness programme which it is estimated reached 10,000+ people indirectly.

89. In terms of project implementation of component 3 the project fell short in delivering any of the objectives. The gasification plant was not completed and the biogas plant abandoned in large part for reasons attributable to project management and implementation. As a result the project is unable to meet its target of reducing GHG emissions in the cassava value chain and improving on environmental health. To the contrary, once the gasification plant will be

completed with continued IFAD support, it will become a net GHG emitter and the waste by-products of cassava production such as cassava peels and cyanide contaminated wastewater will remain and add to the environmental problems.

90. **Recommendations.**

- The project has exposed necessary improvements that need to be made in project management and implementation but also monitoring and evaluation and reporting.
- IFAD has shown a willingness to support the completion of the gasification plant, however this notable effort should be extended to the biogas energy plant as well. Any effort to complete the gasification plant should also include the original aim to address GHG emissions as well as the associated environmental impacts of cyanide contaminated wastewater and cassava peels.
- The achievements in demonstrating the added value of climate smart agriculture through peer reviewed research in yield and productivity increases, should be capitalised upon and mainstreamed into a wider sectoral approach to improving cassava productivity and mainstreaming climate change resilience.
- It is recommended that future projects consider developing a curriculum focused on climate smart agriculture in partnership with FAO and the MOFA that can be used for broader use both at beneficiary level in the FFF as well as through the higher educational system.

Annex 1 Indicator and achievement logframe

RESULTS HIERARCHY	INDICATORS			ACHIEVEMENTS	DATA SOURCE
	APPRAISAL	Baseline	Target		
SCCF Goal Reduce the vulnerability of the food supply system to the deleterious impacts of climate change	Contributions to the NCCAS objectives to increase resilience of key agricultural production systems to climate change impacts in Ghana	• 91% climate change awareness • 44% used drought resistant cassava varieties. • 35% tree planting • 18.6 mulching • 12% irrigation • 3% rainwater harvesting • 1% Agricultural insurance.		• 94% of surveyed demonstrated climate change awareness. • 91% of those interviewed confirmed 100% to 200% increases in crop yield p/ha for all improved cassava varieties. • 41% carried out mulching • 28% carried out ridging, • 13% appropriate fertiliser use, • 10% bunding, • 8% water harvesting techniques, • 4% used mounds. • 2% cassava spacing, • 1% stem handling techniques. • 0.8% planting across slopes.	Impact assessment (Thematic studies)
SCCF Objective To promote activities that reduce climate induced risks to the achievement of food security and income generation objectives for the rural communities in Ghana.	i. At least 70 per cent of supported beneficiaries report ability to maintain or increase healthy food production in the event of harsh climatic conditions. ii. Climate resilient sustainable land and water management practices introduced to promote food security in 144 farm plots. iii. Innovative solutions along agriculture value chain for climate resilient diversified income sources for vulnerable households promoted in 34 community groups, and benefiting about 7,200 cassava growers and	n/a	i. At least 70 reporting ability to maintain or increase healthy food production. ii. 144 farm plots using climate resilient SLWM. iii. 34 community groups, and benefiting about 7,200 cassava growers and processors from innovative solutions.	• 10,527 direct beneficiaries (6,245 male and 4,282 were female). • 610 received farmer-to-farmer exchange visits. • 620 school children received climate change awareness and tree planting training. • 2,832 farmers (163 community groups) received training through 49 FFF's. • 49 1 ha FFF demonstration plots • 950 were trained by trainers in soil fertility testing. • 98% applied some form of climate smart agriculture techniques from the FFF. • 9 out of the 14 improved cassava and 14 of local varieties gave yields above	PIR 2016/2017 Progress reports 2014/2015

