Independent Office of Evaluation

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Republic of Rwanda

Kirehe Community-based Watershed Management Project

PROJECT PERFORMANCE EVALUATION

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Project Performance Evaluation

May 2019
Report No. 5044-RW
Document of the International Fund for Agricultural Development

Photos of activities supported by Kirehe Community-based Watershed Management Project

Front cover: Cattle farmers in Kirehe District in eastern Rwanda. They received this cow and gender training through the project. They named the cow 'Cyuzuzo', which means 'this is what I was missing'. Sales from milk have enabled them to send their two children to school, put nutritious and healthy food on the table, buy clothes for their family and afford health care.

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Back cover: Rice fields in Kirehe District irrigated from the water received from the dams created by the project (left); Tomato greenhouse in Kinnyogo watershed, which was constructed with the help of project funds in order to improve productivity of high value commodities such as tomato (right).

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Preface

This report presents the findings of the project performance evaluation of the Kirehe Community-based Watershed Management Project (KWAMP) in Rwanda, undertaken by the Independent Office of Evaluation of IFAD. The project's goal was to contribute to reducing rural poverty in Kirehe District through developing strong local institutions, efficient agricultural and livestock production systems and improved market access.

The central tenet of KWAMP, and one of the reasons for the success of the project, was its focus on a single district. By concentrating all its activities and resources in one location it intended to follow a holistic approach to rural development. Closely aligning itself with the Government's own initiatives helped the project secure strong Government ownership. KWAMP was successful in achieving its objective of fostering an increase in production of traditional crops such as rice and maize, and diversification to vegetables and milk production, while the rehabilitation and maintenance of feeder roads opened up opportunities for selling surplus produce. Women beneficiaries were not left behind economically, and innovations such as the flexi-biogas system freed up the time they had previously spent fetching firewood. The project is an example of community-driven development; the watershed management committees formed by the project were transformed into hydrographic basin committees with legal status.

KWAMP's focus on one district notwithstanding, the design was ambitious considering the limited project time frame and the emphasis on building local capacities, which is time-consuming. The lack of effective market linkages and unfavourable prices for producers meant that the attempt at integrating farmers into complete value chains remained incipient. The project also failed to link beneficiaries with rural financial institutions – linkages which would have been important for financing production and value addition.

Moving ahead, the evaluation has underscored the need to adopt a programmatic approach in the case of development projects that involve an integrated, coordinated and comprehensive approach to rural poverty alleviation in a particular area. The evaluation also recommends ensuring that value chain development is truly demand-oriented by involving market actors such as traders and private companies when integrating value chain components in principally supply-side projects.

This project performance evaluation was conducted by Hansdeep Khaira, Evaluation Officer, Independent Office of Evaluation of IFAD (IOE), in collaboration with Ernst Schaltegger, IOE senior consultant, and Vivine Tuyizere, IOE local consultant. The report was peer reviewed by Johanna Pennarz and Maximim Kodjo, IOE Lead Evaluation Officers. Fabrizio Felloni, IOE Deputy Director, also provided very useful comments on the draft report. Manuela Gallitto, IOE Evaluation Assistant, and Shaun Ryan, IOE Administrative Associate, provided valuable administrative support.

IOE is grateful to IFAD's East and Southern Africa Division and the Government of Rwanda's Ministry of Agriculture and Animal Resources for their insightful inputs during the evaluation process and the valuable support they provided to the IOE mission. I hope the results of this evaluation will enable IFAD's operations to contribute to a more inclusive and sustainable rural development in Rwanda.

Oscar A. Garcia
Director
Independent Office of Evaluation of IFAD

The Cyunuzi Dam in Kagogo watershed constructed by the project to supply water to beneficiaries for irrigation.

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Annexes

Currency equivalent, weights and measures

Currency equivalent

Currency unit = Rwandan Franc (FRW)

US$1.00 = FRW 675*

*This is an average rate for the entire project period. At design the rate was about US$1.00 = FRW 550, while at project closure the rate was approximately US$1.00 = FRW 800

Weights and measures

Metric system

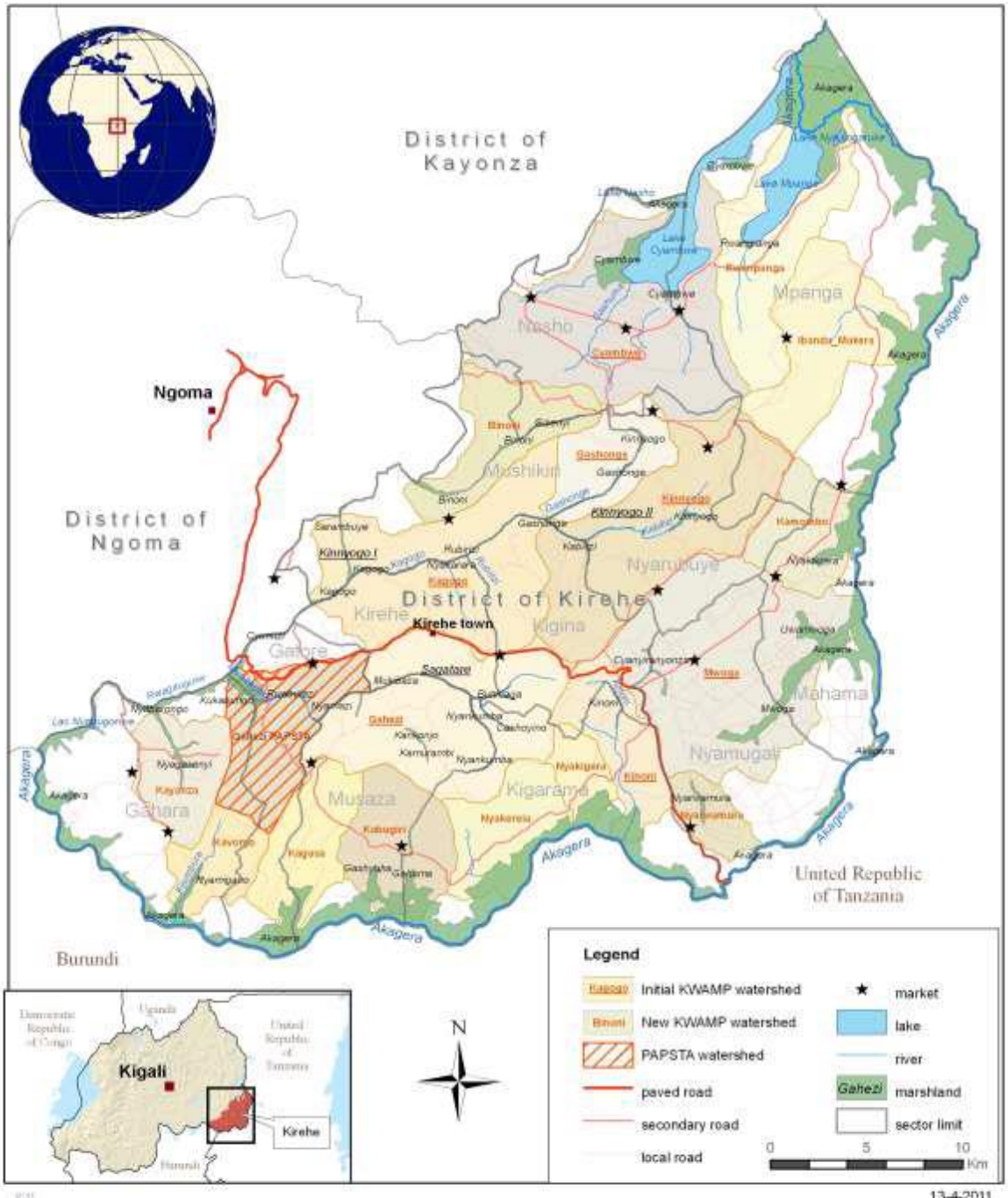
Abbreviations and acronyms

AWPB	annual work plan and budget
CCI	community centre for innovation
CLGS	comité local de gestion et de supervision (local management and supervision committee)
COSOP	country strategic opportunities programme
DED	German Development Service
ESA	East and Southern Africa Division (IFAD)
FO	farmer organization
HBC	hydrographic basin committees
IAS	impact assessment survey
IOE	Independent Office of Evaluation of IFAD
KWAMP	Kirehe Community-based Watershed Management Project
M&E	monitoring and evaluation
MINAGRI	Ministry of Agriculture and Animal Resources
MTR	midterm review
PAPSTA	Support Project for the Strategic Plan for the Transformation of Agriculture
PCR	project completion report
PoG	Pass on the Gift programme
PPE	project performance evaluation
PSTA	Strategic Plan for the Transformation of Agriculture
REMA	Rwanda Environmental Management Authority
RWF	Rwandan Franc
SPIU	single project implementation unit
SWC	soil and water conservation
TOC	theory of change
VCD	value chain development
VCDF	Value Chain Development Fund
WFP	World Food Programme
WUA	water user association

Map of the project area

Rwanda

Kirehe Community-based Watershed Management Project



The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof.

IFAD *Map compiled by IFAD*

Executive summary

Background

1. The Independent Office of Evaluation of IFAD (IOE) undertook a project performance evaluation (PPE) of the Kirehe Community-based Watershed Management Project (KWAMP) in Rwanda. The main objectives of the evaluation were to: (i) conduct an independent assessment of the results of the project; and, (ii) generate findings and recommendations for the design and implementation of ongoing and future IFAD operations in the country.

2. In preparation for the PPE, IOE gathered preliminary findings from the desk review of the project completion report and other key project documents. Following this, IOE undertook an evaluation mission where additional evidence and data were collected to verify the preliminary information and to reach an independent assessment of the project's performance and results. The methods deployed for data collection in the field comprised direct observations, key informant interviews with project stakeholders, former project staff, local and national government authorities and group interviews with beneficiaries.

The project

3. The goal of KWAMP was to contribute to reducing rural poverty in Kirehe District, primarily through an improvement in household food and nutrition security, asset ownership and quality of life indicators, particularly among vulnerable groups including women-headed households, orphans and those living with HIV/AIDS. The project had three objectives: (1) to develop strong public and private local institutions with effective planning and management capacity in the natural resource sector; (2) to increase efficiency in agricultural and livestock production with a positive effect on the natural resource base; and (3) to improve physical access to markets.

4. The project had four components that mirrored the project objectives: (i) local institutional development (14 per cent of project base costs) to increase the capacity of government and community institutions; (ii) agricultural intensification (64 per cent), providing the market-led investments in value chain development, crop and livestock intensification, irrigation development and soil and water conservation required to transform agriculture into business for smallholders; (iii) feeder roads (17 per cent) to provide a fully functional road network to allow trade to pick up in both agricultural inputs and produce; (iv) project coordination (5 per cent) which was to be undertaken by the then existing unit that managed the IFAD-supported project, the Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA).

5. Kirehe District was selected based on its high poverty incidence and high agricultural potential. The project targeted around 87 per cent of the district's population. The target group consisted of three categories of beneficiaries: (1) farmers with lands of less than 1 ha. They may have access to reclaimed land and irrigation, and benefit from the distribution of livestock and forage trees and from soil and water conservation activities; (2) landless farmers who rent land from others. They would be eligible to marshland distribution and targeted with agricultural activities that need no or little land for their development, such as small stock. Adults in this group would also benefit from employment opportunities generated through food-for-work activities funded by the World Food Programme (WFP) and other possibilities related to the improvement of infrastructure; and (3) unmarried young people and destitute women. This group would be accorded priority in terms of employment opportunities generated by the project.

6. Project cost at design was US$49.3 million, but this was increased to US$55.7 million through supplementary funds from IFAD in the form of a loan and

a grant and increased contributions from the beneficiaries and the private sector. The additional funding more than compensated for the withdrawal of initial commitments by WFP and the German Service for Development.

Main evaluation findings

7. **Relevance.** KWAMP was aligned with priorities set under the Economic Development and Poverty Reduction Strategy and directly supported several of the Government's own programmes. It was also aligned with IFAD's own priorities, including the Rwanda Country Strategic Opportunities Programmes 2008-2012 and 2013-2018 and IFAD's Strategic Framework 2007-2010. The design incorporated several successful activities of its pre-cursor project and focused on one district alone with inter-related activities targeting watershed management, agricultural intensification and value addition. While the focus on one district alone was commendable, the design was somewhat ambitious especially when considering the limited project time frame and the emphasis on building local capacities, which can take time. The targeting strategy was elaborate, with a poverty-mapping exercise including a vulnerability assessment and analysis carried out to help determine how best to ensure maximum participation of the vulnerable households.

8. **Effectiveness.** KWAMP largely achieved its objective of agricultural and livestock intensification through the provision of training and inputs, water for irrigation and livestock to the beneficiaries. There was an increase in production of traditional crops such as rice and maize, and also diversification of production to vegetables, and milk production. Feeder roads were particularly useful in creating additional avenues for selling the surplus produce. KWAMP's objective of building the capacities of decentralized government structures (district) and grass-roots organizations was largely achieved due to *inter alia* the use of proficient service providers. There were some impediments, though, which hampered the full achievement of KWAMP's objectives. The most obvious was the lack of effective marketing linkages and competitive prices for producers. In addition, value addition efforts, especially by poorer groups, faced issues of finance and the plan to distribute small ruminants to the poorer beneficiaries was not successful due to the fact that these were sold by them as opposed to using them for their milk.

9. **Efficiency**. KWAMP fared well on most measures of efficiency. It had a short effectiveness gap (board approval to effectiveness) of only eight months, much shorter than that of IFAD-supported projects in East and Southern Africa i.e. 23 months. It was able to disburse almost 99.03 per cent of the earmarked funds. Despite the high incidence of infrastructure costs (irrigation, feeder roads), KWAMP managed to exhibit per beneficiary household costs that were less than anticipated. Its internal rate of return at completion, calculated to be in the range between 31 per cent and 38 per cent, was much higher than the forecasted 17 per cent planned at design. Admittedly, the doubling of project management costs at completion and some of the investments not giving the desired results, as in the case of the Mahama dam which had a lower than anticipated water run-off, were some issues that marred its performance on efficiency.

10. **Rural poverty impact**. KWAMP's impact on rural poverty in the areas that it was implemented was overall positive. The economic benefits for KWAMP beneficiaries were mirrored in the increase in their incomes and assets and the positive changes among the wealth categories. Food security situation too improved; beneficiaries were able to afford more meals, and the health of their children had improved consequently. These benefits were driven by productivity increases in crops (maize, beans and sorghum substantially increased in area occupation), diversification to higher value crops such as vegetables, and new sources of income such as milk. Financial and technical support for value addition to agricultural products also contributed to income increases. KWAMP built human and social capital through training to grass-roots organizations such as water user associations (WUAs) and

facilitating group cohesion. Admittedly, these changes cannot be attributed to KWAMP with scientific accuracy because there were no control groups considered in the baseline and endline surveys. Despite this caveat, the amount of data shown in the surveys, and the evidence collected by the evaluation team, leads the PPE to conclude that the rural poverty impact of KWAMP was plausibly satisfactory.

11. **Sustainability of benefits.** Overall, the larger benefits emanating from KWAMP are expected to be sustainable. The project assigns fair to good prospects of sustainability to the crop intensification and diversification, as well to the dairy sector, due to the considerable progress of productivities and the attractive price levels for tomatoes and milk, as verified by the mission. There are several other drivers of sustainability: strong project ownership from the involvement of the district, sectors and cells, the availability of an exit strategy and formal handover of irrigation schemes, the proven ability of the district to substitute KWAMP staff, the management capacity of farmer organizations and the considerable involvement of women and their presence in executive positions. On the other hand, the transformation of Comité Local de Gestion et de Supervision (formed by the project) to hydrographic basin committees under the law will lead to an increase in responsibilities and needed skills of the former and poses the risk of loss of institutional knowledge and skills on the project activities and investments made by KWAMP which were watershed-specific.

12. **Gender equality and women's empowerment.** The project's performance related to this criterion was positive. Women were well represented in all the aspects of the project, and the representation exceeded the 30 per cent target up to above 40 per cent. Several project activities directly benefited women. The biogas system provided poor households with energy for cooking and lighting and freed up the time women time spent previously fetching firewood, and also reduced the amount of smoke and health-damaging particles. The women beneficiaries felt empowered, given that they were active members on the project-supported committees such as WUAs and others, holding prominent positions. Their economic situation improved from prior to the project, largely due to the crop and livestock intensification interventions of the project. On the other hand, a lack of explicit gender strategy at project design and the fact that a gender focal point was appointed only after some five years into the project life, were some aspects that blemished the project's noteworthy performance related to gender equality and women's empowerment.

13. **Innovation**. The project carried out several notable innovations in the context of the country. The Flexi Biogas Systems was one such innovation. These systems are more economical, due to lower investment costs, than concrete dome biogas digesters. Hillside irrigation by small diameter piping, which greatly reduces water wastage and is good practice for horticulture, was also a notable innovation. The irrigation management transfer agreements between the district, the Rwanda Agriculture Board, the WUAs and cooperatives active on irrigation perimeters was a genuine innovation and apparently a pioneering act in Rwanda. On the other hand, several activities had been already tried under the previous IFAD-supported project and were not innovations introduced by KWAMP. On such example were the community competitions (*Inteko y'Imihigo*) that enabled villagers to design and submit their projects to KWAMP as well as the animal health insurance schemes.

14. **Scaling up**. The Government of Rwanda has reportedly appointed biogas officers in every district with a view to scaling up the flexi biogas systems used under KWAMP. The mechanism of setting up "Irrigation Management Transfer Agreements", developed by KWAMP, is considered best practice by other districts and was being discussed for use in the other districts at the time of the evaluation. The USAID-funded Private Sector Development Project has established a funding mechanism similar to KWAMP's matching grants.

15. **Environment and natural resource management.** KWAMP's activities led to expansion in agriculture. While this can potentially have negative effects of deforestation, geo-spatial analysis done by the PPE team shows that expansion of agriculture has mainly occurred in areas that were sparsely forested. It can thus be argued that the change from degraded and sparse forest in favour of sustainably managed terraces that can help protect soil is a positive development. Additionally, there has been an increase in the forested area due to planting of trees. The tree-planting initiatives supported by KWAMP are also reported to be slowing down soil erosion in the district. In terms of water resource management, the creation of WUAs has the focus to ensure a rational and sustainable use of water. However, it would have been useful to establish observatory point networks with simple soil analyses before and after the interventions. In particular, aspects of prevailing soil acidity were not taken into account, except on radical terraces where liming was applied.

16. **Adaptation to climate change.** Although climate change was not an explicit focus of the project design, several activities will help contribute to adaptation to climate change. For instance, provision of irrigation water led to more predictable and longer cultivation periods while at the same time providing diversified irrigated and rain-fed farming. An integrated crop and livestock production system is of greater help in assisting beneficiaries to build their resilience to climate variability and climate change than more specialized agricultural systems. In addition, the introduction of biogas is intended to promote the use of renewable energy and reduce the release of harmful gases into the air. The only downside is that KWAMP did not generate tangible evidence on the relevance of climate change, its practices and observed effects.

Recommendations

17. The PPE offers the following four recommendations to IFAD and the Government of Rwanda to consider in its ongoing and future operations.

18. **Recommendation 1: Aim for a programmatic approach in area development projects.** A greater use of a programmatic approach, covering a longer time frame than the typical five to seven-year project, should be encouraged to not only implement integrated development interventions but also to fully exploit the complementarities and synergies between them. The complexity of such programmatic interventions should be commensurate with the installed capacity and institutional maturity of the target population and participating implementation partners.

19. **Recommendation 2: Aim for a better balance between the capacities and resources of fledgling institutions, their level of involvement and the concomitant responsibilities**. The empowerment of decentralized district structures and grass-roots organizations by supporting them in assuming responsibility for project activities should be based on a realistic assessment of their initial capacities and the resources at their disposal. Accordingly, the level of responsibility that they can shoulder should be made proportionate to these aspects. If needed, project complexity should be reduced to a degree commensurate with the institutional maturity.

20. **Recommendation 3: Systemize knowledge generated in a single or centralised project management unit for future projects**. Besides leveraging the advantages of the single project implementation units (SPIUs), namely, better efficiency and stronger effectiveness, their true potential should be realised in using them as fountainheads of knowledge. They should be able to generate and document knowledge accumulated in the course of implementing the projects, which can be used to more effectively inform subsequent projects. In addition, cross-fertilization of ideas and experiences among the SPIUs of different development partners should be strongly encouraged by IFAD.

21. **Recommendation 4: Ensure that the value chain development is truly demand-oriented when integrating value chain components in principally supply-side projects.** If value chain components are built in projects that invest heavily on the supply side, such as irrigation and natural resource or watershed management, care should be taken that value chain development is truly demand-side oriented. This can be done by involving downstream actors of a value chain such as traders, processors or small and medium enterprises. Without the proactive involvement of downstream actors, value may be added, but not along an entire chain.

IFAD Management's response[1]

1. Management welcomes the project performance evaluation (PPE) of the Kirehe Community-based Watershed Management Project (KWAMP) in the Republic of Rwanda, conducted by the Independent Office of Evaluation (IOE).

2. Management agrees with the overall assessment of the project performance as satisfactory (5) considering that KWAMP largely achieved its objectives to reduce rural poverty in Kirehe District. Evidence is clearly provided of how beneficiaries experienced improved incomes, assets, food security and health. The drivers behind these social and economic benefits are well explained including productivity increases in crops, diversification to higher value crops, new sources of income, such as from milk, and financial and technical support for value addition to agricultural products. Management appreciates that the PPE recognizes KWAMP's capacity to introduce several notable innovations in the context of country, including the flexi biogas systems and the mechanism of setting up "Irrigation Management Transfer Agreements", which are considered best practices and have been scaled up by other donor- and Government-led initiatives. Management also acknowledges that KWAMP was less able to facilitate the effective marketing of surplus production and that limited access to adequate financial services was an impediment to beneficiaries of value-addition activities.

3. Management agrees with the identification of key success factors during implementation that also support the sustainability of interventions, including: the Government's commitment through a competent SPIU; the strong focus on one district; and the participatory approach used, coupled with the capacity-building of grass-roots organizations.