RESULTS HIERARCHY	INDICATORS APPRAISAL	Baseline	Target	ACHIEVEMENTS	DATA SOURCE
	processors.			20 t/ha	
Component 1: Awareness raising to climate change and capacity to address impacts along cassava value chain / other complementary food crop production.					
Outcome 1.1: Increased awareness and capacity of small producers, formal/informal organizations of growers, processors and traders about CC impacts and adaptation on agriculture value chains and livelihoods					
Output 1.1.1 A climate change capacity building programme and awareness raising campaign are designed and tools produced.	RTIMP, Extension, and Research staff are trained on participatory climate-risk assessment and vulnerability mapping	n/a	25 Staff trained	Two training programmes were undertaken for 25 beneficiaries (RTIMP, MOFA Extension and Research Staff) in: a) Assessing and mapping climate related vulnerabilities using GIS b) Identifying and implementing adaptation options. c) Monitoring and reporting on climate impacts.	2014 RTIMP Annual Report Implementation log frame.
	No. of consultation sessions (4 in PY1,4 in PY2, and 4 in PY3) undertaken in 20 of communities.	n/a	12 consultation sessions.	322 stakeholders (218 males and 104 females) including District Administrators, Planning Officers, Agriculture Officers, cassava farmers, processors and traders at the district level.	2014 status report, MTR
	Climate-related risks and vulnerability mapping is undertaken with 20 local communities in the project targeted areas in PY1 and integrated in a GIS/Monitoring Information System.	n/a	1 vulnerability assessment	Not achieved	2014 progress Report.
	Equipment (GIS requirements, GPS, etc.) are procured in PY1 and climate-related impacts and vulnerability assessment conducted annually.	n/a	GIS software and GPS equipment procured.	GIS software procured and plans to use RTIMP GPS equipment.	2014 progress Report.

RESULTS HIERARCHY	INDICATORS			ACHIEVEMENTS	DATA SOURCE
	APPRAISAL	Baseline	Target		
	Set of materials (handbook, cultural-adapted jingle (songs), pictorial materials, leaflets and posters, info kits) produced in local languages, and distributed to users.			a. 4 radio jingles produced in Ewe, Twi, Gonja and English. b. 20 interactive radio programmes held in 3 regions Brong Ahafo, Northern and Volta regions. c. Posters- (1) Mitigating and adapting to climate change in cassava production and processing.	PIR 2015,2016
Output 1.1.2 The capacity of targeted groups to mainstream climate change adaptation into their professional activities is built.	10 trainers from 10 cassava-producing districts in 3 Agro-climatic Zones (Guinean Savanna, Transition, and Deciduous Forests) are trained to carry out community-workshops on climate change impacts and adaptation needs/options (50 in Yr. 1; 50 in Yr. 2).	n/a	10 trainers of trainers to receive training	132 FFF leaders trained as trainers in 7 districts in 3 agro-ecological zones.	Project Implementation Logframe.
	Community capacity building workshops and training sessions on climate change related issues undertaken to benefit women, youth and men of vulnerable households, local/district/regional community and commercial radio stations.	n/a	40 communities, 4 training sessions to benefit 2000 women, youth and vulnerable households.	163 communities 70 communities in project year 1 (49 of which were selected to participate in the FFF after Participatory Rural Appraisal) 52 communities in project year 2 (17 of which were selected to participate in the FFF) 40 communities in project year 3 5515 farmers (3318 male and 2193 female). Participants were made to understand the connection between climate change, agricultural productivity and their livelihood.	Status report 2014, PIR 2014, 2016.
Output 1.1.3	Pilot non-formal education activities			Number of environmental clubs formed –	

RESULTS HIERARCHY	INDICATORS			ACHIEVEMENTS	DATA SOURCE
	APPRAISAL	Baseline	Target		
The awareness of the society in the project targeted areas is raised on climate change and adaptation needs and mechanisms	in 2 pilot schools per each of the 3 agro-climatic zones organized.			6. Six (6) school nurseries established and maintained, 11,600 seedling produced and planted (Cassia= 5,600, Teak= 5,000, Mango=1000). Survival rate is about 70%. 4 woodlots of at least 1 ha area established and fenced. About 1,500 trees planted around 6 school compounds. Children became aware of the potential implication of climate change on our food supply systems and human existence. They are also aware of the roles they could play to reduce their environmental impact and the climate change phenomenon. The school clubs established tree nurseries to be used for woodlots and planting around their communities.	PIR 2014, 2016, 2017
	Radio campaigns on climate change and adaptation designed and launched in at least 1 community-radio station and 1 commercial radio station in 4 regions (Ashanti, Brong-Ahafo, Northern, and Volta) (i.e. every two months, right before key agriculture periods like planting season and harvesting season; etc.).	n/a		4 Jingles produced in Ewe, Twi, Gonja and English (in total). 30 interactive radio programmes held in 4 regions.	MTR, PIR 2017
	Equipment (10 community announcers, 1 info van, etc.) is procured in PY1 and climate change-related announcements conducted every month (PY1, PY2, PY3).	n/a		Not achieved	

RESULTS HIERARCHY	INDICATORS APPRAISAL	Baseline	Target	ACHIEVEMENTS	DATA SOURCE
Output 1.1.4 Study visits to Congo, Nigeria and Benin to undertake promotion adaptation benefits arising from the proposed approach and upscaling of technologies.	Stake holder representatives participate in learning tours (PY2,PY3).	n/a	40 stakeholder representatives.	Not achieved	
	Press news in Ghana and WCA participating countries highlighting experiences of model-processing unit.	n/a	150 press news agencies.	Not achieved	
	Additional indicator: Knowledge sharing through research papers and peer reviewed publications.	n/a	n/a	Publications- (1) 'Drought Assessment for Reduced Climate Impact on Cassava Production', (2) 'Evaluation and selection of different cassava varieties for climate change adaptation in Ghana', (3) 'Farmer perception of the potential of Agroforestry as a climate change adaptation strategy in cassava Production', (4) 'Technical efficiency of cassava farmers in three Agro-ecological zones of Ghana; A stochastic frontier approach' and (5) Responses of different cassava varieties to soil fertility management options for climate change adaptations.	
Outcome 1.2: Climate meteorological information is made available to inform agricultural investments and planning decisions					
Output 1.2.1 Agro-meteorological information integrating CC aspects is produced, gathered, tailored and disseminated to end users.	National/regional meteorological staff trained abroad on advanced agro-climatology management and climate change modelling.	n/a	PY 1, 6 staff	Not achieved	MTR 2014
	Basic meteorological stations purchased and installed.	n/a	By PY 1, 4 basic meteorological stations built in 16 districts, in 16 districts (4 districts per region: Ashanti, Brong-	The weather stations were abandoned. Instead eighty (80) rain gauges were procured and distributed to only the 7 project districts. (Unverifiable no reference made in reporting, only in 2015 AWPB as	PIR 2015 & 2017 Project Implementation

RESULTS HIERARCHY	INDICATORS APPRAISAL	Baseline	Target	ACHIEVEMENTS	DATA SOURCE
			Ahafo, Northern, Volta).	planned and PIL).	Logframe (PIL)
	Community groups of farmers and processors trained on the use of basic meteorological stations to help plan production decisions according to climate variability.	n/a	8 community groups by PY 2.	10 District Agricultural Development Units trained in the use of the rain gauges.	Project implementation logframe (PIL)
	Beneficiaries receive relevant meteorological forecasts (through mobile SMS or community announcements) on a regular basis and in a timely fashion.	n/a	At least 200 beneficiaries	Discontinued	MTR 2014
Component 2: Support adaptation to climate change of cassava production					
Outcome: 2.1: Cassava production is more resilient to climate change impacts and its quality is maintained despite risk of deterioration associated to climate impact					
Output 2.1.1 Probability of CC-associated yield losses reduced	Training materials on CC-adaptation cassava production guidelines produced.	n/a	Training materials developed 400 training materials distributed.	• 49 FFF were set up and communities have volunteered 49ha (1 per community) for year long trials. • 32 trainers trained in soil fertility testing; 956 farmers trained (402 women) • Illustrated guide to 'climate smart' cassava production produced. • Climate smart cassava production guide produced. • 2,500 brochures in English have been distributed across the 7 pilot Districts. In agroforestry, good soil management Practices, Project background information, Cassava production steps.	PIR 2014, 2016 2015 supervision mission. 2015 Annual Progress Report.
	Beneficiaries trained on CC-adaptation cassava production	n/a	200 beneficiaries	• 2,832 (M=1,679, F=1,153) trained in FFF trials.	PIR 2015, 2017

RESULTS HIERARCHY	INDICATORS			ACHIEVEMENTS	DATA SOURCE
	APPRAISAL	Baseline	Target		
	guidelines.			• FFF trials have employed land preparation techniques such as ridging and bunding. Other techniques include recommended mounds and tying of the mounds for soil moisture conservation. Mulches have also been applied on some fields. Improvements have been observed in terms of number of stands per square meter and the general performance of the crops.	
	Agricultural equipment purchased and distributed to 16 beneficiaries in PY1 and PY2	n/a	8 types of agricultural equipment	Not achieved	
	80 per cent of cassava experimental plots have used climate resilient cassava varieties with higher yields than the baseline (equal or more than 20 MT/ha) by PY3.	n/a	80 per cent of cassava experimental	• 14 improved varieties and 40 local varieties were used. • Nine (9) out of the 14 improved varieties gave yields above 20 t/ha while 14 of the 40 local varieties used achieved that threshold • The results from the study confirmed reported findings about the resilient nature of different cassava varieties. The improved cassava varieties generally gave better yields than the local varieties which had low yielding potential and susceptibility to common pests and diseases of cassava. • 98 percent of farmer trainees are applying the knowledge on their farms.	ProVACCA Thematic studies 2017 PIR 2016
Output 2.1.2 Adaptive research on	Training visits (farmers, research and extension workers) from Ghana and	n/a	One training visit per year with 15 participants	Approval could not be secured for international the training visits.	PIR 2016/2017