4. Despite focusing on a single target area i.e. Kirehe district, Management acknowledges that KWAMP covered a number of activities – watershed management, crop and livestock intensification and value addition – within a limited project period, lending a measure of complexity to design. This was compounded by implementation through the newly devolved district administration with limited capacity. Management agrees that the design of KWAMP was nevertheless relevant considering the alignment between project objectives and Government strategies and the IFAD results-based country strategic opportunities programme (COSOP) not least the assimilation of lessons learned from earlier IFAD-supported projects.

5. Management accepts the downgraded efficiency rating. In spite of otherwise good project efficiency, the increase in project management costs and some of the investments not giving the desired results (Mahama dam) lowered the project's performance on efficiency.

6. Management welcomes the recommendations of the PPE, which have contributed, and will continue to do so, to improving country programme performance. Management's views on the proposed recommendations are as follows:

   (a) *Recommendation 1: Aim for a programmatic approach in area development projects*.

   Agreed. When relevant and feasible, the programmatic approach, covering a longer time frame than the typical five to seven-year project, will be encouraged to implement integrated development interventions and make the most of their complementarities and synergies, while avoiding over-complexity.

[1] The Programme Management Department sent the final Management's response to the Independent Office of Evaluation of IFAD on 13 February 2019.

(b) *Recommendation 2: Aim for a better balance between the capacities and resources of fledgling institutions, their level of involvement and the concomitant responsibilities.*

Agreed. Management will ensure that the complexity of future programmes corresponds to the capacity levels and institutional maturity of the target population and implementing partners. IFAD-supported future investments in the country will continue to focus on building capacities at different levels, including those of farmers and their institutions to enhance the sustainability of projects interventions.

(c) *Recommendation 3: Systemize knowledge generated in a single or centralised project management unit for future projects.*

Agreed. Management would like to point out that this recommendation has already been addressed in the new 2019-2024 COSOP. A robust knowledge management plan is outlined with explicit mention of leveraging and strengthening the knowledge management function of the SPIU, and thus promoting cross-learning between projects, a structured approach to development, documentation of practical knowledge and know-how, and evidence-based identification of critical areas that require policy focus and support.

(d) *Recommendation 4: Ensure that the value chain development is truly demand-oriented when integrating value chain components in principally supply-side projects.*

Agreed. Management acknowledges the importance of this recommendation for the sustainability of IFAD-supported value chain projects. The follow-up project to KWAMP, the Kayonza Irrigation and Integrated Watershed Management Project (as well as the other ongoing IFAD-supported projects in the country i.e. the Post-Harvest and Agribusiness Support Project; the Project for Rural Income through Exports; and the Rwanda Dairy Development Project) includes strong market orientation through: business advisory services for farmers to acquire a better understanding of market demands; business development service provision and facilitated exposure of farmers' cooperatives to markets; facilitated marketing arrangements with traders, processors and/or major off-takers; and public-private-producer partnerships.

7. Management would like to thank IOE for the concise yet thorough PPE of KWAMP. Management remains committed to internalizing the PPE findings and lessons learned to further improve the performance of IFAD-funded programmes in the Republic of Rwanda.

Republic of Rwanda
Kirehe Community-based Watershed Management Project
Project Performance Evaluation

I. Evaluation objectives, methodology and process

1. **Objectives.** In line with the IFAD Evaluation Policy, the Independent Office of Evaluation of IFAD (IOE) undertook a project performance evaluation (PPE) of the IFAD-financed Kirehe Community-based Watershed Management Project (KWAMP) in Rwanda. The objectives of the PPE were to: (i) assess the results of the project using the standard evaluation criteria, outlined below in paragraph 4; (ii) generate findings and recommendations for the design and implementation of ongoing and future operations in Rwanda; and (iii) by virtue of the assessment, identify issues that require further evaluative work related to the corporate and/or strategic domains.

2. **Scope.** The scope of the PPE was defined based on the following criteria: (i) areas identified through a desk review – the PPE reviewed additional evidence and proposed a complete list of consolidated ratings; (ii) selected issues of strategic importance for IFAD in Rwanda; and (iii) limitations set by the available time and budget.

3. Analysis in the PPE was assisted by the ex-post design of a theory of change (see annex VII). The theory of change (TOC) shows the causal pathway from project outputs to project impacts and the changes that should take place in the intermediary stage i.e. between outcomes and impact. External factors which influenced change along the major impact pathways, i.e. assumptions on which the project has no control, were also taken into account. The TOC was reconstructed in a manner that any deviation from the project design, in terms of objectives and/or activities that may have occurred during the course of project implementation, were taken into account. These changes were identified from the project completion report (PCR), supervision mission reports and in consultation with project stakeholders during the country visits.

4. **Methodology and process.** The PPE exercise was undertaken in accordance with IFAD's Evaluation Policy[1] and the IFAD Evaluation Manual.[2] In line with the practice adopted in many other international financial institutions and UN organizations, IOE has used a six-point rating system to evaluate the performance criteria,[3] where 6 is the highest score (highly satisfactory) and 1 is the lowest score (highly unsatisfactory).

5. The PPE took into account the preliminary findings from the desk review of the PCR and other key project documents and interviews at IFAD headquarters. In addition, during the evaluation mission, additional evidence and data were collected to verify available information and reach an independent assessment of performance and results. The methods deployed consisted of direct observation and individual and group interviews with project stakeholders, beneficiaries, former project staff, and local and national government authorities.

6. In compliance with the IOE Evaluation Policy, the main project stakeholders were involved throughout the PPE to ensure that the key concerns of the stakeholders were taken into account, that the evaluators fully understood the context in which the programme was implemented, and that opportunities and constraints faced by the implementing institutions were identified. Formal and informal opportunities were explored during the process for the purpose of discussing findings, lessons

[1] IFAD. Revised IFAD Evaluation Policy, EB/2011/102/R.7/Rev.3, Rome, 16 December 2015.
[2] IFAD. IOE. Evaluation Manual, Second Edition, Rome, 2015.
[3] The evaluation criteria are: relevance, effectiveness, efficiency, rural poverty impact, sustainability, gender equality and women's empowerment, innovation, scaling up, environment and natural resource management, and performance of IFAD and government.

and recommendations. The PPE also made use of additional data available through the programme's monitoring and evaluation (M&E) system such as outreach numbers, targets against achievements for various activities and financial data. Triangulation was applied to verify findings emerging from different information sources.

Box 1: Use of satellite imagery

The evaluation also used satellite imagery to assess the before-after results of vegetation cover due to some of the project interventions. This exercise was undertaken as part of the collaboration between IOE and a Swiss agency, Sarmap, that specialises in geospatial analysis. The period of comparison was the year of project effectiveness i.e. 2009 and the completion year i.e. 2016. Data for the intervention areas in Kirehe were collected using the Landsat satellite. In addition to optical satellite imagery, a synthetic aperture radar (SAR) derived colour composite was also used to better capture changes in landscape for 2017. One of the main characteristics of SAR images is that they are not heavily affected by cloud and thus, a robust analysis can be performed. Finally, a false colour composite image using mid-infrared, near infrared and red spectral bands was created to highlight vegetation properties. Spectral imaging can allow extraction of additional information the human eye fails to capture with its receptors for red, green and blue (a more technical detailed analysis is presented in annex VI).

Source: Sarmap.

7. **Process of in-country visit.** The PPE mission was fielded between 16 and 26 April 2018. It was composed of Mr Hansdeep Khaira, Evaluation Officer, IOE, Mr Ernst Schaltegger, senior consultant, and Ms Vivine Tuyizere, local consultant. The mission met with the country programme manager and country programme officer in the IFAD ICO to discuss the mission plan and expected outcomes. This was followed by a group discussion with staff of the single project implementation unit (SPIU) established for IFAD projects in Rwanda. The IOE lead evaluator for the PPE met with the Honourable Minister for Agriculture and Animal Resources of Rwanda, Ms Geraldine Mukeshimana, to apprise her of the findings of the mission team. The list of persons met is exhibited in annex V. Data files were collected from the project M&E staff. Thereafter, a meeting was held with the Permanent Secretary of the Ministry of Agriculture and Animal Resources (MINAGRI). Other meetings were held with the partners of the project – the Rwanda Agriculture Board, the Ministry of Environment and Natural Resources and Heifer Project International.

8. Over the course of five days, the mission undertook field visits in the Kirehe district. The visits commenced with a meeting with the Mayor of Kirehe district. The district technical staff were interviewed and additional data files were collected. This was important in order to examine the sustainability of project activities that have been formally handed over to the district by the central government. Several project sites were visited, including dams, feeder roads, communal cowsheds and value chain development fund (VCDF) sites (such as greenhouses and milling plants), and group discussions were held with local groups such as farmer cooperatives, Watershed Management Committees, Irrigation Water Users' Associations and road brigades. At the end of the mission, a wrap-up meeting was organized at the Ministry of Finance to share the preliminary findings with project stakeholders. Following the mission, further analysis of the data and findings was conducted to prepare the draft PPE report.

9. A presentation of the preliminary findings of the mission was also made at the wrap-up meeting, which was attended by the IFAD ICO, staff of the SPIU along with district and some project partners.

10. **Limits and constraints of the evaluation.** The PPE did not undertake quantitative surveys or visit the full spectrum of project activities. Time was a constraint, with five days available for field visits. This limitation was mitigated to an extent by splitting the evaluation team into two so that more data could be gathered. Similarly, the PPE also had to rely on documentary evidence. In this regard, the evaluation

benefited from information provided by the In-Country Office (ICO) of IFAD and by the SPIU in MINGARI. The SPIU is a distinct feature of Rwanda in that MINAGRI has a dedicated SPIU for all foreign-funded projects, and other ministries have similar structures.[4] For the PPE at stake, it was helpful to avail of one unit with a considerable collective memory on operations of agriculture and real development. While the SPIU was a good rallying point for project specific information, it was initially difficult to gather more general information, such as environmental benchmarks or time series of climatic data. The authorities of Kirehe District and the SPIU, however, assisted the evaluation mission to access such important information.

[4] https://www.afdb.org/fileadmin/uploads/afdb/Documents/Procurement/Project-related-Procurement/Rwanda%20-%20Competitiveness%20and%20Development%20Enterprise%20Project%20II%20-%20SPN.pdf

II. The project

A. Project context

11. **National context.** According to the United Nations Rwanda Annual Report,[5] over the last 26 years, Rwanda's Human Development Index has increased by over 103 per cent from 0.244 to 0.498 and life expectancy has increased by 31.3 years to 64.5 years. This has improved Rwanda's ranking to 159 out of 188 countries globally and 27th in Africa. The improvement in HDI is attributed to several factors, one of which is the concerted efforts made to eliminate gender inequality. The country's economic performance has remained strong, with a GDP growth rate in 2016 of 5.9 per cent dominated by the service sector (3.3 per cent) closely followed by industry (1.2 per cent) and agriculture (1.1 per cent). However, the Project Design Report states that, despite efforts to diversify the economy, Rwanda remains heavily dependent on agriculture in terms of employment opportunities and export revenues. Notwithstanding the sector's difficulties, an emerging large-scaled agro-processing sector is beginning to evolve in Rwanda.

12. Since the devastating genocide against the Tutsi of 1994, Rwanda has made strong progress in the area of socio-economic development. Rwanda met most of the Millennium Development Goals (MDGs) by the end of 2015. Strong economic growth was accompanied by substantial improvements in living standards, with a two-thirds drop in child mortality and near universal primary school enrolment. A strong focus on home-grown policies and initiatives has contributed to a significant improvement in access to services and human development indicators. The poverty rate dropped from 44 per cent in 2011 to 39 per cent in 2014, while inequality measured by the Gini coefficient fell from 0.49 to 0.45.[6]

13. **Economic tailwinds.** Agriculture remains an important contributor to growth. Three factors are likely to influence the economic outlook. First, the recovery in commodity prices and global demand is expected to increase export revenues and contribute to a build up in official reserves. Second, ongoing investment in fertilizer, improved seeds and irrigation, as well as higher prices for coffee and tea, are expected to boost food and export crops. Third, the Made in Rwanda campaign and public infrastructure investment are projected to boost growth in industry. Given the importance of agriculture, Rwanda's average percentage of agricultural spending in total public expenditure has increased from about 3.5 per cent in 2007 to close to 7 per cent in 2011/12,[7] though it still falls short of the ten per cent committed by African countries under the Maputo Declaration.[8]

14. Agricultural activities constitute the main source of food and income for most of the rural population. Production is based on small family farms that cultivate less than 1 ha. Food crops cover 92 per cent of the cultivated area, of which two-thirds is for family consumption. Increasing population pressure has forced people to cultivate on steep slopes and marginal lands, resulting in a rapid loss of forests and damage to the natural resource base. The Kirehe District, where the project activities were concentrated, encompasses diversified ecological zones with good potential for agricultural development along with challenges for intensification. There are lake and river water resources and opportunities for productive investments in irrigation. The area has good potential for high-value crops and dairy production.

15. **Economic headwinds.** The country is vulnerable to weather shocks affecting the largely rain-dependent agriculture sector; ongoing investment in irrigation is expected to reduce dependence on rainfall. Given that the country exports predominantly unprocessed raw materials, any fluctuations in commodity prices will reduce export earnings and increase external sector vulnerabilities. Initiatives such

[5] United Nations Rwanda, Delivering as One Annual Report 2016 – 2017.
[6] The World Bank. The World Bank in Rwanda, rwandaalert@worldbank.org.
[7] Claude Bizimana, Felicien Usengumukiza, John Kalisa and John Rwirahira (2002), *Trends in Key Agricultural and Rural Development Indicators in Rwanda*, Rwanda Strategic Analysis and Knowledge Support System (SAKSS), July 2012.
[8] http://www.un.org/en/africa/osaa/peace/caadp.shtml.

as the Made in Rwanda campaign seek to increase value addition and to reduce vulnerability to commodity price fluctuations. Regional peace and security measures, including those under the African Union and the International Conference on the Great Lakes Region, are expected to increase peace and stability.[9]

16. Rwanda has also made big strides towards gender equality – almost 64 per cent of parliamentarians are women, compared to just 22 per cent worldwide – which has enabled women in the country to make economic advances. Women are now able to own land and girls can inherit from their parents.[10] It is fair to say, in view of the above, that Rwanda has progressed substantially since KWAMP was designed.

B. Project description

17. **Components.** The KWAMP aimed to promote the market-oriented intensification of agricultural systems built on sound environmental practices in order to assist very poor smallholders: i) to overcome their food insecurity and low agricultural incomes, ii) to arrest land degradation, and iii) to restore soil fertility. The **goal** of KWAMP was to contribute to reducing rural poverty in Kirehe District, primarily through an improvement in household food and nutrition security, asset ownership and quality of life indicators, particularly amongst vulnerable groups including women-headed households, orphans and those living with HIV/AIDS. Given the small prospect for agricultural expansion in Rwanda, agricultural growth and poverty reduction depend on crop and livestock intensification, crop diversification and crop-livestock intensification.

18. The project had three **objectives**, as follows:

    (i) **To develop strong public and private local institutions with effective planning and management capacity in the natural resource sector**. This would be achieved through establishment of permanent institutions capable of supporting profitable smallholder agriculture in Kirehe, creating decentralized structures, community focal points for the promotion of economic activities and farmer organizations. In addition, effective water and land use planning and management practices would be adopted to enable agricultural intensification that conserved the natural resource base.

    (ii) **To increase efficiency in agricultural and livestock production with a positive effect on the natural resource base.** This would be achieved through an increase in the volume and profitability of trade in agricultural and livestock products, crop and livestock production intensification, irrigation of farm lands, and soil and water conservation practices.

    (iii) **To improve physical access to markets.** This would be achieved through restoration and/or establishment of year-round road links between producers and markets and proper maintenance of feeder roads in Kirehe District.

19. **Project components.** The project had four components that mirrored the project objectives:

    (i) **local institutional development** (14 per cent of project base costs) to increase the capacity of government and community institutions to support a rapid and sustained increase in profitable smallholder agriculture in the district and to ensure effective water and land use management;

    (ii) **agricultural intensification** (64 per cent), providing the market-led investments in value chain development (VCD), crop and livestock intensification, irrigation development and soil and water conservation required to transform agriculture into a business for smallholders;

    (iii) **feeder roads** (16 per cent) to provide a fully functional road network to allow trade to pick up in both agricultural inputs and produce;

[9] African Development Bank. Rwanda Economic Outlook, African Economic Outlook (AEO) 2018.
[10] World Economic Forum. 5 things to know about Rwanda's economy, © 2018 World Economic Forum.

(iv) **project coordination** (5 per cent) which was to be undertaken by the then existing unit that managed the IFAD-supported project, PAPSTA.[11]

20. **Project intervention area.** KWAMP covered the entire Kirehe District in the South-East of Rwanda. Kirehe District has a land surface of 1,266 km² and is divided into twelve sectors. At project design, the district had a population of 292,000 people, consisting of approximately 55,000 households. Just over 86 per cent of households owned less than 1 ha of land, 46 per cent owned less than 0.5 ha and 13 per cent had no land at all. Accordingly, the majority of the district population were rural poor. Poverty was widespread with some 51 per cent of the people living below the poverty threshold and extreme poverty affecting about 29 per cent of the population of the district.

21. **Targeting and targeted groups.** Kirehe District was selected based on its high poverty incidence and the high agricultural potential versus constraints, among others (see also previous paragraph). The total number of households in the project target group was to be around 48,000, corresponding to a total population of about 253,000 people and 87 per cent of the district's population, based on an average of 5.3 people per household. The target group consisted of three categories of beneficiaries: (1) farmers with lands of less than 1 ha. They may have access to reclaimed land and irrigation, and benefit from the distribution of livestock and forage trees and from soil and water conservation (SWC) activities; (2) landless farmers who rent land from others. They would be eligible to marshland distribution and targeted with agricultural activities that need no or little land for their development, such as small stock. Adults in this group would also benefit from employment opportunities generated through WFP-funded food-for-work activities and other possibilities related to the improvement of infrastructure; (3) unmarried young people and destitute women. This group would be accorded priority in terms of employment opportunities generated by the project.

22. Women were also to be targeted in several ways such as: (i) granting them equal access to productive resources and income-generating activities; (ii) including the interests of women in capacity-building opportunities and knowledge management under the project; and (iii) giving women equal representation in decision-making and institutions under the project.

23. **Project theory of change.** As per the theory of change constructed by the PPE, increased incomes of beneficiaries were to occur as a result of increased and higher value marketable surplus sold by them. This in turn was to be driven mainly by: production (increased yields, higher value crops, dairy) and small-scale infrastructure (irrigation-related, feeder roads, storage facilities). Underpinning these outcomes were project activities related to beneficiary training on good agricultural practices and natural resource management.

24. **Key project dates.** KWAMP was approved by IFAD's Executive Board in September 2008, declared effective on 30 April 2009 and completed on 30 June 2016. IFAD and the Government of Rwanda carried out a joint midterm review (MTR) of the project in December 2012 to review the implementation of planned project activities and outputs against actual results and to assess the scope and level of supplemental financing required for KWAMP's implementation. The supplementary financing equivalent to the amount of US$15.19 million (50 per cent grant and 50 per cent loan) was approved by IFAD's Executive Board in July 2013. At project completion, the total cost was equivalent to US$55.2 million in accordance with the data provided in tables 1 and 2. KWAMP's original termination and closing dates were not modified, *inter alia* as a result of the approved supplementary financing.[12]

[11] PAPSTA became effective on 31 March 2006 and closed on 30 September 2013.
[12] Republic of Rwanda, IFAD. Kirehe Community-based Watershed Management Project (KWAMP), Project Completion Report, mission dates: 10 October – 4 November, 2016.

25. **Project financing by source and by component.** Table 1 informs on the initial and effective contributions by the financiers. The most significant non-compliance with initial commitments refers to the World Food Programme (WFP), followed by the German Development Service (DED),[13] the reasons for which could not be explored ex-post. These gaps were more than offset by IFAD's supplementary funding, but also by higher shares of beneficiaries' and private sector contributions. Project financing by component in table 2 exhibits absolute and relative increases in components 2 and 4, and the opposite in components 1 and 3. In the section on efficiency, reference is made to the increase of programme management costs between appraisal estimates and effected final costs.

Table 1
Commitment at appraisal and closure, and actual disbursements (USD'000)

Source of funds	*Commitment at appraisal*	*Commitment at closure*	*Amount disbursed*	*Disbursement (%)*
		1) Grants		
IFAD (8020)	20 446	20 004	20 004	100.00
IFAD (8054)	6 324	6 183	6 183	100.00
IFAD (8116)	-	7 594	7 571	99.71
WFP	8 130	88	88	100.00
DED	511	-	-	-
		2) Loan		
IFAD 897	-	7 594	7 571	99.71
		3) Other counterpart funds		
Government	9 544	7 017	7 017	100.00
Beneficiaries	3 123	4 514	4 514	100.00
Private Sector	1 250	2 735	2 241	81.95
Total	49 328	55 728	55 190	99.03

Source: PCR.

Table 2
Project financing by component (US$'000)

Components	*Design*	*%(design)*	*Actual*	*%(actual)*
Component 1: Local institutional development	6,468.2	13.1	4,322.8	7.8
Component 2: Agricultural intensification	29,530.3	59.9	42,119.2	76.3
Component 3: Feeder roads	8,221.3	16.7	4,294.7	7.8
Component 4: Programme management	2,442.6	4.9	4,490.2	8.1
Physical and price contingencies	3,764.4	5.4		
Total	49,328.2	100	55,190.3	100

Source: PCR.

C. Project implementation

26. **Implementation arrangements.** KWAMP was implemented through MINAGRI, which had the overall responsibility for project implementation through a project coordination unit (PCU). In the post-midterm review (MTR) period, an SPIU for IFAD-funded projects was put in place by MINAGRI to manage all IFAD-funded projects in Rwanda.

[13] Deutscher Entwicklungsdienst (German Development Service).