RESULTS HIERARCHY	INDICATORS			ACHIEVEMENTS	DATA SOURCE
	APPRAISAL	Baseline	Target		
drought-resistant and improved varieties undertaken	other cassava producing countries with high expertise on CC adaptation and cassava varieties organized.			Local exchange visits to successful FFF demonstration fields under the project were conducted instead. The exchange visits were at the recommendation of the MTR mission. A total of 14 exchange visits were organized for 610 farmers who were not involved in the FFF.	
	Farmers trained on the use of CC resilient cassava varieties to address adaptation to climate change (4X trainings x 200 farmers field fora x 3 years).	n/a	200 (of whom, 30 per cent women) farmers trained	2,832 (M=1,679, F=1,153) composition of 49 FFF.	PIR 2017
	Research results available in local languages on the web (project data-base), and translated into cultural-friendly web info sections/leaflets.	n/a	n/a	Not achieved.	
	Plant material of CC resilient cassava varieties to cover of the needs is distributed to project beneficiaries in PY2.	n/a	75 per cent (50 per cent in PY3) of needs covered	49 demonstration plots 1 acres each of planting fields were established in 7 pilot districts (at 70 per cent establishment rate).	PIR 2017
	Soil fertility test kits cyanide field kits are distributed to farmer groups in the targeted districts.	n/a	64 Soil fertility test kits and 64 cyanide field kits	64 were procured. Eight (8) were used for training and the remaining 56 were distributed. No cyanide test kits were procured or distributed. Going by the project's experience the cyanide kits had no immediate use.	PIR 2017 Project implementation logframe
Output 2.1.3 Higher level of forecasting and prevention of CC- related	Training provided to staff from local/regional meteorological and agriculture research centers	n/a	10 staff (PY 1).	A training curriculum had been developed between the project and the African Center of Meteorological Application for Development (ACMAD) based in Niger.	2014 PIR

RESULTS HIERARCHY	INDICATORS			ACHIEVEMENTS	DATA SOURCE
	APPRAISAL	Baseline	Target		
pests and diseases promoted (time bound with output 1.2.1).				A second training programme was being developed with the Physics Department of the University of Cape Coast, Ghana on climate modelling before the activity was abandoned. Discontinued	
	Local climate change scenarios for agriculture and pests/diseases developed (PY 1) and used in agriculture decision planning (national, regional, local) (PY 2 and PY 3).	n/a	n/a	Discontinued	
	Project beneficiaries integrate local knowledge, climate scenarios and agro-meteorological data in decision-making at the community level	n/a	80 per cent of project beneficiaries by PY 3.	Discontinued	
Outcome 2.2: Risk to cassava production associated with water scarcity mitigated					
Output 2.2.1 Adaptive water harvesting demonstrated and promoted successfully	Extension workers; researchers; municipal planning; RTFs; RTIMP staff trained on CC-adapted water harvesting systems and techniques.	n/a	40 trainers trained	25 Extension Officers, Researchers, Planning Officers etc.) trained on water harvesting techniques.	PIR 2017
	Participatory sessions on integrated water resource management with local stakeholders held in PY1 and 2 in PY2.	n/a	4 participatory sessions	Three sessions in PY 2 and another 3 in PY 3. conducted for Agricultural officers, some researcher and District planning Officers	Project Implementation Logframe 2014 Annual Report.
	CC-adapted water harvesting equipment provided and installed in two pilot areas (PY 2).	n/a	n/a	Not achieved	

RESULTS HIERARCHY	INDICATORS			ACHIEVEMENTS	DATA SOURCE
	APPRAISAL	Baseline	Target		
	Decrease of project beneficiaries in water vulnerability during the dry season (PY 3)	n/a	50 per cent decrease	The impact study found 98% of farmers applying learned techniques.	ProVACCA Thematic studies 2017
Outcome 2.3: Agro-ecosystem resilience to climate change strengthened					
Output 2.3.1 Adaptive land management practices implemented and successfully contributing to soil and water conservation	Training sessions on SLM and soil/water conservation techniques provided to 100 farmers	n/a	Bimonthly training sessions (50 in PY1 and 50 in PY 2).	2,832 (M=1,679, F=1,153) composition of 49 FFF Was not was not done on bimonthly basis but incorporated into the FFF sessions.	PIR 2017 Project Implementation Logframe
	64 sustainable land and water management demonstration plots promoted	n/a	64 plots by 200 (of whom, 30 per cent women) farmers in 16 districts over 100 ha (60 ha in PY2 and 40 ha in PY3).	The project carried out 49 demonstration plots and this activity was integrated in the FFF.	Project Implementation Logframe
	Equipment (i.e. mechanization needs) for SLM provided to farmer associations or community groups	n/a	4 sets of equipment to 32 farmer associations or community groups	Not implemented	
	Soil and water moisture conditions improved	n/a	100 ha of land by PY 3	Gravimetric analysis carried out on mulching soil moisture reported that the moisture content of the mulched ridges showed greater moisture content versus the control soils.	Published study: Drought Assessment for Reduced Climate Impact on Cassava Production
Output 2.3.2 Agro-forestry promoted in selected sites	Increase in revenue diversification rate	n/a	80 per cent of beneficiaries participating in agro-forestry demonstration initiatives have increased their revenues by PY3.	Land tenure rights were cited as the main reason agroforestry plans were not developed.	2014 annual report. Study: Farmer Perceptions of agroforestry as a climate change adaptation strategy for cassava production.
	Beneficiaries participating in agro-forestry demonstration initiatives	n/a	At least 50 per cent of beneficiaries	This activity was not fully implemented. 6 communities and100 farmers (13 women)	

RESULTS HIERARCHY	INDICATORS APPRAISAL	Baseline	Target	ACHIEVEMENTS	DATA SOURCE
	have reported reduced impact of unusual climate events on their crops.			were supported to grow trees but only as plant shade and fire barriers. No community forestry plans were developed.	Project Implementation Logframe
Component 3: Promote innovative adaptation solutions along agriculture value chain					
Outcome 3.1: Successful adoption of innovative solutions that contribute to adaptation in the targeted area and sub-sector / Contributes to CCA-3					
Output 3.1.1 Environmental-friendly technologies for energy production and use to support CC adaptation for food safety and food security in the cassava value chain demonstrated and promoted	Raw cassava per year are processed, with sustainable energy sources, into high-quality cassava derivatives.	n/a	5,000 MT (PY 1) to 8,000 MT (PY 3)	Not achieved	
	Households substituted fossil and firewood is almost completely eliminated for the processing of cassava	n/a	3,200 households (about 800 cassava farmers)	Not Achieved	
	Gasification and biogas pilot plant have replaced “diesel” required to operate the new facilities equipment and the motorized roasters; fire wood to produce gari.	n/a	Up to 265,000 l/y of “diesel” replaced and 1,500 MT/y of fire wood to produce 500 MT/y of gari.	Not Achieved	
	Beneficiaries (cassava processors and producers) are applying sustainable firewood management practices	n/a	Approx. 7,500 beneficiaries (PY 2 and PY 3),	Not achieved.	
	Cassava peels are no longer disposed in the environment causing pollution problems.	n/a	1,500 MT of cassava peels per year	Not achieved	
Output 3.1.2. Energy-operated water pumping system installed	Wastewater treatment for bio-gas generation in Asueyi (Techiman Municipality).	n/a		Discontinued	

RESULTS HIERARCHY	INDICATORS			ACHIEVEMENTS	DATA SOURCE
	APPRAISAL	Baseline	Target		
in the cassava model-processing unit, to supply the necessary water, based on the integrated water resources management			8,250 m3/year (25 m3 x 330 days/year)		
	Water tests proving an abatement of environmental pollution (soil, groundwater, etc.) in Asueyi (Techiman Municipality).	n/a		Not implemented.	
	Install borehole and water distribution system	n/a		A borehole and water distribution system have been installed.	PIR 2017
Outcome 3.2: Diversified livelihoods and socio-economic impacts of climate change mitigated / Contributes to CCA-3					
Output 3.2.1 Climate-resilient complementary income sources created for cassava producing and processing communities	100 Kg/straw mushroom produced per demonstration pilot site by PY 3.	n/a		Discontinued	
	Train 15 young entrepreneurs (half of them women) in growing local straw mushroom making use of cassava peels.	n/a		Discontinued	
	50 beekeepers equipped with input package and trained on improved honey production, extraction technology and marketing.	n/a		Training programmes on honey production and bee keeping had been planned for 2014 and the curriculum for the bee keeping training had been prepared. It included establishing and maintaining an apiary, harvesting and processing and packaging of bee products. This activity was discontinued.	PIR 2014
	High quality honey produced	n/a	2,850 kg (11.4 kg/beehive/year x 250 beehives PY 2 and PY 3).	Not achieved	

Annex 2 Record of supervision and follow-up missions.