27. *National ministries*. In order to deliver extension services to farmers, MINAGRI worked with three parastatals, namely: the Rwanda Agriculture Development Authority, the Rwanda Animal Resources Development Authority and the Rwanda Agricultural Research Institute. The Rwanda Environmental Management Authority (REMA) was engaged by the project in validation of environmental impact assessments for irrigation development and for the watershed management plans. REMA also provided authorization for supply and installation of flexi-biogas in Kirehe District. In addition, KWAMP worked closely with the Ministry of Natural Resources that was involved in the capacity-building of hydrographic committee members.

28. *Local government*. In Kirehe District, within the decentralization process, the local government was the main executing agency of KWAMP, being the institution responsible for consultation, including local participatory planning and M&E, as well as the implementation of the feeder roads component. A district steering committee chaired by the mayor and made up of members representing the farmers and local institutions from the public and private sectors' participating in the project, was responsible for the technical oversight of the implementation of the annual work plan and budget (AWPB) and the project's integration into the district structure.

29. *Grass-roots organizations and NGOs*. A watershed management committee, or the *comité local de gestion et de supervision* (CLGS), was also set up for each selected watershed. These CLGSs worked closely with sector development committees, farmer organizations (FOs) and various other associations. They were responsible for the implementation of work plans, quality control related to contracted services and the use of allocated resources. They were the primary decision-makers, as long as their decisions did not conflict with the basic principles, approach and modalities of the project or the district and sector priorities. The project also worked with FOs, which were organized by commodities and national and international NGOs which brought local experience on community development and technical matters. These NGOs were used as service providers for technical support and advisory services to producers.

30. Originally, the Government was to finance 190 km of feeder roads, but the targets were reduced to 64 km estimated at US$3.587 million. Total Government contribution was hence reduced to US$7.017 million.

31. **Notable changes during project implementation.** During project implementation, a number of changes to the original design were made.

32. *Value chain development*. The general objective of this subcomponent was to increase the incomes and food security of smallholder households through intensification and value addition of their on-farm production for six selected commodities. KWAMP provided support to three main commodities: maize, rice and milk, because these showed most potential. Via the 28 projects of VCDF, other commodities such as bananas, greenhouse vegetables, animal feed and honey were added.

33. *Livestock development*. In the post-MTR period, the project introduced a new strategy for livestock distribution through communal cowsheds. This new model served as a farmer field school to improve disease control, nutrition and reproduction for livestock in the district.

34. The *hilltop reforestation initiative* was not part of the original project design. This was included in 2009, following the recommendations of the IFAD supervision mission, to address dramatic deforestation caused by the rapid expansion of agricultural intensification activities in the district.

35. *Irrigation development*. The design proposal was to implement hillside schemes consisting of "mini-dams, ponds or cisterns that would provide irrigation water for commands of up to approximately 60 ha". Instead, based on the findings of a hydrogeological study carried out on behalf of the Government, it was recommended during project implementation to construct four relatively bigger dams with

command areas ranging from 130 ha to 441 ha. However, according to the official classification, these dams remained in the category of small dams, with a storage capacity of less than one million cubic metres.

III. Main evaluation findings

A. Project performance and rural poverty impact

Relevance

36. Relevance measures the extent to which the objectives of development interventions are consistent with beneficiaries' requirements, country needs, institutional priorities and partner and donor policies. It also entails an assessment of project design and coherence in achieving its objectives (IOE Evaluation Manual 2016). In the context of KWAMP, three dimensions of relevance are examined, i.e. (i) the relevance of its objectives, (ii) the relevance of its design, and (iii) the relevance of the project's pro-poor orientation.

37. **Relevance of objectives.** KWAMP's objectives and activities directly supported specific Government-defined programmes: the Girinka programme,[14] the Crop Intensification Programme, soil conservation, and the irrigation and terracing programmes. KWAMP also directly supported two of the six pillars in the Government's Vision 2020,[15] namely, pillar 4 - Infrastructure Development (land use management including rural land consolidation) and pillar 5 - Productive and Market Oriented Agriculture. Transformation of the rural economy and poverty reduction were also among the priorities set under the Economic Development and Poverty Reduction Strategy, due to the fact that agriculture played, and continues to play, the leading role in the fight against poverty.[16]

38. The project was harmonized with the IFAD Strategic Framework 2007-2010 by prioritizing access of the rural poor to land and water; agricultural technologies; functioning agricultural input and produce markets; and local policy and programming processes. It was also fully coherent with the agreed principles of engagement by: (i) focusing on rural economic development; (ii) including specific pro-poor targeting mechanisms; (iii) empowering local organizations through participation in decision-making and through innovative mechanisms for managing project resources; (iv) integrating effective local learning mechanisms; (v) forging partnerships with local government, community-based institutions, development partners and the private sector; and (vi) promoting sustainability through sound environmental practices.

39. IFAD's focus in Rwanda, as per the Rwanda country strategic opportunities programmes (COSOPs) 2008-2012 and 2013-2018, was on the development of human capital, water, rural finance, access to markets, decentralization, agricultural productivity and rural employment, and land reform. When comparing KWAMP's objectives with these policy and strategy references, it can be deduced that the project was well aligned to Rwanda's and IFAD's priorities.

40. **Relevance of design.** KWAMP's design was in effect upscaling of some of the activities under the earlier IFAD-supported project PAPSTA[17] while at the same time including additional activities. For instance, the project's approach to SWC was based on lessons learned from interventions under the PAPSTA, where the main strategy was an integrated watershed management approach that utilised community

[14] The Girinka programme was initiated in 2006 with the objective of reducing poverty through dairy cattle farming and increased milk consumption and income generation. It consists of giving one cow per poor family and includes a pass-on component whereby a recipient gifts the first-born calf to a neighbour (source: http://www.minagri.gov.rw/fileadmin/user_upload/SUCCESS_STORY/article_about_Girinka.pdf).
[15] Republic of Rwanda. Rwanda Vision 2020, Revised 2012, Kigali, 2012.
[16] The two priorities are also strategized by the Rwandan Ministry of Agriculture and Animal Resources (MINAGRI) under its Third Strategic Plan for the Transformation of Agriculture (PSTA).
[17] PAPSTA was a national project implemented by MINAGRI between 2006-2013 with the overall goal being to contribute to achieving the Economic Development and Poverty Reduction Strategy through support to the implementation of PSTA I&II in-order to improve income and nutrition of the poor rural population. The project's purpose was to improve the institutional, professional, and technical capacities of central, provincial and district level institutions, including farmers' groups and their umbrella organizations, and ensure the coordination, efficiency and effectiveness in the implementation and delivery of PSTA priority programmes.

participation in the planning process.[18] However, importantly, as opposed to PAPSTA, KWAMP used an area-based approach by concentrating on one district alone.

41. The noteworthy features of the design included the explicit combination of market demand with the ability to enhance the production and productivity bases, both for crop and livestock intensification and crop diversification. The latter occurred within a logic of preserving natural resources. The TOC in the annex displays 11 assumptions in the shaded boxes. All assumptions materialized by and large and did not compromise the validity of the TOC.

42. Another positive feature was that, at design, KWAMP's activities under SWC complemented the investments in farming efficiency with measures to reverse the negative trends and conserve the natural resource base for the future. Similarly, by integrating watershed management plans into the district development plan, the design ensured that project activities would feature prominently on the regular work plan of the district.

43. On the other hand, although the provision of small ruminants (goats, sheep and pigs) to the poorer beneficiaries was carried out on the basis that bigger livestock such as cattle require a certain level of investment for purchase and maintenance, the design overlooked two aspects: one, it is easier to (illegally) sell small ruminants, effectively ending the benefits expected by the project such as gaining income from their milk, and, two, the veterinary services in the district were better equipped to deal with bigger animals than small ruminants.

44. Similarly, the committees responsible for the quality enhancement and quality assurance mechanisms at IFAD had flagged the concern regarding project complexity. In response, certain changes were made in the original design, for example, renouncing the rural finance component. However, as discussed later in the section on effectiveness, rural finance proved to be one of the impediments especially regarding the success of value-addition initiatives. Another concern of the Quality Assurance Committee[19] was to obtain a written commitment from the WFP to honour their commitment of US$8.13 million to the project. In hindsight, this was not unreasonable, as WFP pulled out of KWAMP and funded only US$88,000.[20]

45. **Relevance of implementation approaches and institutional arrangements.** KWAMP was not only driven by a proven project implementation capacity (the SPIU at MINAGRI) but also by district authorities and community-based organizations (CBOs). Given that the focus was on one geographic area alone, the aim was to use a holistic approach targeting several inter-related activities in order to achieve the objective of improved incomes derived from agricultural intensification that was underpinned by sustainable natural resource use. Thus, the design essentially revolved around three principal activities: watershed management, agricultural intensification (including infrastructure) and value addition. However, this rendered the design an intricate structure, requiring active and strong coordination between these three areas that are significant in their own right, and to be completed within a set time period. Additionally, the design placed demands on the project management through a somewhat complicated system for decision-making involving many stakeholders (e.g. project staff, FOs, local committees) and based on a host of Memoranda of Understanding and service contracts.

46. The design responded to Government's unambiguous commitment to decentralising development planning and implementation to the district level after the administrative and territorial reform in Rwanda that resulted in four provinces

[18] The key ingredients of this approach were: (i) community ownership as the key to ensure the success and sustainability of projects, specifically the need to make these communities aware of the impact of erosion on their production levels and of the interrelatedness between the two; (ii) farmers being able to decide on options appropriate to their farms; and (iii) a growing acknowledgment of the watershed as a unit of planning in SWC to ensure optimum use and preservation of soil and water resources.
[19] IFAD. Rwanda, KWAMP, Minutes of the Quality Assurance Meeting, Rome, 27 June 2008.
[20] The PPE team was unable to ascertain the reason for the withdrawal of WFP.

and 30 districts, from 2005-2006 onwards.[21] However, this also made it somewhat risky, considering that competence and responsibility for project implementation was to be given to a newly constituted district team (although, a district-based capacity-building programme that included creating new staff positions in the district was expected to help overcome the issues associated with a new district).

47. The original logical framework (logframe) in the final project design report[22] counts seven indicators at goal and component level, and 25 at output level, a comparably fair number (as compared to more than 80 indicators in a big number of IFAD-supported projects). However, about half of all indicators from output level and above are devoid of time-bound magnitudes and thus difficult to measure with objective verifiability.

48. The project relied on the M&E infrastructure (administrative structures) of PAPSTA which itself was performing weakly at the time of KWAMP's design. However, it was expected that the technical assistance being provided to PAPSTA would help it strengthen its M&E which would in turn benefit KWAMP. The PCR infers that KWAMP's M&E was functional as it "was found to be effective in tracking physical progress of the project against AWPB". The evaluation team's assessment of the M&E system is that some of the initial shortcomings of the system were eventually overcome with the M&E expert tracking progress against the AWPB after the SPIU was formed.

49. **Targeting.** The project's pro-poor orientation was mirrored in its selection of Kirehe District as its geographic focus, a district which at the time of design was one of the poorest and most drought-prone districts of Rwanda.[23] The targeting strategy was elaborate, with a poverty-mapping exercise including a vulnerability assessment and analysis carried out to help determine how best to ensure maximum participation of the vulnerable households and to respond to the needs of different segments of the rural poor. Consequently, a typology of vulnerability factors (such as gender and land tenure) and the poverty-inducing processes were developed, and different segments of poor/vulnerable people within rural communities were identified. The project design also highlighted key gender gaps that required to be addressed including: i) granting women equal access to productive resources and income-generating activities; ii) including the interests of women in capacity-building opportunities and knowledge management under the project; and iii) giving women equal representation in decision-making and institutions under the project.

50. However, certain occurrences during project implementation reduced the potential positive effects for some of the categories of beneficiaries. Given that IFAD increased its contribution to cover the WFP funding shortfall, this negative consequence was diminished to some extent. In light of the fact that the target group was so poor, perhaps their willingness to save could have been used as a sort of self-screening mechanism. Savings would come from the salaries received for their High Intensive Public Works–temporary jobs. Similarly, the design did not incorporate obligation on the part of the beneficiaries, or any similar mechanism, to prevent or discourage the illegal selling of small ruminants by the above two types of beneficiaries. This issue is revisited in paragraph 66.

51. **Summary – relevance**. KWAMP's objectives were relevant to Government strategies for the transformation of agriculture, especially the Strategic Plan for the Transformation of Agriculture in Rwanda (PSTA) that called for the intensification and commercialization of agriculture and was consistent with the COSOPs' major thrusts in Rwanda. The design imbibed lessons from the earlier IFAD-supported PAPSTA by including some activities that had proved to be successful and not spreading its

[21] Republic of Rwanda, Ministry of Local Government, Administrative and Territorial Reform in Rwanda, Vision, Challenges and Progress, PPT, not dated.
[22] IFAD. Republic of Rwanda, Kirehe Community-Based Watershed Management Project (KWAMP), Project Design Report, Main Report and Working Documents, Rome, September 2008.
[23] The project design report surmises that given the regional disparities and the high percentage of farmers working with less than 0.5 ha of productive land, the headcount of poor people in Kirehe District may be higher than in the other districts of the Province (paragraph 51).

reach over a wide geographic area. Importantly, it helped to implement some specific programmes of the national government that were being implemented by other districts in the country.

52. On the other hand, the evaluation posits that in attempting to target three principal areas – watershed management, agricultural intensification and value-addition - within a limited time frame, the design became ambitious, requiring strong coordination skills and placing a heavy demand on implementation which was to be undertaken in collaboration with a newly devolved district administration with low capacity and a defined budget. In hindsight, the attempt to reduce design complexity by renouncing some activities such as rural finance proved to be misplaced. The PPE rates project relevance as *moderately satisfactory* (4).

Effectiveness

53. Effectiveness corresponds to the extent to which the development interventions' objectives were achieved or are expected to be achieved. Accordingly, the PPE assessed the three main objectives that underlined the project. The project's theory of change was also considered to guide the assessment.

54. **Objective 1: To develop strong public and private local institutions with effective planning and management capacity.** This would be achieved through the establishment of permanent institutions capable of supporting agricultural transformation in Kirehe, creating decentralized structures, community focal points for the promotion of economic activities and FOs. In addition, effective water and land use planning and management practices would be adopted to enable agricultural intensification that conserved the natural resource base. The activities to be undertaken and the achievements are presented in table 1 in annex VIII.

55. The project was able to achieve most targets set at design for support to agricultural transformation. For instance, in terms of the effective management of water and land use, KWAMP met its target of preparing watershed management plans (table 2 in annex VIII). The watershed plans included detailed topographical and soil maps that allowed the determination of various measures, such as radical and progressive terracing, and soil amendments. An example analysed by the PPE mission showed the various land husbandry measures proposed and mapped, which were professionally state-of-the-art.[24]

56. Through the construction of three community centres of innovation (CCIs), which were to serve as platforms for information, coordination and delivery of services to farmers and training centres for participatory planning, KWAMP financed 28 business plans (from 28 cooperatives) and 141 natural resource management proposals from Kirehe District. The evaluation team visited one CCI at Nyarubuye and observed the facilities which were in use, including a library and an ICT centre. The beneficiaries interviewed by the team were generally satisfied with the services offered in the centre.[25] However, as mentioned later in this document, their longer-term sustainability is suspect.

57. KWAMP also helped register 13 livestock cooperatives (of the 25 farmer cooperatives that were trained) at district and sector level (including 8 at national level) helping them to become more permanent institutions in the district. As a result, participating farmer cooperatives improved their management. They are now able to buy seeds and fertilizers, and some of them are able to build their own stores, as they informed the evaluation team.

58. The project also supported the registration of all land in Kirehe District. Importantly, due to KWAMP's support, Kirehe was the first district to complete land registration in the country and this set the pace for other districts to replicate this success. Finally, the water user associations (WUA) were able to operate without external assistance

[24] Improved Land Husbandry Technologies to be carried out on six sites of Kirehe District, no author, not dated.
[25] Some, though, pointed out the lack of some facilities such as a demonstration plot for practical trainings and a canteen which was important given the location of the centre and the fact that beneficiaries often came from far flung areas.

and to mobilize funding for system maintenance and repairs (although, as discussed later in the section on sustainability of benefits, the internal mobilising of funds may not be sustainable).

59. There were, however, issues with regard to the effectiveness of the project's support to building decentralized government structures. The main issue was the low capacity and under-staffing of technical staff in the district to implement the project's activities which was not considered a possible risk at design. Therefore, although early involvement of the district was foreseen in the design, implementation in the initial stages of the project had to be undertaken to a large extent by the SPIU and service providers.[26] Accordingly, some activities were delayed - especially related to livestock, SWC and value chain initiatives. The limited budget of the district was another issue; the district government was unable to support the project staff positions as originally envisaged, and these had to be supported by the project.

60. Another issue was that to ensure sustainability of the 18 CLGS, KWAMP supported their transformation into 12 hydrographic basin committees (HBCs)[27] both at district and sector level, in line with the established legal framework. This had the advantage of giving a legal status to the CLGS. The transformation meant that CLGSs ceased to be watershed management committees within the physical limits of a given watershed and adopted the logic of the administrative boundaries of sectors. The issue here, however, was that watersheds and administrative boundaries are not the same[28] and this meant a departure from a watershed-based approach to an area-based approach which was not in keeping with the original design of the project. The evaluation team strongly considers that, besides diluting the effectiveness of CLGSs under a watershed approach as envisaged by the project, there is a strong likelihood of loss of institutional memory, knowledge and best practices that were gained by being a CLGS.[29] It will also require a different set of skills and additional responsibilities on the part of HBC committee members which are yet to be tested.

61. **Objective 2: To increase efficiency in agricultural and livestock production and intensification of agriculture as a business for smallholders with a positive effect on the natural resource base.** This was to be achieved through an increase in volume and profitability of trade in agricultural and livestock products, including value-addition, crop and livestock production intensification, irrigation of farm lands, and soil and water conservation practices. The activities undertaken and the results achieved are presented in table 3 in annex VIII.

62. **Crop and livestock intensification**. As part of crop intensification, the provision of inputs (improved seeds varieties) to farmers, land use consolidation, training on improved crop husbandry techniques and support to post-harvest management, resulted in increased production of crops and marketable surplus (discussed further in the section on rural poverty impact). The four hillside dams constructed under KWAMP provided a source of water to a large proportion of the active poor and landless farmers in the district, reducing dependence on increasingly erratic rains and permitting a shift to higher value crops in response to market demand. These two outcomes were confirmed by the evaluation team through interviews with beneficiaries. For example, in Kinoni II area, farmers had shifted from maize and

[26] As a result, ministry staff were seconded to the project to support implementation of its activities. As per the PCR, while this arrangement provided the project with highly skilled and technical staff when required, many of these staff also had other full-time job descriptions away from the project and therefore they could not dedicate their full time with the project.
[27] In accordance with the organic law No. 62/2008 dated 10/09/2008 the CLGSs migrated into 12 District Hydrographical Basin Committees, one per sector, at project completion, to regulate the use, conservation, protection and movement of water resources.
[28] For example, in three watersheds (Binoni, Kagogo, Kayanza) the hydrological boundaries also cover sectors in neighbouring Ngoma district. One HBC (Binoni) visited by the evaluation team expressed the challenge of having to coordinate activities of three watersheds now as opposed to a CLGS that managed only one.
[29] The CLGS had a crucial role to play in the project's activities and objectives. These committees were responsible for overseeing the elaboration, implementation and monitoring of watershed management plans to protect and conserve the natural resources in each watershed.

beans to vegetables (tomatoes, bell peppers, cabbage). Mostly though, the beneficiaries met by the IOE team were cultivating rice.

63. In the spirit of partnership with IOE, a Swiss firm, Sarmap, specialized in remote sensing pro-bono analysed Kirehe District for this PPE, by obtaining and comparing satellite imagery between 2009 and 2016-2017.[30] The aim was to use satellite imagery obtained from the Landsat mission, which is freely available,[31] as additional evidence to examine the change in landscape brought about in Kirehe District for the period coinciding with KWAMP's lifespan. The results of this exercise are presented in annex IX. The analysis, that shows a comparison of a 2009 satellite image with one of 2016 in annex IX, infers that without substantial changes in the landscape, there was an expansion or intensification of the agricultural area, as evidenced from figures 8 to 18 in the annex. This is also supported by the creation of some dams and basins to collect the water to be used for cultivation (figure 7 in the annex IX).

64. KWAMP's approach to livestock intensification was based on productivity enhancement through the distribution of improved breeds of dairy cattle, goats and pigs, the solidarity chain known as the Pass on the Gift (PoG) programme and through the construction of communal cowsheds. The PoG was a successful intervention providing an additional source of income for them from the sale of milk. General management, sanitary conditions and feeding systems were up to good standards and the average daily cattle milk production was 10 litres.[32] The communal cowsheds developed under the project eased the provision of veterinary services as animal health technicians were able to visit the communal sheds every day. It also provided the opportunity of collecting large volumes of milk from one point for sale and sharing of good practices among farmers.

65. However, the effectiveness of livestock intensification was affected by several issues: firstly following the large number of dairy cows distributed, the quantity of milk increased rapidly and could not be fully absorbed by the local market. Also, demand for milk in Rwanda being price-elastic, livestock farmers were essentially price-takers,[33] and this, combined with their low market power, meant they could not influence the price received. Secondly, there were issues of negative group dynamics resulting in members of dairy groups side-selling to individual buyers and not to milk collection centres through their group. Thirdly, a lack of adequate feed particularly in dry seasons continued to plague beneficiaries resulting in an unbalanced diet for livestock which affected milk production.[34]

66. Fourthly, while the first batch of recipients of cows under PoG were generally satisfied with the livestock management services provided by Heifer Project International, the secondary recipients of PoG who were trained by local extension officers lamented the quality of training to the evaluation team. Fifthly, the implementation of the PoG model, by giving the better-off farmers cows while giving others goats and pigs, faced some challenges. For instance, the veterinarians were more adept in livestock health than of small ruminants. Further, while it was far more difficult to sell larger animals such as cows, small livestock was sold off illegally by the owners, as evidenced by interviews with livestock groups conducted by IOE.[35] Finally, there were instances of less healthy calves being passed on by recipients to those recipients who were next in the chain under the PoG. PoG, being a scheme based on offspring in order to generate outreach and sustainability, can only maintain goodwill among participating and potential farm households if veterinary

[30] SARMAP. Land cover changes analysis 2009-2017 in Kirehe province based on satellite data, Purasca, June 2018.
[31] The Landsat series of satellites provides the longest temporal record of moderate resolution multispectral data of the Earth's surface on a global basis.
[32] Veterinary officials informed the IOE mission that, on average, a local breed can produce 3 litres of milk per day, while a cross-breed can produce an average of 8 to 10 litres.
[33] As per interviews with dairy specialists in Rwanda, including from Heifer Project International.
[34] The supervision mission report 2010 had noted that scarcity of feed in the previous year led to 50% reduction in production of milk.
[35] It was illegal to sell animals received under the government's scheme of "one family, one cow", and animals received under KWAMP.

services cover all participants. The asset value of a dairy cow is superior to that of small ruminants and pigs, which may be one of the reasons why the dairy cattle PoG scheme worked fairly well compared to the attempted copying with pigs and small ruminants.

67. **Value addition**. In order to promote value-addition of agricultural produce, support was provided for the implementation of business development plans prepared by beneficiary groups through training, and through the establishment and operation of the VCDF, in which IFAD contributed 50 per cent while beneficiaries mobilized the balance through the private sector (financial institutions)[36]. The VCDF funded 28 proposals that included a variety of income-generating activities.[37]

68. The outcomes of VCD activities were mixed. The warehouses constructed using the VCDF facilitated the collection of rice and maize produce and reduced losses to some extent. In terms of improvement in prices by farmers from bulking produce, however, this did not occur, as per the interviews conducted by the evaluation team.[38] Prices received by farmers were marginally above the floor prices set by the Government. One reason was the limited demand in the country, but equally important was the lack of market linkages actively fostered by the project. On the other hand, where some cooperatives had taken the lead themselves and drawn contracts with buyers, they were assured of sales and prices.[39] The individuals benefiting from greenhouses reaped the benefits in terms of better quality and more quantity of produce (for tomatoes mainly).

69. In terms of construction of post-harvest infrastructure such as drying facilities, this proved useful to the beneficiaries in reducing both the losses and the time period between harvesting and selling. On the other hand, according to some of the beneficiaries interviewed, the area available for drying was limited, and the fact that it was not covered limited its use to dry periods only.

70. The PCR noted that the complexity of implementation arrangements related to VCD activities resulted in delays with the upshot of this sub-component not fully achieving its objectives (paragraph 56). There was also a delay in operationalization of the VCDF as the operation of the fund was not clear in the beginning. Similarly, many financial institutions did not fully embrace the model of financing farmers in the cooperatives and they took the view that financing farming enterprises was very risky and that the business plans produced by the farmers and cooperatives did not therefore justify funding. Some of the beneficiaries met by the evaluation team had faced issues of producing sufficient collateral for their loan.

71. **Biogas**. In regard to the promotion and establishment of biogas as a strategy to replace the use of firewood by farmers, this was a success. The 2016 assessment showed a general decline in trend for households who used a higher number of bundles of firewood for cooking for the period between 2008 and 2016. This was indicative of a decrease in firewood used in cooking which could be attributable to having alternative sources of energy for cooking.

[36] Partnering financial institutions included: (i) local commercial banks (Banque Populaire, KCB Rwanda, Bank of Kigali, Cogebanque, BRD), (ii) Microfinance institutions (Duterimbere Microfinance Institution) and SACCOs (SACCO Kigarama, SACCO Mpanga, SACCO Nasho, SACCO Nyarubuye, SACCO Musaza).

[37] These included: (i) installation of big food processing plants (rice, maize, banana); (ii) mid-sized processing units (honey, maize, animal feed and cassava); (iii) warehouses and drying infrastructures for maize and rice cooperatives; (iv) greenhouses for smallholder farmers.

[38] Interviews were conducted with the Isabane Rice Cooperative and the Coopriki Cooperative, the two of the three cooperatives benefiting from the VCDF.

[39] The financing provided to companies such as the Kirehe Rice Milling Plant was useful in connecting farmer cooperatives with big private players in the value chain. The additional milling line financed by KWAMP helped the company to process more, and therefore procure more, from the three cooperatives that were also beneficiaries of KWAMP. Additionally, indirect benefits in the form of employment generation also occurred with more persons employed by the company to handle the additional processing.

72. **Soil and water conservation**. Finally, the SWC activities[40] contributed to conservation of 98 per cent of watershed against soil erosion (PCR, paragraph 102). The anti-erosive measures also contributed to the reduction of runoff and sedimentation.

73. **Objective 3: To improve physical access to markets to enable trade in both inputs and produce.** This was to be achieved through restoration and/or establishment of year-round road links between producers and markets and proper maintenance of feeder roads in Kirehe District. The rehabilitation of feeder roads supported by KWAMP created better access to markets for farmers. Where new roads had been constructed, interviews conducted by the IOE team showed that production of food crops for sale had gone up (although, this is merely correlation; increase in production cannot be attributed to new roads). As per project M&E data, traffic counts increased after rehabilitation of feeder roads by 52 per cent and 50 per cent for vehicles and motorcycles, respectively. Moreover, 1,500 women and 3,500 men had access to periodic road rehabilitation and maintenance employment opportunities.

74. However, despite new and improved roads, the majority of produce was still sold on-farm. Results of the Impact Assessment Survey (2016) carried out on five surveyed commodities (rice, maize, cassava, bananas and beans) to ascertain how they were sold (means of transport) show that selling on-farm was the principal channel for all five commodities. This is confirmed through the other results of the same study that demonstrate that the majority of the produce was mainly sold to businessmen (48 per cent) followed by local markets (12 per cent), cooperatives (11 per cent) and neighbours (5 per cent). In addition, as per the PCR, the allocation for feeder roads was reduced from 16 per cent to 7.76 per cent following reduction in Government contributions, leading to a shortage of funds for the roads (paragraph 196).

75. In order to facilitate year-round links to markets, as stated in the project design report, maintenance of rehabilitated roads was critical. This was to be the responsibility of the district, and in this regard, some 40 per cent of the project rehabilitated feeder roads were maintained annually by the local government's own budget. In 2017, the district had used RWF 20 million for the maintenance of 75 km feeder roads (of which 47 km were KWAMP-built). However, this results to only about US$313 per km, an amount which is assessed as insufficient as per IOE interviews with the district road division. Some of the roads visited by the IOE team demonstrated that the KWAMP-built feeder roads were in a significantly better state of maintenance than the remainder, but there was frequent ditch erosion, especially on slopes.[41]

76. **Summary – effectiveness**. KWAMP largely achieved its objectives. As a result of training and provision of inputs, it achieved agricultural and livestock intensification which was one of its core objectives. There was not only an increase in production of traditional crops such as rice and maize, but also diversification of production to vegetables. Regular and timely provision of irrigation water helped plan production better. Distribution of livestock and the concept of communal sheds increased milk production. Feeder roads created additional avenues for selling the surplus produce. The land registration will help beneficiaries with facilitating loans. The post-harvest infrastructure was useful in reducing losses and warehouses made collection of produce more efficient and economical. The VCDF provided several individual farmers with new or additional sources of income. KWAMP's objective of building capacities of decentralized government structures (district) and grass-roots

[40] This included establishment of grass strips and construction of soil bunds, improved bench terraces, cut off drains, waterways, check-dams for hillside conservation as well as planting trees and shrubs, grass and legume and the application of liming and compost.

[41] One issue, as gathered by the IOE team through its interviews with Road Brigades (community members in charge of road maintenance), was the lack of trenches alongside the roads that would have prevented their inundation by rainwater. Where there were trenches, the fact that they were not lined (with concrete, for example) or cleaned regularly also led to the same result of inundation.

organizations was largely achieved due to *inter alia* the use of proficient service providers.

77. Admittedly, there were some issues which hindered its effectiveness. Changing the role and scope of grass-roots organizations such as the CLGS (to HBC), which were to be the bedrock of watershed management planning and monitoring, risks losing the effectiveness of a watershed-based approach (by modifying it to an administrative area-based approach) and the training provided to the CLGS under it. Other issues include livestock beneficiaries facing challenges of feed in dry months. The plan to distribute small ruminants to the poorer beneficiaries was not successful, thereby eroding the expected benefits to this category. Some value-addition efforts, especially by poorer groups, have faced issues of finance. Finally, effective marketing linkages and competitive prices for producers were lacking. It can be surmised that some of the issues were related to the ambitiousness of the project design which meant that not all objectives could be fully and satisfactorily met.

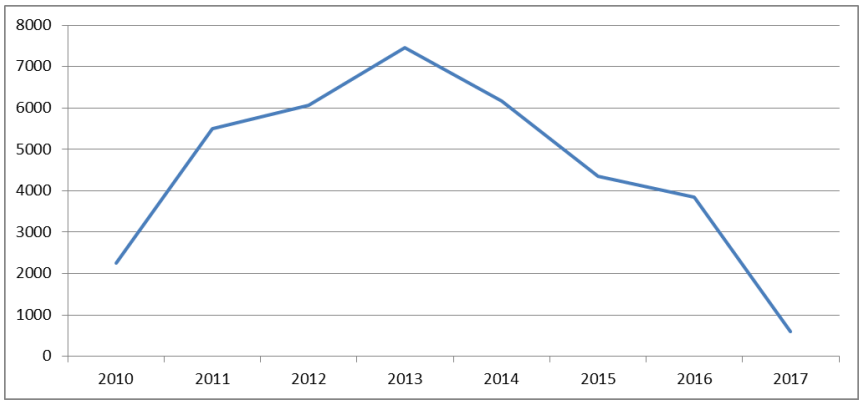
78. In rating the criterion, the PPE considers that, notwithstanding some impediments to its effectiveness, overall, KWAMP achieved its most important objective of agricultural intensification and its interventions touched the lives of a large base of beneficiaries providing them with tangible benefits. Consequently, the PPE gives a rating of *satisfactory* (5) to effectiveness.

Efficiency

79. Efficiency is a measure of how economically resources/inputs (such as funds, expertise, and time) are converted into results.

80. **Time to effectiveness.** One dimension of efficiency is the minimization of delays between the various legal and administrative steps needed to make a project effective. In this regard, KWAMP displayed a "board approval to effectiveness" gap of only eight months, much shorter than that of IFAD-supported projects in East and Southern Africa (ESA) i.e. 23 months.[42]

Figure 1
Project disbursement trends (in thousand US$)



Source: SPIU.

81. **Disbursements.** Figure 1 shows the funds disbursed in the different years of the project life span. The disbursements were slow to start with. One reason was that the VCD sub-component and the feeder roads component lagged behind with a cumulative execution rate estimated respectively at 5 per cent and 22 per cent at MTR. Withdrawal of funding by international partners was one reason that led to the delay, in addition to some of the reasons provided earlier in this report. On the other hand, investments in irrigation development accounted for a majority of the disbursements until 2013 when they peaked (in 2013, for instance, irrigation development accounted for two-thirds of the total project disbursement). The final disbursement rate stood at a healthy 99.03 per cent.

[42] Source: IFAD Grants and Investment Projects System for projects approved from 2000 to 2008.

82. **Cost per beneficiary**. The IFAD President's Report mentions the number of beneficiaries as 48,000 households (annex 4 of the PCR infers that out of this number, 20,500 were assumed to be direct). In terms of outreach achieved, the PCR states that more than 72,000 households became beneficiaries: over 40,000 direct and close to 32,000 indirect. As it is difficult to assign an average attendance cost to each household, the cost per beneficiary household can only be estimated approximately. At project closure, total cost amounted to US$55.2 million, resulting in an average household cost of US$1,370. The appraisal estimates for average cost per direct household were US$2,192 (PCR). Thus, despite the high incidence of infrastructure costs (irrigation, feeder roads), KWAMP managed to exhibit per beneficiary household costs that were less than anticipated.

83. **Project management costs**. In accordance with table 2 earlier in this report that shows funding by component, the portion of project management costs was 8.1 per cent at completion, compared to appraisal estimates of 4.9 per cent. The low percentage at appraisal was mainly obtained by having the PAPSTA PCU serving also as PCU for KWAMP. The underlying reason is that use of service providers, such as Heifer Project International for the provision of dairy cattle, and other public and private services providers, such as banks, worked efficiently, as these partners were competent in dispensing their services. Another factor is that the combination of the project workforce between the SPIU, district staff and CBOs proved to be a good solution in the Rwandan context of decentralization. The loan closing of PAPSTA in September 2013, and the concurrent reinforcement of the M&E in the SPIU and at Kirehe District, caused the management cost ratio to increase to 8.1 per cent.

84. **Internal rate of return**. At appraisal, the project internal rate of return of KWAMP exhibited a value of 16.8 per cent. The higher number of project beneficiaries and good agricultural and dairy productivities, as documented by the PCR and confirmed by stakeholder interviews by the evaluation team, were the drivers of an internal rate of return at completion calculated to be in the range between 31 per cent and 38 per cent. However, not all investments gave desired results. For example, the decision to construct four big dams instead of several smaller ones to increase the command area, led to a lack of sufficient run-off water (or spring flow) needed to fill the dams to service the increased command area. The drier-than-usual season for a couple of years exacerbated the situation. As a result, since the completion of the Mahama dam in 2013, the dam has not received sufficient runoff for irrigation thereby reducing some of the intended effects. Even in the other three dam schemes, the mission found that since the 2017 season had been drier than usual, the stored water was proving inadequate for irrigating farms in the command areas. In normal years, these schemes proved to be operational, though.

85. **Additional funding**. During project implementation, DED withdrew from financing the project while WFP's contribution was reduced from US$8.123 million to US$88,000. This slowed down the implementation of some activities. Activities affected by this measure included, among others, the importation of high quality Ankole bulls for genetic preservation purposes, VCD, SWC activities including land husbandry techniques to protect irrigation schemes, and the acquisition of required equipment for cooperatives (supervision mission 2013). The effect on the budget due to the withdrawals of DED and WFP was mitigated due to an increase in the IFAD participation and additional contributions from the beneficiaries and the private sector. Supplementary financing was granted by IFAD in the form of an IFAD Loan 897/RW (5.1 million Special Drawing Rights) and an IFAD Grant 8116/RW (5.1 million Special Drawing Rights).[43]

86. **Summary – efficiency**. The project fared well on most measures of efficiency. A short effectiveness gap, a healthy disbursement rate, lower cost per beneficiary than planned, and an internal rate of return better than forecasted were factors in favour of KWAMP. Admittedly, the doubling of project management costs and some of the

[43] Supervision mission report 2013, paragraph 7.

investments not giving the desired results, as in the case of the Mahama dam, presented some minor issues. Summing up the various dimensions of the project efficiency, a rating of *satisfactory* (5) is provided by this evaluation.

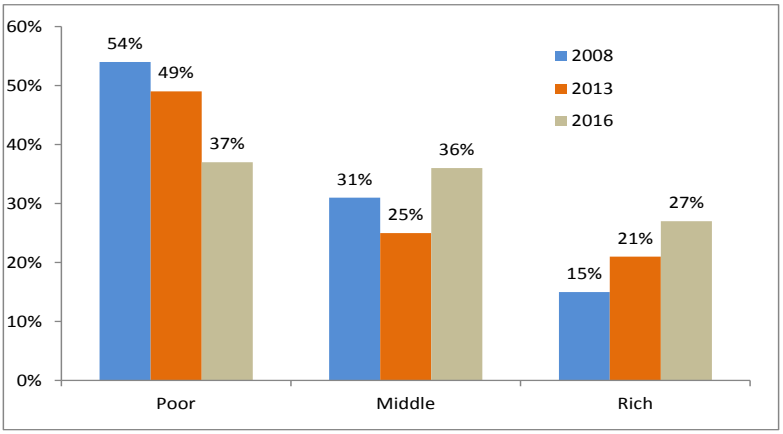
Rural poverty impact

87. Impact is defined as the changes that have occurred or are expected to occur in the lives of the rural poor (whether positive or negative, direct or indirect, intended or unintended) as a result of development interventions (i.e. changes in: household income and net assets, human and social capital and empowerment, food security and agricultural productivity, and institutions and policies).

88. A key source for the assessment of KWAMP's rural poverty impact is the Final Impact Assessment Survey (IAS)[44] and the interviews conducted by the evaluation team. In 2009, a baseline study was published, notably before the date of project effectiveness.[45] However, in neither the baseline nor the impact assessment report, have comparison groups been included, which makes the attribution of observed changes problematic. On the other hand, the final impact assessment does not only refer to the baseline study of 2009, but also to an intermediary assessment of 2013. This makes the IAS a relatively good reading because targets can be compared with effectively attained values, especially in table 18 of the assessment report.

89. **Household income and assets.** The results of the IAS of 2016 show that there was a noteworthy improvement in wealth categories in the district. There was a reduction in the category of "poor" and improvement in the categories of "middle" and "rich" (figure 2). However, as mentioned above, it cannot be said with scientific certainty that these results were caused by KWAMP's interventions or whether they were part of a general trend. For instance, secondary data referred to by the PPE show that poverty headcount in the Eastern Province, of which Kirehe is a part, had reduced - from 44 per cent to 38 per cent - between 2010/2011 and 2013/2014.[46]

Figure 2
Distribution of household according to the wealth profile



Source: data from KWAMP Impact Assessment Survey 2016.

90. In terms of assets, as per the IAS 2016, beneficiaries made improvements to their houses as reflected in the type of house roof. Thus, more beneficiaries used better roofing material (iron) as opposed to baseline, and consequently, the use of inferior roofing material such as glass and tiles/sheeting decreased (figure 3). This may be due to the "Bye bye Nyakatsi campaign"[47] introduced by the Government of Rwanda in 2010 and the increase in household incomes from KWAMP interventions (IAS, page 37). The IOE mission also observed that improvements to their houses were

[44] MINAGRI/KWAMP. Final Impact Assessment of Kirehe Community – Based Watershed Management Project (KWAMP), Final Report by SESMEC Ltd, Kigali, August 2016.
[45] République du Rwanda, FIDA. Projet de Gestion Communautaire Des Bassins Versants du District de Kirehe (KWAMP), Etude Socio-Economique de Base, Rapport Définitif, Kigali, Janvier 2009.
[46] National Institute of Statistics of Rwanda, Poverty Trend Analysis Report, June 2016.
[47] The campaign was designed to assist disadvantaged and poor families by replacing grass thatched houses with modern housing.

one of the first actions that beneficiaries took when their incomes increased. Beneficiaries also acquired means of transport since the inception of KWAMP which also facilitated their access to markets (figure 4).

Figure 3
Type of house roof

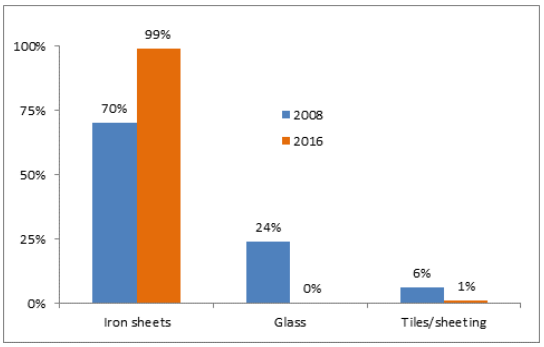
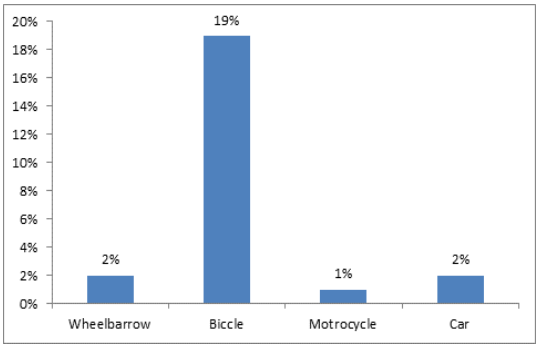


Figure 4
Means of transport acquired



Source: data from KWAMP Impact Assessment Survey 2016.

91. In terms of productive assets such as livestock ownership, KWAMP distributed 3,390 dairy cattle of which 1,302 heads were pass-on cattle from previous beneficiaries who benefited from the scheme. As a result, cattle possession substantially increased. The goat and pig distributions were much less successful, and more difficult to organize for the subsequent pass-on of offspring from an original beneficiary. The sale of milk from ownership of livestock contributed to incomes of beneficiaries.[48] The project also helped in the creation of milk collection centres to help stabilize milk prices and increase the shelf life of milk. However, it is likely that this did not play a significant role since, according to the IAS report, the majority of the milk produced by a beneficiary was either consumed by the beneficiary or sold to a neighbour or a middleman. This was apparently easier to manage than transporting milk to a milk centre, and importantly, cash was received immediately upon the sale. This was also confirmed through the IOE team's interviews with livestock beneficiaries.

92. The efforts of the project also contributed to improved land ownership and security through land registration and provided an additional productive asset to the beneficiaries. This was possible thanks to a memorandum of understanding with the National Land Centre. It was established that, at project closure, 100 per cent of farmers had their land registered and 92 per cent of households had land titles.

93. Implementation of various infrastructures increased the communities' income through provision of employment. During the construction of both irrigation infrastructure and feeder roads, the poor in the project area were employed as manual labourers. While it is difficult to establish the exact amount spent on wages, an estimate at 20 per cent of the infrastructure costs (irrigation cost was RWF 9.4 billion and feeder roads cost FRW 2.6 billion) would place the figure at around estimated RWF 2.4 billion.

94. The IOE mission visited various undertakings that benefited from KWAMP's support under the VCD scheme. These visits led to an understanding that the undertakings were profitable, e.g. tomatoes growing in greenhouses, and a cereal mill operated by a female entrepreneur. The visits also confirmed that some of the approved business plans were able to get bank financing, but these were relatively prosperous and bigger businesses; several other smaller beneficiaries had identified the lack of proper collateral as an impediment to finance.