Year	Type of mission	Period
2013	Supervision mission	10 - 17 June 2013
2014	Mid-term-review (MTR)	6 - 24 October 2014
	Implementation support mission	4- 12 November, 2014
2015	Supervision mission	7- 18 January 2015
2016	Supervision mission	4 – 15 May 2015
2016	Supervision mission	5 – 15 July 2016
2017	TER support mission	20 – 27 June 2017

Annex 3 ProVACCA theory of change diagram

Figure 2 Theory of change at project start

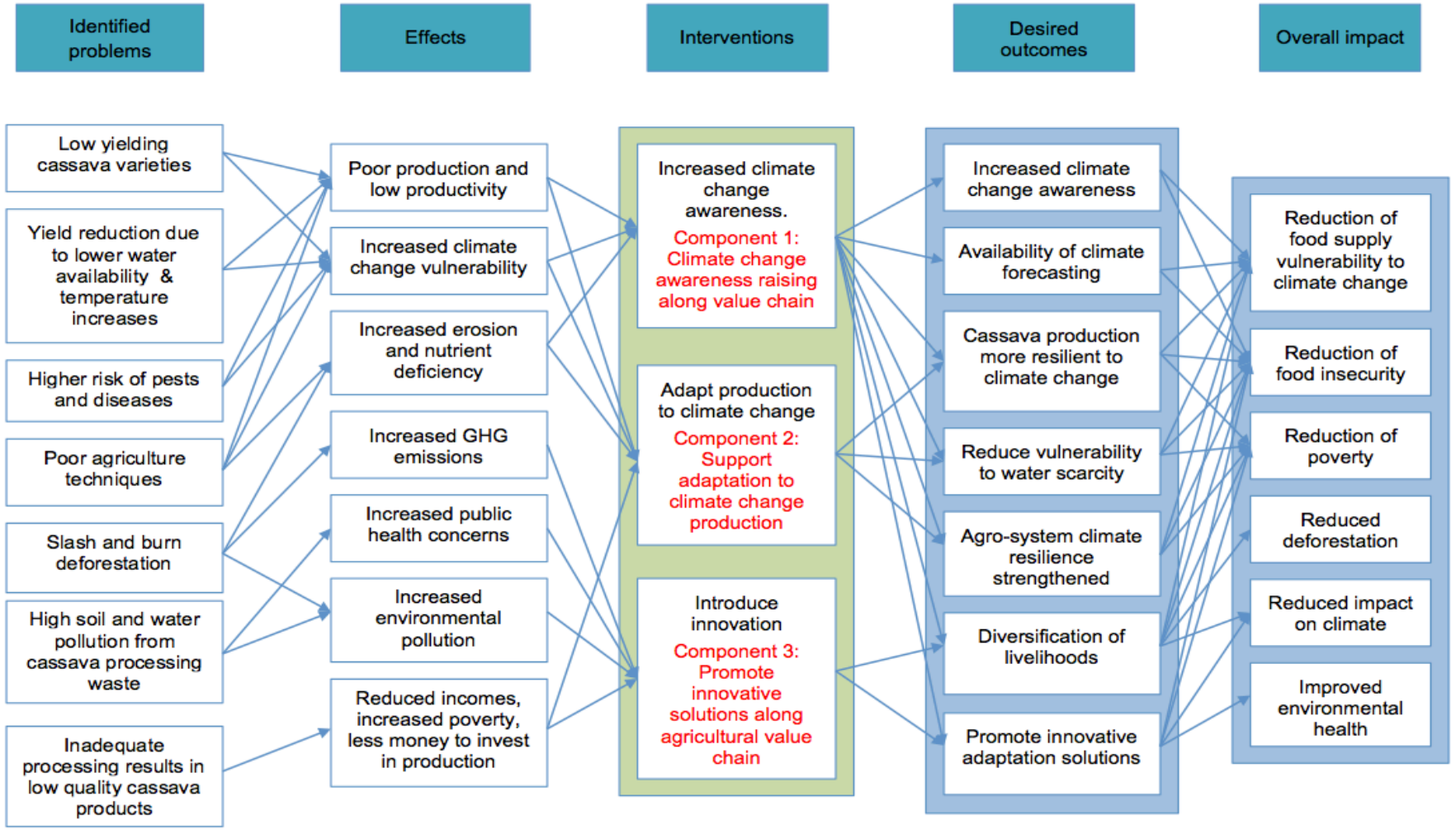
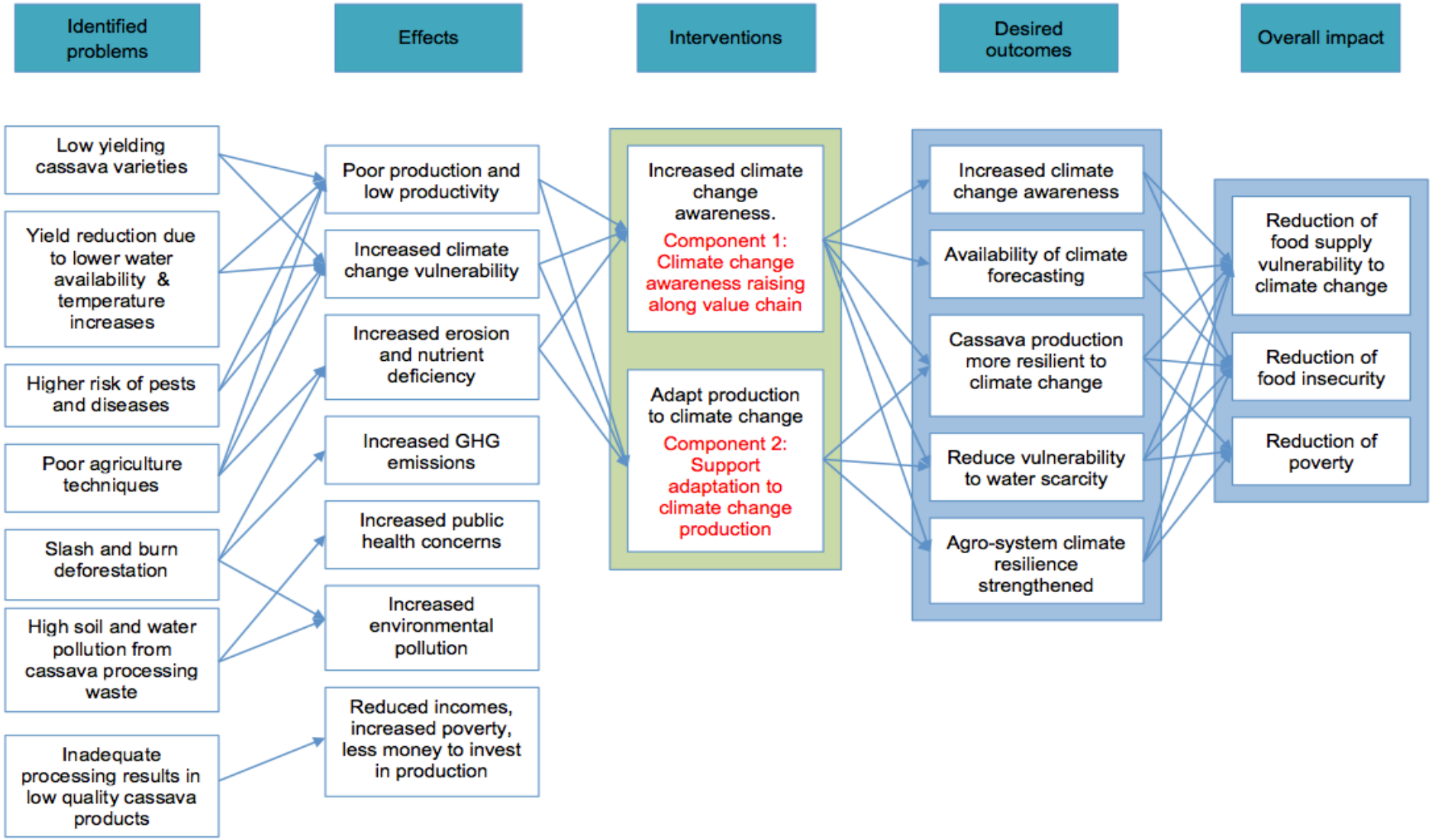