95. The project M&E has not captured effective volumes, costs and prices of these activities to ascertain these general impressions. KWAMP would have gained much

[48] Again, the fact that the district itself distributed 10,087 in-calf heifers in a national scheme, against the 3,720 KWAMP-sponsored heifers, illustrates that income increases cannot be directly attributed to KWAMP alone.

credibility by effectively verifying the assumptions in the business plans. The situation is similar to that mentioned below under agricultural productivity. It would have been relatively easy to establish sample-based observatories of tangible impact. In the absence of these, the mission can only speculate that, for instance, capacity utilization of the cereal mill may not be sufficient to generate sustainable income for the owner. Similarly, there are no solid records on the volumes and margins of the businesses run by cereal cooperatives although the general impression is one of competence and solidity.

96. **Human and social capital.** KWAMP provided opportunities for communities to benefit from the transfer of knowledge and skills and contribute to their human and social capital empowerment. Part of the infrastructure implementation process involved capacity-building of the local communities in order for them to participate in construction and to manage the operations and maintenance of the completed infrastructure. For example, in irrigation development, the project supported the formation and capacity-building of the WUAs. The capacity-building included both organizational and technical skills development. Similarly, for feeder roads, the project supported the formation and capacity-building of road brigades, again including the development of organizational and technical skills.

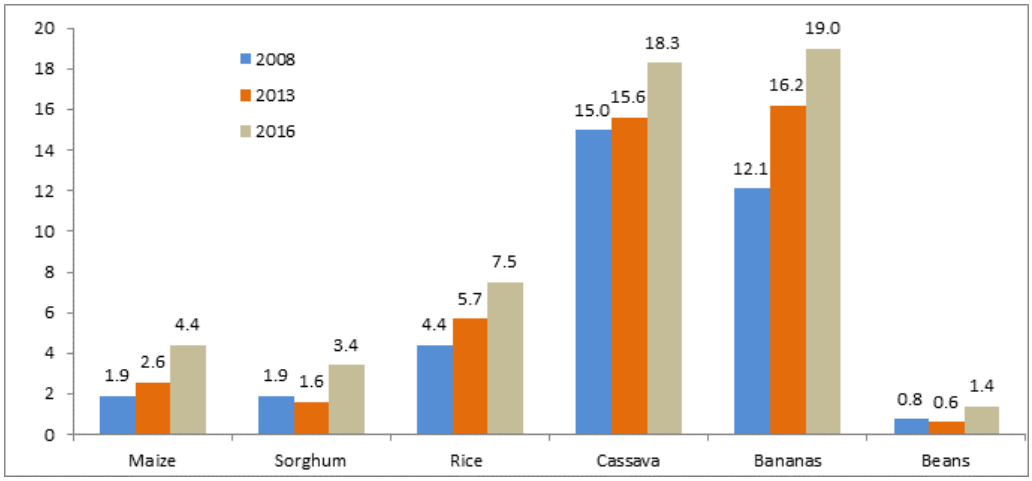
97. The evaluation team was in a position to interact with WUAs and ascertain that they displayed good levels of technical and organizational skills in the organization of irrigation turns and the handling of dam periphery, such as sluice gates. PPE interaction with service providers suggests that the training of FOs and WUAs was too theoretical at first, but later switched to hands-on and inclusive training, which also resulted in the ability to mobilize contributions in cash and kind from their members. The irrigation management transfer agreements between the district, the Rwanda Agriculture Board and the WUAs are today signed and in place, an improbable achievement without the distinctly practical coaching of WUAs.[49] [50] The cooperatives active on the perimeters subsequently signed performance agreements with the concerned WUAs to determine mutual rights and obligations.

98. **Food security and agricultural productivity.** Food insecurity is an important issue in the Kirehe District. As per the project design report, some 70-90 per cent of households face periods of food shortages every year (project design report, page vii). As per the findings of the IAS, there was a general improvement in the food security situation of the beneficiaries. Some 78 per cent of the respondent households reported that eating habits had changed for the better. The households with one meal or less per day decreased from 7 per cent to 2 per cent, and those with one meal or more grew from 28 per cent to 33 per cent while households with higher meal frequencies per day remained unchanged. Interviews and group discussions conducted by the IOE team with farmers revealed the same outcome – beneficiaries were able to afford more meals, and the health of their children had improved consequently.

99. With regards to agricultural productivity, the IAS provides a number of interesting facts and figures. The baseline, intermediary and final impact surveys indicate that maize, beans and sorghum substantially increased in area occupation in the attended watersheds, while rice area coverage grew from 0.1 per cent to 6.3 per cent thanks to the additional irrigation command area gained as a result of the project. Yield improvements were noticed across all five commodities in the study.[51] Data on individual commodities is presented in figure 5.

[49] Discussion with Ms Eva Jordans, who was the responsible consultant for the practical WUA training.
[50] In the realm of human and social capital fostered by KWAMP, there is evidence of additional and creative initiatives. In one road brigade, in addition to the road maintenance work, the members organized a *"merry-go-round",* whereby everyone contributed RWF 200, the sum of which was lent to one of the members on a rotating basis. Another example is the Sagatare WUA, where the members organized a campaign in their village called *"live in a good environment",* which was aimed at having members improve their houses and environmental hygiene.
[51] Men and women in the project area have key data on areas, productivities, costs and prices at their fingertips. Consequently, it is understood that such data are not derived from on-farm verification trials.

Figure 5
Evolution of yield of main crops



Source: data from KWAMP impact assessment survey 2016.

100. The IAS attempted to attribute productivity gains. About 38 per cent of respondents said they gained by the use of improved seeds, 29 per cent attributed these to the use of fertilizer, 25 per cent confirmed they gained from training in farming, 7 per cent reported they had benefited from irrigation services and an overwhelming 46 per cent said they gained through terracing their land.

101. The above productivity increases and perceived gains are substantial. However, they do not appear to reflect formal follow-up productivity trials. To some extent, yield increases can be linked to a set of good agricultural practices as mentioned above. However, it is conceivable that more gains would have been possible with systematic liming. KWAMP included liming only for pH values below 5.7 and only for radical terraces. At pH values below 6, plant availability of key nutrients is seriously compromised.[52] A survey on fertilizing practices in Rwanda published in 2016 confirms that the soil pH values are mostly low (5.51-6.0) in the entire Kirehe District.[53] Thus, limiting liming to radical terraces alone (and not to all terraces) and their low pH values was a missed opportunity.

102. Livestock productivity was noticeable. The average production of milk per improved (cross-bred) dairy cow was estimated at 9.4 litres per day, which was standard for such cows. This notwithstanding, daily milk production per cow can be increased further by increasing the use of feed concentrates for the animals.

103. **Institutions and policies.** The project supported the formation and capacity development of FOs. These constituted the main foundation for assuring the social, economic and environmental sustainability of practically all KWAMP investments including SWC measures, crop and livestock intensification, irrigation schemes and feeder roads. A total of 63 cooperatives in Kirehe District cumulatively recruited 18,181 members out of which 35 per cent were women. A categorization of cooperatives in terms of their performance and organizational strength indicated that 56 out of 63 registered cooperatives had strong or average performances, and only 7 were rated as weak (PCR).

104. This impact sub-domain is indeed meaningful in the framework of KWAMP. The participatory process to prepare, implement and monitor 18 watershed management plans in Kirehe District was formative in terms of lasting institutions. The 18 CLGS established by the project, consisting of 9-13 members, supported the implementation and monitoring of project activities.

[52] http://www.growing-life.com/shop/pH_and_Nutrient_Availability_chart.html.
[53] Republic of Rwanda, Rwanda Environmental Management Agency, UNDP. Effectiveness and Efficiency of Fertilizer Use in Rwanda, Final Report, Kigali, 2016.

105. The project supported Kirehe District to finance eight key technical positions to implement project activities. These technical personnel were fully integrated into the district structures and were considered by the community as district staff and not KWAMP staff. This was a positive move that enabled mobilization of communities towards implementation of project activities.

106. **Summary – rural poverty impact**. The four impact sub-domains presented above exhibit observed changes that were important in terms of rural poverty impact in their great majority. The impact assessment report highlights economic benefits for KWAMP beneficiaries, mirrored in the increase in incomes and assets, and the positive changes among the wealth categories. The food security situation too improved. These benefits were driven by productivity increases in crops, diversification to higher value crops and new sources of income such as milk sales. Financial and technical support for value addition to agricultural products also contributed to income increases. KWAMP built human and social capital through training to grass-roots organizations such as WUAs and by facilitating group cohesion.

107. However, as observed at the outset of this section, these changes cannot be attributed to KWAMP with scientific accuracy because there were no control groups considered when realizing the baseline and end-line surveys. Both the IAS and the PCR tend to infer that the positive changes occurred due to KWAMP. Despite this caveat, the amount of data shown and the anecdotal evidence collected by the evaluation team leads the PPE to conclude that the rural poverty impact of KWAMP has been *satisfactory* (5).

Sustainability of benefits

108. The term sustainability refers to the likely continuation of net benefits from a development intervention beyond the phase of external funding support. It also includes an assessment of the likelihood that actual and anticipated results will be resilient to risks beyond the project's life.

109. The PCR goes to great length in analysing drivers and limitations of sustainability of each component and many subcomponents. The 18 watersheds continue to be monitored by the HBCs, one per sector, after the transition from 18 CLGS which monitored each watershed. This move from watershed to an administrative sector makes them less congruent with the physical boundaries of a given watershed (a sector may transcend more than one watershed) and poses the danger of loss of institutional knowledge and skills on the project activities and investments made by KWAMP which were watershed-specific.

110. There are two additional factors that could constrain sustainability. The first concerns the three CCIs created and maintained by the project which were not operated continuously after project completion. These centres were conceived to serve as platforms for information, coordination and delivery of services to farmers, in collaboration with various institutions. However, annual operation costs are high (staff salaries, costs of electricity, water and internet access). Interviews with officials revealed that unless they become an official part of local government structure and/or a nationally accepted and official rural institution, they will face sustainability problems. Also, it remains to be seen whether the privatization of the CCIs and the creation of sustainable business development platforms are realistic.[54] The second limiting factor, signalled in the section on effectiveness, is the scarce resources available for feeder road maintenance, i.e. only US$313 per km in 2017.

[54] The issue of the sustainability of CCIs is particularly critical, as was seen in the case of PAPSTA. As per PAPSTA's PCR, the CCIs were initially envisioned to generate their own income to support their operation and maintenance along with budget support from the districts. However, budget support from the districts did not happen. Besides, the type of services provided by CCIs did not lend themselves to cost recovery. Of the 6 CCIs, only a few generated some income to cover some of their operating costs, through the provision of services for pay such as photocopies or access to internet. Indeed, those remotely located CCIs such as in Nyamagabe, Nyanza, Gakenke and Ngororero were struggling to generate income.

The evaluation team considers this amount as very low and this was also confirmed by district officials.

111. Similarly, sustainability of some of the activities undertaken under the VCDF such as greenhouses depends on the capacity of the beneficiaries to fund the greenhouse structure that would need replacement periodically.

112. On the positive side, the human resources service of Kirehe District has provided evidence to the evaluation team that the 22 district staff positions dedicated to the implementation of KWAMP were offset by the recruitment of 85 new staff starting in 2016 and well into 2017. Consequently the human resources at district level should be sufficient to assure the smooth working of the HBCs. At district, sector and cell levels combined, Kirehe District presently counts 384 staff.[55] In a similar vein, the 63 cooperatives in the district and the WUAs appear to have a good pool of qualified human resources.

113. The project assigns fair to good prospects of sustainability to crop intensification and diversification, as well to the dairy sector, due to the considerable progress of productivities and attractive price levels for tomatoes and milk, as verified by the mission. However, KWAMP could have done more to document what the effective gains were in soil fertility, and crop and livestock productivity. While the project adopted realistic assumptions in the business plans for VCD projects,[56] the lack of sample-based and on-farm observatories to verify business plan assumptions is conspicuous (this could have been organized at very little cost with the help of academia, for instance). As a consequence, the PPE is not in a position to confirm, based on experimental evidence, whether the assumed changes in soil fertility (limited liming) and the observed productivity changes are sustainable.

114. The PPE nevertheless has identified several drivers of sustainability, such as:

(i) The involvement of the district, sectors and cells, generating strong ownership.
(ii) The availability of an exit strategy and formal hand-over of irrigation schemes.
(iii) The proven ability of the district to substitute KWAMP staff and to perpetuate activities, such as reforestation, heifer distribution and artificial insemination.
(iv) The management capacity of FOs, such as WUAs and cooperatives, the result of hands-on and inclusive training, and the ability to mobilize contributions in cash and kind from their members.
(v) The fact that KWAMP was, in several instances, complementary to mainstream district interventions, such as livestock distribution, reforestations and SWC measures. This means that such activities have continued after the project completion.
(vi) The considerable involvement of women and their presence in executive positions.

115. **Summary – sustainability**. Based on the observations and interviews conducted by the evaluation team, there are some factors that could limit the sustainability of benefits emanating from KWAMP's interventions. However, the PPE considers that, overall, the larger benefits emanating from KWAMP are expected to be sustainable, especially related to production (less prone to erratic rainfall) and the maintenance of infrastructure. The PPE assigns a rating of *satisfactory* (5) to sustainability.

B. Other performance criteria

Gender equality and women's empowerment

116. The final project design report infers that there were very favourable institutional foundations in Rwanda that empower women. The Government sees gender equality as a fundamental human right and an important factor for economic growth and

[55] Kirehe District. Document on staff situation, 24 April 2018.
[56] The PPE mission examined five business plans in detail and confirms that productivity and price assumptions were conservative. The SPIU has meanwhile improved the methodology of business plan preparation, which now includes the standard financial rations such as the Internal Rate of Return, the Net Present Value and the Benefit Cost Ratio. The assessment of the demand side or markets is more prominent than the description of the supply side.

social development. It has shown determination to include gender and equity in the Constitution and all development policies, and the number of women in many governmental institutions is comparatively high. However, in rural communities, married women are still considered as minors placed under the full responsibility and authority of their husbands, and many of them do not own their lands although they could legally. At the rural households' level, women are not fully perceived as full economic agents. There continues to be a high level of tolerance for domestic violence by both men and women.[57]

117. The project's gender target at the design was to focus on the following elements: (i) providing women with equal access to productive resources and income-generating activities; (ii) incorporating the interests of women in capacity-building opportunities and knowledge management; and (iii) giving women equal representation in decision-making and institutions under the project.

118. At the design of the project, the target was to have women as at least 30 per cent of the beneficiaries. The MTR did not make any change to the initial target. During the project implementation, women were well represented in all aspects of the project, and representation exceeded the 30 per cent target up to above 40 per cent.[58] All the training topics included gender equality and empowerment. Table 3 shows women's representation in different activities or institutions.

Table 3
Women's representation in different groups

Activities, institutions	*Women's representation (%)*
Maize cooperative members	43
Rice growers' cooperative	42.6
Banana cooperatives	41.78
Pineapple cooperatives	34.25
Honey	30
Milk	27.7
WUAs	33.6

Source: KWAMP completion report.

119. The above table shows that women's participation exceeded the 30 per cent target (except for milk). According to the impact assessment report and field visits carried out by IOE, women stressed that they work equally with men in support of the household's income, and they confirmed they have equal representation in decision-making. Women also confirmed to be independent since they participate in the household's development. This was not only due to KWAMP but also because of different governmental programmes already in place that empowered women. The above achievements allowed KWAMP to be the winner of IFAD's Gender Award in 2014.

120. Several project activities directly benefited women. The biogas system provided poor households with energy for cooking and lighting and freed up women's time usually spent in fetching firewood. In addition, cooking with biogas instead of firewood or coal reduced the amount of smoke and health-damaging particles. This had a beneficial effect on the health status of the households concerned, especially women and children. This was confirmed by the women beneficiaries interviewed by the evaluation team. Most of the committees formed by KWAMP had good representation of women; women constituted up to 40 per cent of the membership.

[57] http://www.rw.one.un.org/mdg/mdg3.
[58] Republic of Rwanda, IFAD. Kirehe Community-based Watershed Management Project, Final Impact Assessment Report, August, 2016.

121. The communal sheds visited by the evaluation team had women beneficiaries in large numbers. Women were generally adept at milking the cows. However, the lack of water due to the generally dry spells witnessed in Rwanda meant that women, and even children,[59] had to fetch water for the animals. Women had also benefited from irrigation water and had diversified into high value crops such as vegetables. In this respect though, women-headed households faced problems of transporting the surplus to the market and had to employ labour for this. In relation to youth, in some hillside schemes, young graduates were based at village level to support farmers in good agricultural practices and youth were trained on installation, operation and maintenance of biogas units.

122. The women beneficiaries of the project felt empowered given that they were active members on the project-supported committees such as WUAs and others, holding prominent positions. Some admitted that the increase in production had increased their workload (including, and as mentioned in the preceding paragraph, time taken to fetch water for livestock). However, they did not consider this as a negative outcome given that their economic situation had improved. Their economic situation had improved from prior to the project, largely due to the crop and livestock intensification interventions of the project.

123. Despite the above achievements, there was a lack of explicit gender strategy at project design. A gender focal point was appointed only after the MTR, some five years into project life. After numerous discussions during the field visits, it emerged that KWAMP may have missed an opportunity to further capitalize on the remarkable achievements in Rwanda in general (the Republic of Rwanda has supported women's rights for some time and had female representation in the national parliament of 56 per cent in 2010).[60] For example, a needs assessment of women-headed households would have highlighted the unique issues faced by them as compared to their male counterparts (transporting produce, for one) and would have helped formulate activities to ensure equal benefits. Consequently, the PPE rates gender equality and women's empowerment as *satisfactory* (5).

Innovation

124. Innovation, as per the IOE Evaluation Manual, is a measure of the extent to which IFAD development interventions have introduced innovative approaches to rural poverty reduction. The PCR refers to numerous innovations attributed to KWAMP. It is true that the installation of the flexi biogas systems, promoted by a Kenyan engineering firm, was one such innovation. These biogas systems are more economical, due to lower investment costs, than concrete dome biogas digesters. KWAMP sponsored 451 such systems, which were functioning according to the PCR.[61] Hillside irrigation by small diameter piping was also a notable innovation. It greatly reduces water wastage and is good practice for horticulture, just short of drip irrigation. The IOE mission observed that the WUAs of such systems have well internalized the intricacies of required water management.

125. The conclusion of the irrigation management transfer agreements between the district, the Rwanda Agriculture Board, the WUAs and cooperatives active on irrigation perimeters, was a genuine innovation and apparently a pioneering act in Rwanda. The agreements foster ownership and are a driver of sustainability.

126. However, there are several activities where the evaluation team does not concur with the PCR concerning innovation in the context of Rwanda. These activities had been already tried under the PAPSTA and are not innovations introduced by KWAMP. One such example is the community competitions (*Inteko y'Imihigo*) that enabled villagers to design and submit their projects to KWAMP with those deemed to be

[59] As per the impact assessment report, 59.4 per cent and 46.9 per cent of respondents reported that children were responsible for fetching water and collecting firewood respectively.
[60] https://www.theguardian.com/world/2010/may/28/womens-rights-rwanda.
[61] Between 2013-17 and 2016-17, the district reports, in a biogas database, the installation of 829 biogas units. It is not clear whether the KWAMP-sponsored units are included in this figure.

successful receiving funds from the project. Similarly, the CLGSs and CCIs, as well as the animal health insurance schemes were part of PAPSTA. The same applies to roof water harvesting systems, a simple technique known for a long time in the entire region. The intensive rice cultivation system has been developed in Madagascar and was an innovation in Rwanda but had already been adopted by PAPSTA. Notwithstanding that several activities were not innovative, there were other notable ones that the PPE finds innovative. Considering this, the PPE rates innovation as *satisfactory* (5).

Scaling up

127. Scaling up is the process by which project interventions have been (or are likely to be) scaled up by government authorities, donor organizations, the private sector and other agencies. As mentioned under innovation, KWAMP successfully scaled up participatory approaches developed by the precursor project PAPSTA. IFAD's country programme manager confirms that Government and IFAD are presently preparing a successor project in Kayonza District and in one or two more of the Eastern Province, to scale-up the achievements of KWAMP.[62] Thus, a certain sequential logic is visible at least in three projects co-financed by IFAD. However, given IFAD's involvement, the evaluation considers this more as a replication than scaling-up.

128. As per the evaluation team's interviews with officials from REMA, Government has reportedly appointed biogas officers in every district with a view to scaling up the Flexi Biogas Systems used under KWAMP.[63] The mission learnt that the mechanism of setting up "Irrigation Management Transfer Agreements", developed by KWAMP, is considered best practice by other districts and was being discussed for use in those districts at the time of the evaluation.

129. The Private Sector Development in Agriculture, a USAID-funded project, has established a funding mechanism similar to KWAMP's matching grants. MINAGRI, through the same project, is developing an agribusiness strategy and the financing modalities are still under discussion. After this strategy has been developed, it will help to address finance issues faced by rural farmers in Kirehe and countrywide. The PPE rates scaling up as *satisfactory* (5).

Environment and natural resource management

130. In a watershed development project, environment and natural resources are at the heart of the project's aims and efforts. Deserving of a mention is the collaboration between KWAMP and the Ministry of Natural Resources Management which was in charge of coordinating the Hilltop Reforestation Initiative. KWAMP undertook a number of activities that contributed to soil and water conservation. These included: (i) progressive terraces (infiltration trenches) on 18,556 ha against a target of 15,153 ha, (ii) radical terraces on 652 ha, and (iii) reforestation area on 323 ha with the drought- and termite-resistant species Callitris Robusta (Cupressaceae). In comparison, the district itself reports 7,323 ha as reforestation areas and 17,255 ha as agroforestry areas. Thus, KWAMP delivered a complementary effort to ongoing district campaigns directed towards sustainable natural resource management. The tree-planting initiatives supported by KWAMP are reported to be slowing down soil erosion in the district. The effectiveness of erosion control though will depend on the level of engagement of the local administration and the committees in community mobilization and monitoring.

131. KWAMP also supported plantation of trees on private and public land; some 13.4 million seedlings of forestry and agroforestry trees were produced and planted. Community nurseries were also supported by KWAMP where villages got funds through community competitions (Inteko y'Imihigo) to carry out seedling production in nurseries and tree planting. The approach promoted community participation in natural resources management as a way of ensuring sustainability through increased

[62] Country programme manager comments on the PPE approach paper.
[63] Ibidem.

ownership. Finally, the creation of WUAs helps ensure a rational and sustainable use of water. Again, the success of water management will depend on the level of ownership and engagement of WUAs and support from the district authorities.

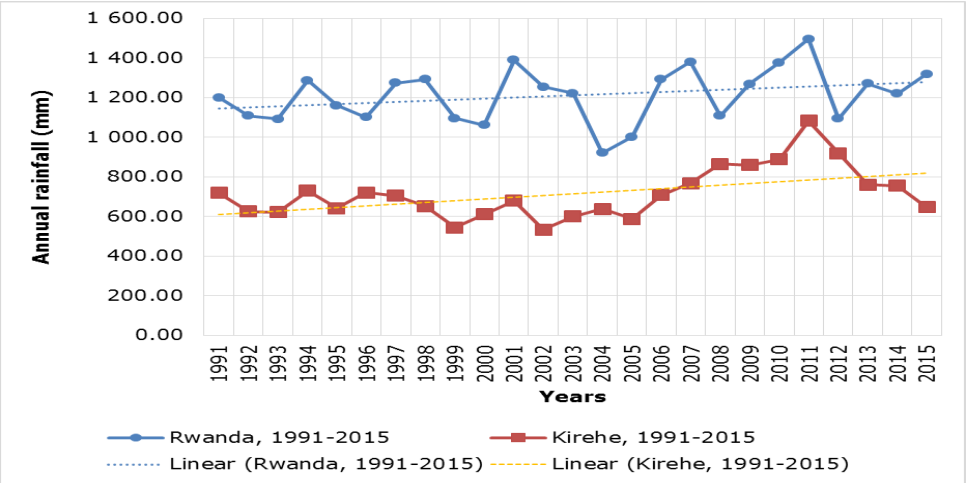
132. However, KWAMP could have established an objective reference framework in this regard. It would have been useful to establish observatory point networks with simple soil analyses before and after the interventions, with a limited number of relevant variables. In particular, aspects of prevailing soil acidity were not taken into account, except on radical terraces where liming was applied. Data of installed rain and river gauges are not available at district level.

133. A key question in this regard is whether the above achievements represented a tangible contribution to the environment and the sustainable management of natural resources. Expansion of agriculture has mainly occurred in areas that were sparsely forested (figure 8 to figure 16 in annex IX). In this regard, it can be argued that the change from degraded and sparse forest to sustainably managed terraces that can help protect soil is to be considered as a positive development in terms of the environment and natural resources. Additionally, there has been an increase in the forested area due to planting of trees (over an area of 330 hectares). The PPE rates this evaluation criterion as *satisfactory* (5).

Adaptation to climate change

134. The President's Report does not mention adaptation to climate change nor does it refer to climate as a concern in Rwanda. The final design report marginally refers to this theme.[64] It only states that a proper assessment of how climate change is affecting cropping and yields would require the analysis of daily rainfall data. Thanks to the assistance of the SPIU, such data are now available and were obtained by the PPE. Figure 6 compares the average annual rainfall data for Rwanda with Kirehe between 1991 and 2015.

Figure 6
Annual rainfall data, Rwanda and Kirehe, 1991-2015

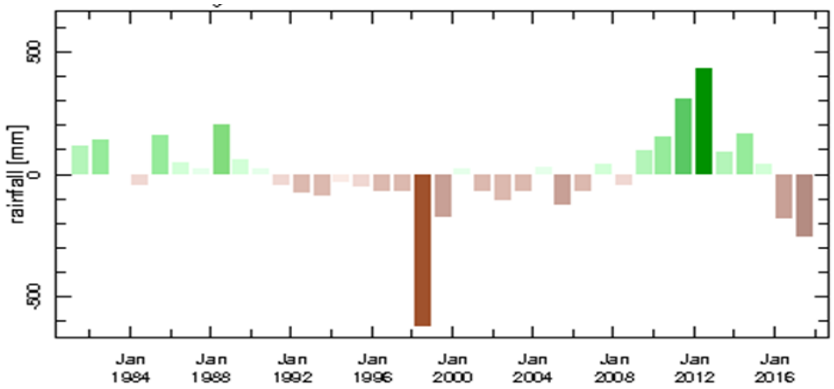


Source: World Bank Climate Data (Rwanda) and Map Room Monthly, Kirehe.

135. Both curves indicate a visible increase in annual rainfall totals. However, as in many areas of the world, the number of precipitation days decreased, meaning that periods between precipitations tended to be longer, and that precipitation events grew more abundant, or even violent. This trend is imposing additional strain on agriculture. Figure 7 provides an indirect confirmation of this pattern. From 1992 onwards, rainfall anomalies toward the drier side seem to prevail. This is consistent with a recent World Bank study.[65]

[64] As per IOE's harmonization agreement with IFAD Management, projects will be evaluated with respect to adaptation to climate change regardless of whether or not this was the focus of a project.
[65] The World Bank. High and Dry, Climate Change, Water, and the Economy, Washington DC, 2016.

Figure 7
Yearly seasonal rainfall anomalies



Source: Map Room Kirehe.

136. Considering the above, did KWAMP take the right action despite the initial low awareness of climate change issues? The evaluation considers some of the activities undertaken by KWAMP as contributing to adaptation to climate change, including responding to unpredictable rainfall patterns. For instance, *embocagement* (a hedging technique leading to better protected soils, better water retention capacity and better micro climate) was one of the significant activities of the project. In addition, provision of irrigation water led to more predictable and longer cultivation periods while at the same time providing diversified irrigated and rain-fed farming. An integrated crop and livestock production system is assisting beneficiaries to build more resilience to climate variability and climate change than more specialized agricultural systems. In addition, the introduction of biogas is intended to promote the use of renewable energy and reduce the release of harmful gases into the air.[66]

137. Thus, although climate change was not an explicit focus of the project design, several activities intended to contribute to adaptation to climate change. The only downside is that, as already mentioned under agricultural productivity, KWAMP did not generate tangible evidence on the climate change relevance of SWC practices and observed effects. The PPE gives a rating of *satisfactory* (5) to this criterion.

C. Overall project achievement

138. By concentrating its activities in one single geographic area i.e. Kirehe District, KWAMP avoided the risks associated with a large geographic spread and was able to leverage an integrated approach to agricultural development. However, by focusing on three significant thematic areas – watershed management, crop and livestock intensification and value addition – thus covering a number of activities within the limited life span of a project, the design became complex. On top of this, the implementation of this design was to be undertaken with a district administration whose capacity was untested.

139. Despite the above factors, KWAMP managed to achieve a large part of its objectives. This was largely a result of the Government's commitment in the form of a competent SPIU and IFAD's experience in the country. A participatory approach, coupled with the mechanism of working with groups, were other factors underpinning the project's achievements, in addition to strengthening human and social capital and building local grass-roots organizations. The impact on incomes and food security was positive. This was a result of increased crop production and productivity, crop diversification and the introduction of livestock production (milk) into the income-generating activities of beneficiaries. On the downside, the project was less successful in facilitating effective marketing of the surplus production of

[66] Cooking with biogas instead of firewood helps abate around five tons of CO2 per year/biogas system and due to the proper disposal of organic waste, methane (CH4) emissions are also reduced. (http://www.snv.org/update/biogas-climate-change-mitigation-adaptation-nicaragua).

crops and milk. Similarly, lack of finance was seen as an impediment especially for the beneficiaries of value addition activities supported by the project.

140. The sustainability of several project interventions such as infrastructure is expected to stay intact largely due to the Government's commitment and grass-roots organizations. KWAMP's activities related to natural resource management such as soil and water conservation are crucial in the face of climate change-induced phenomena. The evaluation rates overall project achievement as *satisfactory* (5).

D. Performance of partners

Government of Rwanda

141. The Government was the principal partner, as the borrower, and as such it participated in the project design, negotiation of the loan agreement, implementation, supervision and offering implementation support, carrying out of annual performance reviews, auditing and reporting. The Government adhered to all the loan agreements and covenants which included the provision of counterpart funding utilized to support all project components.

142. Government performance was also driven by a well-functioning SPIU which accumulated a critical mass of institutional memory that is largely absent in PIUs set up from scratch and separately for every project. The set up and implementation of project management under SPIU for all IFAD-funded projects under MINAGRI generated positive results since it provided efficiency in decision-making and space for an exchange of ideas and discussions. Routine management meetings both at district and SPIU levels provided opportunities for cross-learning and teamwork. KWAMP also profited from case studies elaborated by the project team in close collaboration with PROCASUR corporation.[67] These case studies present an overview of the approach used by PAPSTA and KWAMP for an integrated community-based management of watersheds in Rwanda.

143. The SPIU was composed of highly motivated expert staff, as also observed by the evaluation mission. The use of performance-linked contracts for the SPIU staff helped in achieving high standards (although, it is only correct that the evaluation points out that the yearly nature of the contracts also added to job insecurity with the staff). Government performance was likely also the effect of a decentralization philosophy that grew over time and indeed allowed the devolution of authority to the periphery.

144. On the other hand, the project's aim that the SPIU involve the Kirehe District administration in the management of the project faced some issues, partly due to the low capacities of the district administration and partly because service providers did not initially involve them completely while dispensing their services, leading to a feeling of lack of ownership for the project on the part of the district staff.

145. There were some missed opportunities to document facts and figures with tangible and hard evidence in relation to agriculture, business development, SWC and climate change, signifying the shortcomings of the M&E system. Another shortcoming of the M&E system was low capacity, initially, to track and document progress of achievements. However, after a weak start, the new SPIU was able to strengthen the performance of the M&E system to the desired degree, with the help of experts.

146. Overall, the performance of the Government was notable despite some issues related to M&E and low involvement of the district initially. One main reason for the Government's high level of commitment was the fact that KWAMP was supporting several of the Government's own initiatives (in Kirehe). The PPE accords a rating of *satisfactory* (5) for government performance.

[67] http://africa.procasur.org/.

IFAD

147. Part of the credit goes to IFAD for having designed a project based on previous experience that proved to be instrumental for conceptual continuity from the precursor project PAPSTA and will, in all likelihood, also inspire a successor project. IFAD, in collaboration with PROCASUR, also facilitated a joint learning route "Lessons from an integrated approach based on the community-based management of watersheds: case study of PAPSTA and KWAMP projects", which brought together development partners from other IFAD-funded projects in Africa.

148. IFAD played a significant role in supervision missions. It demonstrated substantial technical support to KWAMP through the missions that were conducted throughout the life of the project. The Aide Memoires prepared at the end of each mission provided concrete suggestions on the performance of the SPIU, as well as the project's achievements and plans for the upcoming period. For instance, the supervision missions conducted jointly by IFAD recognised the limited capacity and heavy workload of the district and advised/recommended additional manpower support. The reports of the supervision missions included succinct tabulations of recommendations for future actions within an associated time frame.

149. IFAD's implementation support was timely and requisite including the processing of withdrawal applications, no objections and constant consultations and communication with the SPIU and Government. IFAD also provided supplementary funding for the project when other co-financiers pulled out, displaying its commitment to the project.

150. The design of the project was responsive to IFAD's quality enhancement and quality assurance processes and took into account the comments and recommendations arising thereof, especially with regards to prioritizing activities (for example, the biogas intervention was pushed back to be implemented at a later period of the project).

151. However, for the same reason as in the case of government performance, the PPE concludes that IFAD could have aimed to include much more data intelligence in the form of follow-ups on-farm, or accompanying research to gather scientific evidence on the outputs; this could have been subcontracted to academia a little or no cost. In doing so, it missed the opportunity to establish more technical and scientific evidence of what the underlying reasons of its success were. IFAD could have also taken advantage of the SPIU system for donor-funded projects to collaborate with other development agencies and donors to enrich knowledge by way of exchange.

152. The above two aspects were missed opportunities, but overall, the PPE considers IFAD's performance as *satisfactory* and assigns a rating of (5).

E. Assessment of the quality of the project completion report

153. **Scope.** The PCR was a serious undertaking involving ten qualified professionals over 25 days in 2016 just before project completion. With its 145 pages, the PCR scope is comprehensive, with 12 annexes to provide evidence for the observations made. Its scope would have been increased with a dedicated bibliography. It is rated as *satisfactory* (5).

154. **Quality.** The PCR refers to available evidence and frequently refers to the IAS where applicable, especially in the impact section. The executive summary is short and to the point. The PPE rates the PCR as *satisfactory* (5).

155. **Candour.** In terms of candour, it can be said that the PCR may have been carried away, at some instances, by the enthusiasm of authors, as only ratings of 5 and 6 were given. The authors were somewhat oblivious to the fact that neither the baseline survey, nor the IAS, provided the necessary statistical basis to attribute a number of observed changed to KWAMP. It is true, however, that the IAS itself tends to attribute effects to KWAMP in cases where this is not possible on purely statistical

grounds. Considering these points, PCR candour is rated as *moderately satisfactory* (4).

156. **Lessons.** The PCR goes at great lengths to draw lessons from KWAMP. Combined with conclusions and recommendations, the lessons cover close to seven pages. Less could have been more in this regard. Still, the concluding parts to the PCR are relevant and rated as *satisfactory* (5).

IV. Conclusions and recommendations

A. Conclusions

157. **KWAMP's focus on one district alone was one of the reasons for its success although the design was somewhat ambitious for the limited project lifespan.** Having concentrated its activities in one district alone avoided the typical risks associated with a large geographic spread of a project that can lead to a scattered approach (spreading a project's resources thinly over a large area). The design aimed for a holistic approach to development, with several integrated activities targeting different needs of beneficiaries. However, this also made it susceptible to being ambitious especially in the context of the limited period of the project. Support to decentralization, watershed management in 18 watersheds, intensification of crops and livestock and value-addition are sizeable areas to focus on within the limited duration of a project, increasing the likelihood for inadvertent neglect of, or lesser focus on, some activities. A case in point is that value-added activities were less successful than desired, and the creation of adequate linkages between beneficiaries and market actors was missed.

158. **The SPIU played a key role in navigating the implementation of the design.** The highlight of the project was the SPIU that was put in place by MINAGRI to manage all IFAD-funded projects in Rwanda. The set up and implementation of project management under SPIU allowed for a smoother implementation and fostered efficiency by reducing transaction costs associated with setting up separate PIUs and subsequently dismantling them at project completion.

159. **KWAMP's support to the decentralized government structure did not accurately assess the capacity requirements of the local government.** KWAMP's design provided for support and involvement of the district administration in keeping with the spirit of strengthening decentralized government structures and institutionalising the project's activities. It can be argued though that the project did not accurately estimate the capacity of district staff and the budgetary resources. As a result, some of the staff were provided by KWAMP from its resources. Moreover, the shift over to district, sector and cell staff as well as local leaders taking over their roles in capacity-building took place post-MTR, meaning that there was little time for district teams to fully assume their roles as mentors and coaches to the IWUOs after project closure.

160. **The interventions on the supply side were tangible while the attempt for integration into complete value chains was incipient**. KWAMP's success was clearly visible on the production-side. Intensification efforts of the project led to an increase in rice and maize production, some of the traditional crops grown in Kirehe, but also diversification into higher value products such as vegetables. However, a definitive strategy for channelizing the increase in production to markets was lacking. Admittedly, feeder roads provided the opportunity to sell the marketable surplus of agricultural and livestock products and some examples of private public partnerships existed (between rice mills and farmers cooperatives). However, there was a lack of strategy for better marketing the surplus production; no clear plan was in place to facilitate linking traders and processors, to ensure sustained and transparent relations between farmers and processors and traders, and to enable better prices for beneficiaries.

161. **The lack of direct involvement of the project in facilitating finance for its beneficiaries was a missed opportunity.** As stated in the project design report, only three per cent of farmers had access to adequate financial services and agricultural credit with the microfinance institutions remaining cautious, and access to financial resources for the rural poor was very limited. Notwithstanding that, in order to reduce project complexity, the design was modified to remove provision of rural finance as one of the interventions. Financing from financial institutions was to be elicited by beneficiaries through presenting business plans; assistance in preparing these plans was provided by the project. Some beneficiaries were able to

avail credit, but in the absence of guarantee mechanisms and risk mitigation instruments, the risky nature of farming deterred many financial institutions from providing finance to beneficiaries.

162. **Dedicated budget and support services are needed on the part of the district to ensure that the sustainability of many KWAMP activities which pivots on the district does not exceed its capacity to deliver and place demands on its budget.** Several interventions of KWAMP such as CCIs, WUAs and road maintenance were designed with the expectation that their sustainability would be ensured through the involvement, and in several cases, ownership of the district administration. However, while certain expenditure to be incurred on KWAMP-led activities has been mainstreamed in the district's budget (such as road maintenance), a definitive strategy on securing the resources required for the sustainability of other activities such as the provision of veterinary services and possible refresher courses for WUAs in supporting operation and maintenance costs of irrigation infrastructure, is needed.

B. Recommendations

163. **Recommendation 1: Aim for a programmatic approach in area development projects.** Area development projects involve a simultaneous, coordinated and comprehensive approach to rural poverty alleviation in a particular area. These projects are characterized by a vast range of interventions that are inter-related in nature and involve building the capacities of various actors. A greater use of programmatic approach, covering a longer time frame than the typical five to seven-year project, should be encouraged to not only implement integrated development interventions but also to fully exploit the complementarities and synergies between them. The complexity of such programmatic interventions should be commensurate with the installed capacity and institutional maturity of the target population and participating implementation partners.

164. **Recommendation 2: Aim for a better balance between the capacities and resources of fledgling institutions, their level of involvement and the concomitant responsibilities**. The empowerment of decentralized district structures and grass-roots organizations by supporting them in assuming responsibility for project activities should be based on a realistic assessment of their initial capacities and their resources. Accordingly, the level of responsibility that they can shoulder should be made proportionate to these aspects. Additionally, their engagement in activities they are responsible for should be timely and tangible. For instance, the capacities of beneficiaries should be built before creating the infrastructure in order to ensure their effective and meaningful participation in its development. If needed, project complexity should be reduced to a degree commensurate with the institutional maturity.

165. **Recommendation 3: Systemize knowledge generated in a single or centralised project management unit for future projects**. Unlike project management units that are formed for the exclusive purpose of a single project and are disbanded at project closure, an SPIU or a centralised project management unit has a longer lifespan. Besides leveraging the advantages of the SPIUs, namely, better efficiency and stronger effectiveness, their true potential should be realised in using them as fountainheads of knowledge. They should be able to generate and document knowledge accumulated in the course of implementing the projects, which can then be used to more effectively inform subsequent projects. In addition, where such units exist for other organizations or development partners too, as in the case of Rwanda, cross-fertilization of ideas and experiences among the SPIUs should be strongly encouraged by IFAD, in the spirit of both fostering partnership and designing more effective interventions.

166. **Recommendation 4: Ensure that the value chain development is truly demand-oriented when integrating value chain components in principally supply-side projects.** If value chain components are built in projects that invest

heavily on the supply side, such as irrigation and natural resource or watershed management, care should be taken that VCD is truly demand-side oriented. This can be done by involving downstream actors of a value chain such as traders, processors or small and medium enterprises. Without the pro-active involvement of downstream actors, value may be added, but not along an entire chain.

Basic project data

				Approval (US m)		*Actual (US m)*	
Region	ESA		Total project costs	49.33		55.2	
Country	Rwanda		IFAD loan and percentage of total	26.77	54.2%	41.31	74.6%
Loan number	DSF-8020-RW		Borrower	9.5	19.4%	7.02	12.7%
Type of project (subsector)	Agricultural development		Cofinancier (WFP, DED)	8.64	17.5%	0.088	0.16%
Financing type	DSF		Beneficiaries	3.12	6.3%	4.51	8.2%
Lending terms*	Grant and loan (HC)		Other sources:	1.25	2.5%	2.73	4.3%
Date of approval	September 2008		--	--	--	--	--
Date of loan signature	November 4, 2008		--	--	--	--	--
Date of effectiveness	April 30, 2009		--	--	--	--	--
Loan amendments	n.a.		Number of beneficiaries: (if appropriate, specify if direct or indirect)	48,000 households			
Loan closure extensions	n.a.		Loan closing date	December 31, 2016		December 31, 2016	
Country programme managers	Claus Reiner; Francisco Pichon		--	--		--	
Regional director(s)	Sara Mbago-Bhunu		Mid-term review			December 10-21, 2012	
Lead evaluator for project performance evaluation	--		IFAD loan disbursement at project completion (%)			99.7%	
Project performance evaluation quality control panel	--		Date of project completion report			November 2016	

Source: IFAD Grants and Investment Projects System; IFAD Flexcube system; PCR.