Figure 3 Theory of change at project closure



Annex 4. IACCAPFS Evaluation ratings

Aspect	Rating and justification
Relevance	The project was aligned with the Ghana Shared Growth and Development Agenda (GSGDA) 2010-2013 in terms of the strategy to promote energy efficiency, sustainable forest management, mitigation measures in the agricultural sector including education, efficient management practices and improve waste management mechanisms. ProVACCA assists Ghana achieve its long-term goal of Low Carbon Growth (LCG) through assessing the scientific basis of action and linking research, industry and government sectors. The project is also consistent with IFAD's Strategic Framework's Results Based Country Strategic Opportunity Strategy (RB-COSOP) 2010-2015 and the Millennium Development Goals (MDGs) 1 to eradicate poverty and hunger and MDG 7 to ensure environmental sustainability. Project relevance was rated **satisfactory (S)**
Effectiveness	As of project closure on the 30th of June 2017 the project was set to disburse 95.77% a remarkable achievement, which is unfortunately marked by poor performance and delays. Project effectiveness shows a mixed picture with disbursement levels for the four components being respectively 74%, 57%, 122%, 162%. Components 1&2 performed better, but the last two overspent due to delays and cost overruns in the implementation of component 3, which at project closure is still incomplete. As a result of the delays, a one-year extension was granted which drove up the costs of the project management and M&E component. Project effectiveness is rated as **moderately unsatisfactory (MU).**
Efficiency	The project was found to have complied to a large degree with financial management practices, there were considerable improvements to be made in the quality of project management. Supervision missions have reported of a lack of investigation and management responsiveness in addressing and solving problems specifically with regards to the implementation of component 3, specifically with the timely completion of administrative tasks, meeting key deadlines and outputs, procurement, following up on mission recommendations and regular reporting which have contributed to delays in the implementation of component 3. Efficiency is rated as **moderately unsatisfactory (MU)**.
Monitoring and Evaluation system	M&E was found to have been adequate and

	responsive for components 1 and 2, while component 3 reflected less than adequate responsiveness, which placed the implementation of the objectives at risk. The transition from implementation under RTIMP to GASIP also saw a drop in quality of M&E procedures being followed. During the transition the M&E data was being collected but not inputted into the centralised system that was developed under RTIMP, this point was raised repeatedly by supervision missions, but never acted upon. Progress reports other than GEF Project Implementation Reports (PIR) and supervision mission reports were not available, and the project did not make use of a project logframe to monitor and track project implementation. Monitoring and evaluation is rated as **moderately unsatisfactory (MU)**.

Annex 5. Assessment of risks to sustainability of project outcomes

Sustainability dimension	Likelihood for this dimension to be achieved and description of the existing threat
Financial sustainability	Economic sustainability of cassava production cannot be verified because no economic benefits analysis was conducted on the improved cassava yields. The technical efficiency of cassava study showed that farm size was the most important factor of production to ensure increases in output t/ha. Yet farmers in the impact assessment felt that they have been inhibited by a lack of ploughing capacity, inadequate farm labour and supply of planting materials. The project had foreseen the introduction of rural financing mechanisms such as micro-finance schemes and innovative capital subsidy schemes but only for cassava processing groups for component 3. The project has been training cassava processors in business management, but at the time of closure the final financial analysis of the processing groups activities had not been completed. If IFAD supports the implementation of the gasification plant financial sustainability is likely. **Moderately likely (ML).**
Socio-political sustainability	The main sustainability risks to the project depend on the successful completion of the gasification plant and an agreed ownership as of closure has not been determined. The climate smart agriculture appears to have to been successful and largely accepted by the beneficiaries, although there has not been any foreseen mainstreaming or upscaling into the cassava value chain through MOFA and the FFF. **Moderately likely (ML).**
Institutional and governance sustainability	The major infrastructure component, the gasification plant**,** has not been completed on time and post-project ownership as of June 2017 had not been satisfactorily addressed. But as long as IFAD is committed to its completion of the gasification plant the underlying risks remain mitigated. **Likely (L)**
Environmental sustainability	The main focus of ProVACCAs environmental sustainability lay in the bioenergy plant, which has been abandoned to redirect funds to the much delayed gasification plant. The project has produced published research on mainstreaming climate change into cassava production by researching improved cassava varieties as well as SLWM techniques to improve soil moisture and fertility levels, hereby increasing productivity by up to 200%. Farmers were also sensitised in climate change awareness and radio jingles and 30 interactive radio programmes have been developed and broadcast to increase general awareness about climate change. Of the activities implemented environmental sustainability is **likely (L)**

Annex 6. TER Rating Matrix[9]

Criterion	Rating
Project performance	
– Relevance	4
– Effectiveness	3
– Efficiency	3
– Sustainability	3
Rural poverty impact	
– Households 'incomes and assets	n/a
– Human and social capital and empowerment	4
– Food security	4
– Agricultural productivity	4
– Institutions and policies	n/a
– **Overall rural poverty impact**	**4**
Additional evaluation criteria	
– Gender equality and women' s empowerment	3
– Access to markets	n/a
– Innovation	4
– Potential for scaling-up	3
– Environment and natural resources management	3
– Adaptation to climate change	5
– Targeting and outreach	4
Partners performance	
– IFAD' s performance	4
– Government performance	4
Overall project achievement	3

[9] These ratings will need to be reviewed by the CPMT