Definition and rating of the evaluation criteria used by IOE

Criteria	*Definition* *	*Mandatory*	*To be rated*
Rural poverty impact	Impact is defined as the changes that have occurred or are expected to occur in the lives of the rural poor (whether positive or negative, direct or indirect, intended or unintended) as a result of development interventions. *Four impact domains* • Household income and net assets: Household income provides a means of assessing the flow of economic benefits accruing to an individual or group, whereas assets relate to a stock of accumulated items of economic value. The analysis must include an assessment of trends in equality over time. • Human and social capital and empowerment: Human and social capital and empowerment include an assessment of the changes that have occurred in the empowerment of individuals, the quality of grass-roots organizations and institutions, the poor's individual and collective capacity, and in particular, the extent to which specific groups such as youth are included or excluded from the development process. • Food security and agricultural productivity: Changes in food security relate to availability, stability, affordability and access to food and stability of access, whereas changes in agricultural productivity are measured in terms of yields; nutrition relates to the nutritional value of food and child malnutrition. • Institutions and policies: The criterion relating to institutions and policies is designed to assess changes in the quality and performance of institutions, policies and the regulatory framework that influence the lives of the poor.	X	Yes No No No
Project performance	Project performance is an average of the ratings for relevance, effectiveness, efficiency and sustainability of benefits.	X	Yes
Relevance	The extent to which the objectives of a development intervention are consistent with beneficiaries' requirements, country needs, institutional priorities and partner and donor policies. It also entails an assessment of project design and coherence in achieving its objectives. An assessment should also be made of whether objectives and design address inequality, for example, by assessing the relevance of targeting strategies adopted.	X	Yes
Effectiveness	The extent to which the development intervention's objectives were achieved, or are expected to be achieved, taking into account their relative importance.	X	Yes
Efficiency	A measure of how economically resources /inputs (funds, expertise, time,) are converted into results.	X	Yes
Sustainability of benefits	The likely continuation of net benefits from a development intervention beyond the phase of external funding support. It also includes an assessment of the likelihood that actual and anticipated results will be resilient to risks beyond the project's life.	X	Yes
Other performance criteria			
Gender equality and women's empowerment	The extent to which IFAD interventions have contributed to better gender equality and women's empowerment, for example, in terms of women's access to and ownership of assets, resources and services; participation in decision making; work load balance and impact on women's incomes, nutrition and livelihoods.	X	Yes
Innovation	The extent to which IFAD development interventions have introduced innovative approaches to rural poverty reduction.	X	Yes
Scaling up	The extent to which IFAD development interventions have been (or are likely to be) scaled up by government authorities, donor organizations, the private sector and other agencies.	X	Yes
Environment and natural resources management	The extent to which IFAD development interventions contribute to resilient livelihoods and ecosystems. The focus is on the use and management of the natural environment, including natural resources defined as raw materials used for socio-economic and cultural purposes, and ecosystems and biodiversity - with the goods and services they provide.	X	Yes

Adaptation to climate change	*The contribution of the project to reducing the negative impacts of climate change through dedicated adaptation or risk reduction measures.*	*X*	*Yes*

Criteria	*Definition* *	*Mandatory*	*To be rated*
Overall project achievement	This provides an overarching assessment of the intervention, drawing upon the analysis and ratings for rural poverty impact, relevance, effectiveness, efficiency, sustainability of benefits, gender equality and women's empowerment, innovation, scaling up, as well as environment and natural resources management, and adaptation to climate change.	X	Yes
Performance of partners			
• IFAD	This criterion assesses the contribution of partners to project design, execution, monitoring and reporting, supervision and implementation support, and evaluation. The performance of each partner will be assessed on an individual basis with a view to the partner's expected role and responsibility in the project life cycle.	X	Yes
• Government		X	Yes

* These definitions build on the Organisation for Economic Co-operation and Development/Development Assistance Committee (OECD/DAC) Glossary of Key Terms in Evaluation and Results-Based Management; the Methodological Framework for Project Evaluation agreed with the Evaluation Committee in September 2003; the first edition of the Evaluation Manual discussed with the Evaluation Committee in December 2008; and further discussions with the Evaluation Committee in November 2010 on IOE's evaluation criteria and key questions.

Rating comparison[a]

Criteria	*Programme Management Department (PMD) rating*	*Project Performance Evaluation rating*	*Rating disconnect*
Rural poverty impact	5	5	0
Project performance			
Relevance	5	4	-1
Effectiveness	5	5	0
Efficiency	6	5	-1
Sustainability of benefits	5	5	0
Project performance[b]	**5.25**	**5**	**-0.25**
Other performance criteria			
Gender equality and women's empowerment	6	5	-1
Innovation	6	5	-1
Scaling up	5	5	0
Environment and natural resources management	5	5	0
Adaptation to climate change	5	5	0
Overall project achievement[c]	**5**	**5**	**0**
Performance of partners[d]			
IFAD	6	5	-1
Government	6	5	-1
Average net disconnect			**-6/12 = -0.5**

[a] Rating scale: 1 = highly unsatisfactory; 2 = unsatisfactory; 3 = moderately unsatisfactory; 4 = moderately satisfactory; 5 = satisfactory; 6 = highly satisfactory; n.p. = not provided; n.a. = not applicable.
[b] Arithmetic average of ratings for relevance, effectiveness, efficiency and sustainability of benefits.
[c] This is not an average of ratings of individual evaluation criteria but an overarching assessment of the project, drawing upon the rating for relevance, effectiveness, efficiency, sustainability of benefits, rural poverty impact, gender, innovation, scaling up, environment and natural resources management, and adaptation to climate change.
d The rating for partners' performance is not a component of the overall project achievement rating.

Ratings of the Project Completion Report quality

	PMD rating	*IOE rating*	*Net disconnect*
Scope	n.a.	5	n.a.
Quality (methods, data, participatory process)	n.a.	5	n.a.
Lessons	n.a.	5	n.a.
Candour	n.a.	4	n.a.
Overall rating of the Project Completion Report	n.a.	5	n.a.

Rating scale: 1 = highly unsatisfactory; 2 = unsatisfactory; 3 = moderately unsatisfactory; 4 = moderately satisfactory; 5 = satisfactory; 6 = highly satisfactory; n.a. = not applicable.

Approach paper

I. Introduction

1. The Independent Office of Evaluation (IOE) of the IFAD will undertake a project performance evaluation (PPE) of the IFAD-financed Kirehe Community-based Watershed Management Project (KWAMP) in Rwanda. The main objectives of the PPE are to: (i) provide an independent assessment of the results achieved by the project; (ii) based on this, generate findings and recommendations for the design and implementation of ongoing and future operations in the country; and (iii) identify issues of corpo**r**ate, operational or strategic interest that merit further evaluative work.

2. This approach paper is the point of departure in the preparation of the PPE. It presents the overall scope and design of the PPE. Further, it outlines the evaluation objectives, methodology, process and timeframe of the PPE. Finally, the project's theory of change, as prepared by the evaluation team for this project, is presented.

II. Overview of the project

3. **National context.** According to the UN Rwanda's Annual Report,[1] over the last 26 years, Rwanda's Human Development Index (HDI) has increased by over 103 per cent from 0.244 to 0.498 and life expectancy has increased by 31.3 years to 64.5 years. This has improved Rwanda's HDI ranking to 159 out of 188 countries globally and 27th in Africa. The improvement in HDI is attributed to several factors, one of which is the concerted efforts to eliminate gender inequality. The country's economic performance has remained strong, with a GDP growth rate in 2016 of 5.9 per cent dominated by the service sector (3.3 per cent) closely followed by industry (1.2 per cent) and agriculture (1.1). The Report states that despite efforts to diversify the economy though, Rwanda remains an economy heavily dependent on agriculture in terms of employment opportunities and export revenues. Notwithstanding the sectors difficulties, an emerging large-scaled agro-processing sector is beginning to evolve in Rwanda.

4. Rwanda's demographic profile is characterised by rapid population growth, youthful age structure, and rapidly growing urban population. Population had doubled from 4.8 million people in 1978 to 10.5 million in 2012. Population stands at 421 persons per square kilometre, the 2nd highest in Africa. This bulge continues to pose huge economic and environmental constraints on the country. The population is heavily youthful with 40.1 per cent being under age 15, 20 per cent between 15 and 24 and 68.7 per cent below age 30.

5. A high economic growth rate combined with stabilizing population growth has contributed to poverty reduction. From 2005-06, the poverty headcount ratio declined from 56.7 per cent to 39.1 per cent in 2013-14. Although poverty declined more in rural areas than in urban areas, the poverty rate stands at 43.8 per cent in rural areas, as compared to an average of 15.7 per cent in urban areas. The contributing factors are a combination of improved agricultural incomes, off-farm job creation, reduction in household sizes, and public and private transfers.[2]

6. Rwanda has emerged as a regional and global leader in advancing gender equality. The Mo Ibrahim Index 2016, with a score of 90.3 per cent, ranks Rwanda 1st in Africa in terms of absence of gender discrimination. The 2016 Global Gender Gap Report of the World Economic Forum (WEF) ranks Rwanda 5th in the world and 1st in Africa.

7. The UN Rwanda report remarks that despite the progress registered in innovation to promote climate change resilience, there is still limited awareness and understanding of environmental and climate change issues. Rural households, especially the most vulnerable and those that rely solely on subsistence agriculture continue to be worst affected by climate related impacts such as floods, landslides and droughts, indicating

[1] United Nations Rwanda, Delivering as One Annual Report 2016 – 2017.
[2] Rwanda Poverty Profile Report 2013/14, Results from the Integrated Household Living Conditions Survey (EICV 4), National Institute of Statistics of Rwanda.

the need for scaling-up of the climate resilience projects implemented and underdevelopment in Rwanda.

8. **Project goal and objectives.** KWAMP aimed to promote the market-oriented intensification of agricultural systems built on sound environmental practices in order to assist very poor smallholders to overcome their food insecurity and low agricultural incomes, to arrest land degradation and to restore soil fertility. The **goal** of KWAMP was to reduce rural poverty in Kirehe District, primarily through an improvement in household food and nutrition security, asset ownership and quality of life indicators, particularly amongst vulnerable groups including women-headed households, orphans and those living with HIV/AIDS. Given little prospect for agricultural expansion in Rwanda, agricultural growth and poverty reduction will continue to depend on intensification (mainly though increases in yields) and crop diversification.

9. Thus the immediate **objectives** of the project converged on the development of sustainable profitable small-scale commercial agriculture in Kirehe District. The project was intended to result in:

- an increased level of marketed production of crops and livestock products, leading to increases in incomes derived from gains in productivity, farming efficiency and cash returns to effort;
- the operation and maintenance of affordable irrigation facilities made available to a large proportion of the active poor and landless farmers in the district, reducing dependence on increasingly erratic rains and permitting a shift to higher value crops in response to market demand; and
- a steady improvement in the natural resource base in selected watersheds to enable production in the future, reversing the present negative trends of soil erosion and nutrient depletion coupled with failure to put available water to productive use.

10. **Project area.** In line with Government's requests and the recommendations of the IFAD COSOP (2008-2012), the project concentrated its activities in Kirehe District in Eastern Province. The selection of the district was based on the grounds of poverty, high population density, a languishing agricultural sector and a physical environment under stress. Kirehe comprises 55,000 households, of which the overwhelming majority are rural. Just over 86 per cent of households own less than 1 ha of land; 46 per cent own less than 0.5 ha and nearly 13 per cent own no land at all. Some 70-90 per cent of households face periods of food shortages every year.

11. **Project target.** The total number of households in the project target group was around 48,000 corresponding to a total population of about 253,000 people and 87 per cent of the district's population, based on an average of 5.3 persons per household. The project categorised the target audience into three profiles:

i. Farmers with lands of less than 1 ha constituted the primary target group. They may have had access to reclaimed land and irrigation, and benefited from the distribution of livestock and forage trees and from soil and water conservation (SWC) activities. These farmers represented 40,900 heads of household or 74 per cent of all farmers, of which 27.8 per cent are women.

ii. The second category was made up of around 7,000 households (13 per cent of all households) of landless farmers who rented land from others. They were eligible for marshland distribution, not exceeding 0.1 ha. In addition, the project targeted the landless households with agricultural activities that needed no or little land for their development, such as small stock. Adults in this group benefited from employment opportunities generated through WFP-funded food-for-work activities and other possibilities related to the improvement of infrastructure.

iii. The third category to benefit from the same type of activities as the landless included unmarried young people and destitute women. This group was accorded priority in terms of employment opportunities generated by the project.

12. **Project components.** The project had four components:

i. **local institutional development** (14 per cent of project base costs) to increase the capacity of government and community institutions to support a rapid and sustained increase in profitable smallholder agriculture in the district and to ensure effective water and land use management;

ii. **agricultural intensification** (64 per cent), providing the market-led investments in value chain development, crop and livestock intensification, irrigation development and soil and water conservation required to transform agriculture into a business for smallholders;

iii. **feeder roads** (17 per cent) to provide a fully functional road network to allow trade to pick up in both agricultural inputs and produce;

iv. **project coordination** (5 per cent), which was to be undertaken by the then existing unit that managed the IFAD-supported project, the Support Project for the Strategic Plan for the Transformation of Agriculture (PAPSTA).[3]

13. **Project costs and financing.** At design, the KWAMP financing package was estimated at US$49.3 million. IFAD was to provide two grants: an initial one of US$20.4 million and a second one of US$6.3 million. WFP contribution (US$8.1 million) was to finance food-for-work activities under the soil and water conservation sub-component. In addition, the German Development Service (DED) would finance US$0.52 million, in kind for technical assistance to support farmer organization capacity building. The Government and the beneficiary contribution were estimated at US$9.54 million (19.4 per cent) and US$3.12 million (6.3 per cent) respectively. The private sector partners were to provide US$1.25 through participation in value chain development activities. The financial pledges at design and at closure are shown in table 1 below.

Table 1
Source of funds committed at appraisal and at closure, and actual disbursements

Source of funds	*Commitment at appraisal (000 USD)*	*Commitment at closure (000 USD)*	*Amount disbursed (000 USD)*	*Disbursement (%)*
1) Grants				
IFAD (8020)	20,004	20,004	20,004	100.00
IFAD (8054)	6,183	6,183	6,183	100.00
IFAD (8116)	-	7,594	7,571	99.71
WFP	8,130	88	88	100.00
DED	511	-	-	-
2) Loan				
IFAD 897	-	7,594	7,571	99.71
3) Other counterpart funds				
Government	9,544	7,017	7,017	100.00
Beneficiaries	3,123	4,514	4,514	100.00
Private Sector	1,250	2,735	2,241	81.95
Total	48,745	55,728	55,190	99.03

Source: IFAD Flexcube; IFAD Grants and Investment Projects System.

14. During project implementation, DED withdrew from financing the project while WFP's contribution was reduced from US$8.123 million to US$88,000. However, during the

[3] PAPSTA became effective on 31 March 2006 and closed on 30 September 2013.

same period, there was supplementary funding from IFAD in the form of grants and a loan. Thus, withdrawals of DED and WFP from the project did not have a significant effect on the budget of the project due to an increase in the IFAD participation and additional contributions from the beneficiaries and the private sector. At closure, the contributions of partners were as follows: IFAD grants US$ 33.78; IFAD loan US$ 7.59 million; WFP US$ 0.088 million, GOR US$ 7.017 million, beneficiaries US$ 4.514 million and the private sector US$ 2.735 million, all totalling US$ 55.77 million. The project financing by component is shown in Table 2.

Table 2
Project financing by component (US$'000)

Component	*Design*	*Actual*	*% (actual)*
Component 1: Local institutional development	6,468	4,323	7.8
Component 2: Agricultural intensification	29,350	42,119	76.3
Component 3: Feed roads	7,407	4,295	7.8
Component 4: Programme management (incl. contingencies)	6,103	4,490	8.1
Total	49,328	55,190	100

Source: IFAD Flexcube; IFAD Grants and Investment Projects System.

15. **Time frame.** The project was approved by IFAD's Executive Board in September 2008. The IFAD loan agreement was signed in November 2008 and became effective in April 2009. As initially scheduled, the project was completed on June 30, 2016, after 7 years of implementation, and closed in December of the same year.

16. **Implementation arrangements.** At design, KWAMP was implemented through the Ministry of Agriculture and Animal Resources (MINAGRI), which had the overall responsibility for project implementation. In order to delivery extension services to farmers, MINAGRI worked with three parastatals namely: the Rwanda Authority for the Development of Agriculture for agriculture, the Rwanda Animal Resources Development Authority for livestock, and the Rwanda Horticulture Development Authority for horticulture. KWAMP collaboration with Rwanda Environmental Authority (REMA) was productive and REMA was engaged by the Project in validation of environmental impact assessments for irrigation development and for the watershed management plans. REMA also provided authorization for supply and installation of flexi-biogas in Kirehe District. In addition, KWAMP worked closely with Ministry of Natural Resources and was involved in the capacity building of hydrographic committee members.

17. The day-to-day management of KWAMP was delegated by MINAGRI to a Project Coordination Unit (PCU). In Kirehe District, within the decentralization process, the District of Kirehe was the main executing agency of KWAMP, being the institution responsible for consultation, including local participatory planning and monitoring and evaluation (M&E), as well as the implementation of the feeder roads component. Project activities and priority sectors were aligned to the district development plan.

18. The project worked closely with district staff to build up their individual and corporate capacities. A district steering committee chaired by the mayor and made up of members representing the farmers, farmer organizations and local institutions from the public and private sectors' participating in the project was put in place. It was responsible for the technical oversight of the implementation of the Annual Work Plan and Budget (AWPB) and the project's integration into the district structure.

19. The project also worked with farmer organizations, which were organized by commodities and national and international NGOs which brought local experience on community development and technical matters. These NGOs were used as service providers for technical support and advisory services to producers. A watershed management committee (CLGS) was also set up for each selected watershed. These CLGSs worked closely with sector development committees and with FOs and various other associations. They were responsible for the implementation of work plans,

quality control related to contracted services, and the use of allocated resources. They were the primary decision-makers, as long as their decisions did not conflict with the basic principles, approach and modalities of the project or the district and sector priorities, as set out in the district development plan. In the post-MTR period, a single project implementation unit of IFAD funded projects (SPIU) was put in place by the parent ministry (MINAGRI) to manage all IFAD funded projects in Rwanda.

20. **Significant changes during project implementation.** During project implementation, a number of changes to the original design were made which had implications on the project outcomes.

21. *Value Chain Development*. The general objective of this subcomponent was to increase incomes and food security of smallholder households through intensification and value addition of their on-farm production for six selected commodities. However, at MTR, the project supported three commodities: maize, rice and milk. This change was done in response to these value chains having demonstrated potential.

22. *Livestock Development*. In the post-MTR period the project introduced a new strategy for livestock distribution through communal cow sheds. This new model served as farmer field school to improve disease control, nutrition and reproduction for livestock in the district.

23. *Hilltop reforestation initiative*. The hilltop reforestation initiative was not part of the original project design. This was included in 2009 following recommendations of the IFAD supervision mission, to address dramatic deforestation that happened due to rapid expansion of agricultural intensification activities in the district.

24. *Irrigation development*. The design proposal was to implement hillside schemes consisting of "mini-dams, ponds or cisterns that would provide irrigation water for commands of up to approximately 60 ha". Instead, based on the findings of a hydrogeological study carried out on behalf of the Government it was recommended during project implementation to construct four relatively bigger dams with command areas ranging from 130ha to 441ha. It turned out that the initial report overestimated the available runoff in the Mahama catchment (Mahama dam, which was not serviced by a permanent spring was to be filled up solely from runoff). However, the expected runoff did not materialize.

III. Evaluation objectives and scope

25. **The objectives of the PPE** are to: (i) assess the results of the project using the standard evaluation criteria; (ii) generate findings and recommendations for the design and implementation of ongoing and future operations in Rwanda; and (iii) by virtue of the assessment, identify issues that require further evaluative work related to the corporate and/or strategic domains.

26. The **scope** of the PPE has been identified based on the following criteria: (i) areas identified through a desk review – the PPE will review additional evidence and propose a complete list of consolidated ratings; (ii) selected issues of strategic importance for IFAD in Rwanda; and (iii) limitations set by the available time and budget – the PPE will be selective in focussing on key issues where value can be added, given the limited time and budget.

27. Analysis in the PPE will be assisted by the theory of change (TOC) (see Annex 2). The TOC shows the causal pathway from project outputs to project impacts and the changes that should take place in the intermediary stage i.e. between project outcomes and impact. External factors which influence change along the major impact pathways i.e. assumptions on which the project has no control are also taken into account. The TOC is reconstructed in that any deviation from the project design, in terms of objectives and/or activities that may have occurred during the course of project implementation are taken into account. These changes were identified on the basis of a desk review. It is likely that the TOC will be modified after consultations with project stakeholders during the country visit.

28. The PPE exercise will be undertaken in accordance with IFAD's Evaluation Policy[4] and the IFAD Evaluation Manual (second edition, 2015). The PPE will evaluate the project performance with regard to of the standard evaluation criteria. These criteria are detailed in annex 1.

IV. Key issues for this PPE

29. **Project design.** The project was essentially designed as a community-based watershed management and hence encompassed elements of natural resource management. However, the orientation of the project appears to be value chain: production-enhancement, upstream and downstream activities (storage, grading, agro-processing and input market), and market-related infrastructure (collection centres and feeder roads) with a vast majority of project funding going to these activities. The implicit focus on the value chain approach is also lodged in the goal of the project which was to reduce rural poverty through raising incomes from agricultural intensification resulting in increased marketed production of crops and livestock products. The PPE will examine how these twin thrusts played out in the end and whether the project was successful in attaining both. Further, since the project was composed of several diverse interventions with a myriad of agencies involved, the PPE would like to understand: (i) to what extent the multiple integrated activities may have affected, positively and negatively, project performance; and (ii) if the project managed to keep the necessary synergies between components and activities. Finally, the role of private sector in the project, which is the key for sustaining marketing linkages, will also be explored.

30. **Environmental effect.** In a country like Rwanda which is among the 22 countries most seriously affected by soil degradation,[4] agricultural intensification undertaken under KWAMP, could have further exacerbate the fragile top soil, eventually leading to loss in soil fertility. The project aimed to arrest soil erosion through some of its activities. The PPE will assess whether the natural resource management measures were sufficiently effective. The PPE will explore a variety of methods where possible, as outlined in paragraphs 42 and 43, to assess the issue of soil erosion and fertility.

31. **Capacity building activities**. The project undertook a number of capacity building activities that touched several groups such as farmer cooperatives, water user associations, road brigades (feeder roads), etc. The need to strengthen the capacity of cooperatives was critical since these are central to the ultimate success of all investments in increasing productivity in either crops or livestock. The PPE will investigate the effectiveness of the services delivered, in terms of their usefulness and ease of understanding and applicability by beneficiaries (and also the capacity of service providers).

32. **Hydrographic basin committees** (CLGS previously). These were created and tasked to oversee the activities related to the management of each watershed under KWAMP Project. They were responsible for the development and implementation of annual work plan and budget, quality control related to contracted services, and the use of allocated resources. They were the cornerstones of the integrated approach of the project. The PPE will examine how effective were these important committees in dispensing their various responsibilities, including in operationalising watershed management plans and coordinating the different stakeholders.

33. **Sustainability.** The PPE will assess the capacity of community based organizations such as the hydrographic basin committees, irrigation water user associations, and cooperatives to operate independently and to generate enough income to ensure their self-sufficiency and sustainability. Further, sustainability of the project will depend on several institutions together creating an enabling environment and responding to local demand: MINALOC, MINAGRI, RCA, decentralized government as well as community based organizations and other economic actors with which agricultural cooperatives must establish vertical and horizontal linkages. The PPE will assess whether or not, and to what extent, the respective institutional actors were aligned with the objective of

[4] Karamage, Fidele et al (2016). "Extent of Cropland and Related Soil Erosion Risk in Rwanda." *Sustainability* 8, no. 7: 609.

strengthening farmer organizations and cooperatives as these were central to the success of all investments in increasing productivity in either crops or livestock.

34. **Context of political devolution**. In the current context of decentralization with the overall devolution of political powers to district, sector and cell levels that encompasses the agricultural sector and natural resource management, the sustainability of project impact will depend on several institutions together creating an enabling environment in the territory and responding to local demand (MINALOC, MINAGRI, RCA, decentralized government as well as community based organizations and other economic actors with which agricultural cooperatives must establish vertical and horizontal linkages). The PPE will examine the role of KWAMP in the roll-out of the devolution and how the institutional actors are aligned to the objective of strengthening farmer organizations in an integral, coordinated fashion.

35. **Rural finance.** Easy availability of rural finance in the desired form is an important aspect in the development of value chains. The project did not include rural credit under the assumption that commercial banks in Rwanda are interested in financing private enterprises. Farmers also borrow from input loans from their cooperatives. The PPE will appraise: a) whether credit was an important need of KWAMP beneficiaries; (b) the sources from which project beneficiaries borrowed; and (c) whether and how effective was this.

V. Analytical framework and methodology

36. **Information and data collection**. The first phase of the PPE is the desk review which will cover a variety of project-related documents, including annual project status reports (along with project supervision ratings), midterm reviews (MTR), supervision reports, and the PCR prepared at the end of a project jointly with the Government, which also includes a set of ratings. The Results and Impact Management System (RIMS) includes a menu of indicators used to measure and report on the performance of IFAD projects – at activity, output and impact level – and these are used for effectiveness and impact criteria. In this regard, M&E data will be important. M&E data are also needed to plan the mission's visits to project areas, for instance, data on what kind of activities were carried out in different areas, and what the results were. The PPE will make use of the baseline and the endline surveys conducted by the project.

37. The PPE will crosscheck findings from the PCR and triangulate data and information from different sources; in order to obtain further information, interviews will be conducted both at IFAD headquarters and in the country. During the in-country work, additional primary and secondary data will be collected in order to reach an independent assessment of performance and results. Data collection methods will mostly include qualitative techniques. The methods deployed will consist of individual and group interviews with project stakeholders, beneficiaries and other key informants and resource persons, and direct observations.

38. The theory of change annexed in this paper has highlighted assumptions that would have been crucial to attaining the desired outputs and outcomes. The PPE will investigate whether these assumptions held, and if not, then what were the impeding factors. This will help the evaluation answer the ''why'' underpinning the results.

39. **Sampling**. If the budget and time permit, the mission will attempt to visit at least half of the 18 total watershed areas in order to present meaningful and confident findings. Within the sampled watershed areas, the PPE will attempt to cover the gamut of project stakeholders – farmer groups, local management and supervision committees (CLGSs), community centres for innovation (CCIs), and water users associations and road brigades. An informed decision on areas to be visited will be taken based on: the team's logistical exigencies, the number of beneficiaries in each area (preference to areas with more beneficiaries) and the need to cover a diverse range of stakeholders.

40. **Rating system**. In line with the practice adopted in many other international financial institutions and UN organizations, IOE uses a six-point rating system to score the

project performance on a set of standard criteria[5], where 6 is the highest score (''highly satisfactory'') and 1 is the lowest (''highly unsatisfactory'').

41. **Stakeholders' participation.** In compliance with the IOE Evaluation Policy, the main project stakeholders will be involved throughout the PPE. This will ensure that the key concerns of the stakeholders are taken into account, that the evaluators fully understand the context in which the project was implemented, and that opportunities and constraints faced by the implementing institutions are identified. Regular interaction and communication will be established with IFAD and the Government. Formal and informal opportunities will be explored during the process for the purpose of discussing findings, lessons and recommendations.

42. **Remote sensing and other data-gathering methods.** The PPE will also explore the use of geo-spatial analysis based on satellite imagery to ascertain before-after results of some of the project interventions such as irrigation development (some 1819 ha of irrigation was developed - 701 ha of marshland and four hillside irrigation schemes covering about 1,118 ha of hillside - and reforestation on 323 ha of land was undertaken). The geo-spatial analysis will conduct a time-series trend analysis of the intervention areas using the Normalised Difference Vegetation Index (NDVI).

43. Based on their feasibility, remote sensing techniques will also be applied to predict changes in soil fertility in project intervention areas over the project life span. One option to explore will be to spatially predict the soil organic matter content making use of soil spectral reflectance. As a way of ground-truthing, the spatial-based approach will be complemented by a perception-based approach to soil fertility changes. This will be done through the preparation and analysis of drawings by the project beneficiaries themselves with a "before-after representation" of criteria for assessing fertility entirely chosen by the beneficiaries.[6]

VI. Process and timeline

44. Following a desk review of the PCR and other project key project documents, the PPE will undertake following steps:

- **Country work.** The PPE mission is scheduled for 16-26 April 2018. It will interact with representatives from the Government and other institutions, beneficiaries and key informants, in Kigali and in the field. At the end of the mission, a wrap-up meeting will be held in Kigali to summarize the preliminary findings and discuss key strategic and operational issues. The IFAD country programme manager for Rwanda is expected to participate in the wrap- up meeting.
- **Report drafting and peer review.** After the field visit, a draft PPE report will be prepared and submitted to IOE internal peer review for quality assurance.
- **Comments by regional division and the Government.** The draft PPE report will be shared simultaneously with the East and Southern Division (ESA) and the Government of Rwanda for review and comments. IOE will finalize the report following receipt of comments by ESA and the Government and prepare the audit trail.
- **IFAD Management response.** A written management response on the final PPE report will be prepared by the Programme Management Department. This will be included in the PPE report, when published.
- **Communication and dissemination.** The final report will be disseminated among key stakeholders and the evaluation report published by IOE, both online and in print.

[5] These include: relevance, effectiveness, efficiency, rural poverty impact, women's empowerment and gender equality, sustainability, innovation, scaling up, environment and natural resource management, adaptation to climate change, IFAD and government performance and overall project performance.
[6] If the remote-sensing approach is not found to be feasible, only the perception-based assessment will be attempted.

Tentative timetable for the PPE process

Date	*Activities*
January-February 2018	Desk review and preparation of approach paper
16 – 26 April 2018	Mission to Rwanda (tentative dates)
May 2018	Preparation of draft PPE report
2nd week of June 2018	Report sent for IOE internal peer review
4th week of June 2018	Draft PPE report sent to ESA and Government for comments
2nd week of July 2018	Comments received from ESA and Government
End July 2018	Final report and audit trail sent for IFAD management response
September 2018	Publication and dissemination

VII. Evaluation team

45. The team will consist of Hansdeep Khaira, IOE Evaluation Officer and lead evaluator for this PPE, and Ernst Schaltegger, IOE senior consultant, and a local consultant experienced in natural resource management (to be hired). Mr. Schaltegger will prepare the draft evaluation report, with the overall responsibility for the execution and quality of the evaluation resting with Mr. Khaira. Shaun Ryan, IOE Evaluation Assistant, will provide administrative support.

VIII. Background documents

46. The key background documents for the exercise will include the following:

Project specific documents

IFAD President's Report (2008)

Design Report (2008)

Medium Term Report (2013)

Supervision Mission Aide Memoire and Reports (2008-2015)

Project completion report (2016)

General and others

IFAD (2011). IFAD Evaluation Policy.

IOE (2012). Guidelines for the Project Completion Report Validation and Project Performance Assessment.

IFAD (2015). Evaluation Manual – Second Edition.

Various IFAD Policies and Strategies, in particular, Strategic Framework (2002-2006), Rural Finance, Rural Enterprise, Targeting, Gender Equity and Women's Empowerment.

List of key people met

Government

Kirehe District staff

Gerald Muzungu, Mayor
Jean Damascene Nsengiyumva, Vice Mayor - Economic affairs
Janvier Nsengiyumva, Director of Agriculture, Livestock and Natural Resources
Daniel Nkurunziza, District Start-up Development Officer
Nathalie Niyonagira, Animal Resources Officer
Monique Buteto, District Irrigation Officer
Jean Nsabimana, District Land Survey and Geographic Information System
Leon Nyiribakwe, Electricity Engineer
Danny Mberamurora, Infrastructure Engineer
Fidele B. Gatore, Cooperative Officer
Mathieu Fashingabo, Cash Crop Officer
Jean Claude Kabalisa, Agronomist Officer
Vital M. Kalinda, Forestry and Natural Resources Officer
Casimir Kaberuka, MIS / One Stop Centre
Cyprien Ntawuhongerumwanzi, Road Engineer
Desire Nsabimana, Investment and Financial Services Officer

Ministry of Agriculture and Animal resources

Jean Claude Kayisinga, Permanent Secretary

Mushikiri Sector Office

Ananie Gatsinzi, Executive Secretary
Dieudone Mudaharana, Agronomist
Claire Umubyeyi, Land manager
Joel Mukeshimana, Veterinary
Tharcille Kayitesi, Cooperatives Officer
Jonas Rwambibi, Executive Secretary
Elie Rudasingwa, Agronomist

Rwanda Agriculture and Animal Resources Development Board

Patrick Karangwa, Ag. Director General

Rwanda Cooperative Agency

Joseph Nzakunda, Ag. Director General

Rwanda Environmental Management Authority

Remy Norbert Duhuze, Director of Environmental regulation and Pollution Control

International and donor institutions

Heifer International

Elisee Kamanzi, Interim Country Director
Seraphine Umurerwa, Team Leader

IFAD

Francisco Pichon, IFAD Representative and Country Director
Aimable Ntukanyagwe, Country Programme Officer
Patrizia D'amico, Programme Assistant

Beneficiaries

Cooperative des agriculteurs des cereales de Musaza

Isaie Hakizimana, President
Innocent Nzamwita, Cooperative Support officer
Festo Nzamwita, Member
Eugene Rwambonera, Member
Donath Kalisa, Member
Emmanuel Harindintwali, Member
Turatimana, Member
Vincent Habumuremyi, Member
Isaie Habakurama, Member
Samuel Uzayisenga, Member
Abdou Ndamage, Member
Ntezimana, Member
Edouard Rutabagisha, Member
Cyprien Munyakazi, Member
Munyazikwiye, Member
Lahabie Twagirayesu, Member

COOPRIKI Cyunuzi

Felix Habyarimana, President
Jeanine Umuhoza, Member
Furaha Niringiyimana, Vice President
Jeanne D'Arc Nkejuwimye, Secretary
Aphrodis Karambizi, Member
Patrick Maniraguha, Member
Drocella Ingabire, Commercial officer

Fish breeder Cooperative Cyunuzi Marshland

Francois Rutayisire, Member
Regine Dusabimana, Internal Auditor
Samuel Nzeyimana, Internal Auditor
Francois Ndamyimana, Member
Xaverine Mukankwiro, Member
Eraste Uwiragiye, Member
Etienne Bimenyimana, Member

Gahezi Watershed

Dinah Mukanyamulima, Beneficiary Livestock Farmer
Jean Pierre Nsengimana, flexi biogas beneficiary
Télésphore Kanyandekwe, water pond/banana farmer

Hydrographic Basin of Kigarama

Etienne Hakizamungu, President
Janviere Namahirwe, Vice President
Samson Uzabakiriho, Member
Bonheur Innocent, Member

Hydrographic Basin of Mushikiri

Gloriose Murereyimana, President
Simon Byarahindutse, Vice President
Alphonse Munyabugingo, Member
Epaphrodite Rutayisire, Member

Kijumbura Rice Growers Cooperative

Damas Nkomejegusaba, President
Venuste Nsabimana, Zone Leader
Etienne Munyaneza, Secretary

Thacienne Banzubaze, Member
Pascal Dusingizimana, Member
Joseline Umugwaneza, Agronomist

Mpanda Communal Cowshed

Jean Pierre Hagumakurama, President
Pelagie Mukampanzi, Vice President
Faustin Nsengumuremyi, Member
Geraldine Niyirora, Member
Vestine Ntakiutimana, entrepreneur in poultry farming
Venant Ndizeye, beep keeper
Evariste Sindikubwabo, house biogas beneficiary

Cyunuzi Marshland WUA

Premier Muvunyi, President
Janvier Nzaramba, Vice President

Kinoni 1 WUA

Jacqueline Mukabisangwa, President
Dieudonne Maniriho, Secretary
Theoneste Hakizamungu, Member
Michel Ngabonziza, Member
Joseph Rwagasore, Member
Cassien Muriro, Zone leader
Theoneste Ngarukiye, Member
Colonel Ndagijimana, Member
Rosalie Mukakigeli, Internal auditor
Odette Murekatete, Internal auditor

Rwabutazi WUA

Jean Pierre Nkeshimana, President
Matias Badege, Member
Clementine Nagurane, Member
Liberatha Murekatete, Member
Lambert Nshimiyimana, Member
Francoise Murekatete, Member
Landouard Habumugisha, Member
Venuste Munyaneza, Member

Other resource persons

Single Project Implementation Unit

Claver Gasirabo, Coordinator
Alexis Ndagijimana, Former KWAMP Project Manager
Jean Claude Mudahunga, Head of MIS
Andrew Ndagijimana, Value Chains Specialist
Raymond Kamwe, M&E Officer & Gender Focal Point
Olivier Faida, Zonal Sector Specialist
Sosthene Munyemana, Irrigation specialist
Jean Paul Ntaganda, Market Support Specialist
Louis Munyemanzi Ndagijimana, Head of Finance
Alexandre Kayitare, Knowledge Management and Communications Officer
Martin Kayiranga, M&E Specialist

Evaluation criteria for the PPE

(i) **Relevance.** The PPE will assess to what extent was the project relevant to the Government of Rwanda's strategies for the transformation of agriculture and with IFAD's focus in Rwanda as articulated in the Rwanda country strategic opportunities programmes (COSOP) 2008-2012 and 2013-2018.

(ii) **Effectiveness.** The PPE will review the existing evidence base, including the data collected by the M&E system and supervision reports, to establish the results achieved by the project in terms of targets, and conduct further analysis on which parts of the project have been more effective, and how and why project activities have achieved the intended results. The PPE will assess how integrated the watershed management system and process was, as a measure of the project's effectiveness in this regard.

(iii) **Efficiency.** The PPE will examine the process and system that underpinned the disbursement of funds under KWAMP. It will also assess whether the physical and financial resources were adequate for successful execution of project activities. Further, the internal rate of return will be checked to identify reasons for the higher-than-estimated rate of KWAMP at its closing.

(iv) **Rural poverty impact**. The PPE will examine the methodology used in the impact assessment study conducted by the project in 2016 and the validity of results; additional evidence will be collected from the field in order to validate these results, where possible.

(v) **Sustainability of benefits.** The PPE mission will visit selected project sites to verify the current situation with regards to the sustainability of benefits and will examine the different aspects of the value chain, for example, feeder roads and the training imparted to farmer groups. It will also assess the watershed management plans with regard to the status of their implementation after project completion.

(vi) **Gender equality and women's empowerment.** The PPE will examine to what extent have the project's interventions contributed to better gender equality and women's empowerment. With regards to the project's impact on women's incomes, the PPE will examine, for instance, the status of the key gender related activities that were planned to be continued beyond KWAMP through IFAD's grant with Oxfam Novib.

(vii) **Innovation.** With regard to KWAMP, the PPE will assess, for instance, whether the application of proven agricultural technology options, specifically, hillside irrigation, was truly innovative, and its results.

(viii) **Scaling up.** The PPE will examine project documentation and rely on key informant interviews to assess the extent to which the interventions under KWAMP have been scaled up by government authorities, donor organizations, the private sector and other agencies.

(ix) **Environment and natural resource management**. Watershed management was an important objective of KWAMP. The PPE will examine this criterion with regard to the new agricultural practices and technologies that were proposed and implemented as part of project interventions with regards to soil and water conservation, and the results of implementing watershed management plans. Using remote sensing, if possible, the extent of reforestation cover will be assessed.

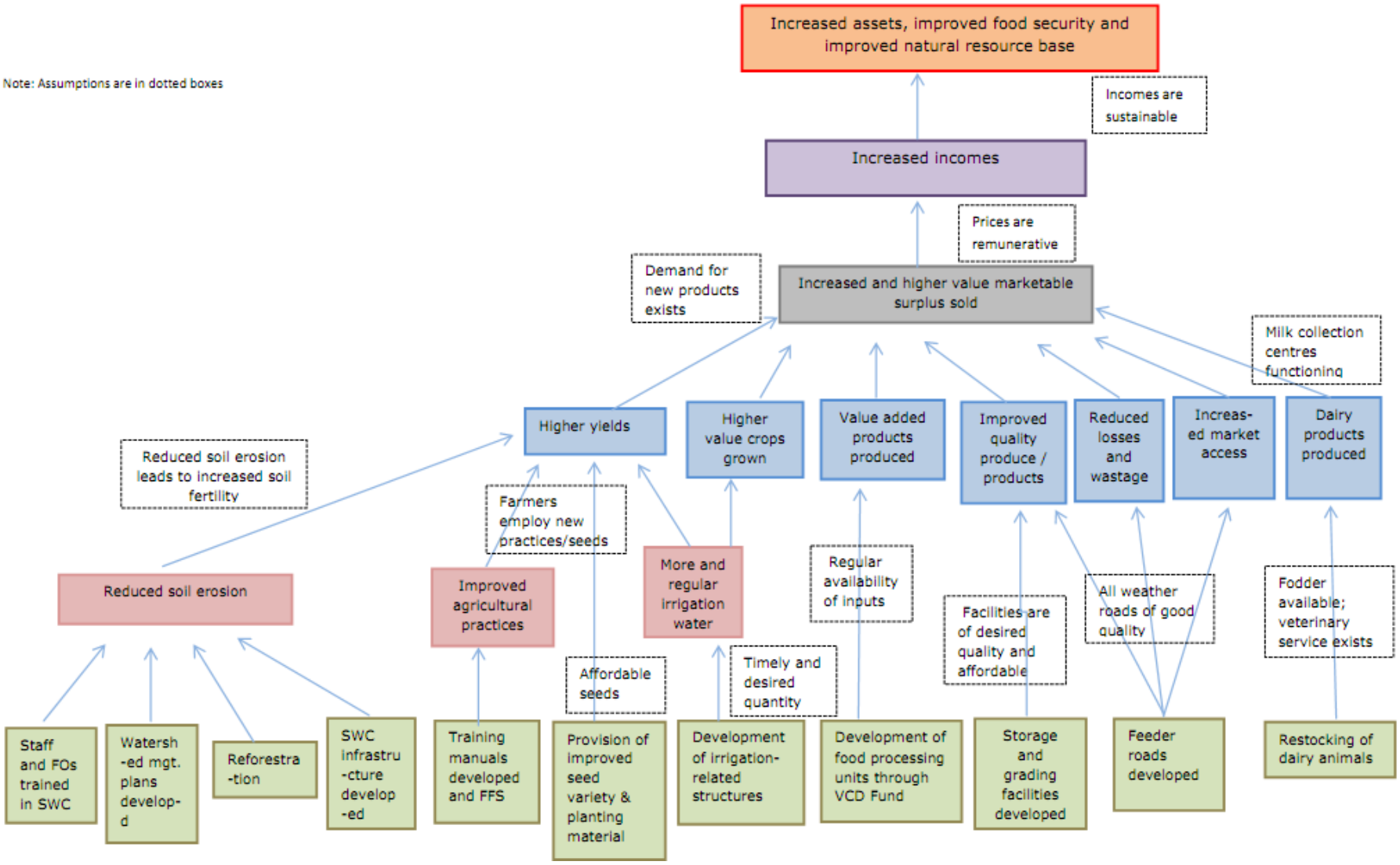
(x) **Adaptation to climate change.** Rwanda faces the threat of climate change, particularly so concerning watershed areas. The PPE will consider the documented threat of climate change in the country and project areas (if possible) and assess the contribution of the project to increase climate

resilience and increase beneficiaries' capacity to manage short- and long- term climate risks.

(xi) **Overall project achievement.** The PPE will provide an overarching assessment of the intervention, drawing upon the analysis and ratings for all above-mentioned criteria.

(xii) **Performance of partners**. The PPE will assess IFAD's performance in terms of *inter alia* supervision and disbursement responsibilities. It will also examine the role of government in undertaking the responsibilities towards project management and implementation.

Theory of change



Outputs related to project objectives

Table 1
Outputs related to objective 1

Activity	*Achievement*
i) support the build-up of the decentralized structures of the district	8 technical specialist positions created to supplement district capacity in provision of key public functions (165%).
ii) Provide physical facilities to serve as a central point for the dissemination and exchange of information and capacity building (Community Centres for Innovation)	Training to 20 district staff in GIS (100%) and 119 staff in planning, monitoring and land reclamation (79%). 3 CCIs constructed (100%).
iii) Build the capacity of farmer organizations to become effective permanent institutions in the District.	25 farmer cooperatives trained (152%).

Note: Targets reached at project end are mentioned in parenthesis.

Table 2
Outputs related to objective 1

Activity	*Achievement*
i) Assist the development of watershed management plans	18 watershed management plans developed (100%)
ii) Establish a Local Management and Supervision Committee (CLGS) that supported the monitoring and implementation of project' activities.	18 CLGS developed (100%)
iii) Assist farmers to have access to land with registered rights and all land in the project area.	Registration of all land in Kirehe District (100%) and 98% farmers accessing land.
iv) Assist the District authority with the creation of a Water Users' Association (WUA) for each potential scheme.	WUA's formed (79%)

Note: Targets reached at project end are mentioned in parenthesis.

Table 3
Outputs related to objective 2

Activity	*Achievement*
i) provide matching grants for value chain development focusing on agri-businesses such as construction of input shops and collection points and value-addition activities such as storage, grading and processing	28 projects value chain activities (97%)
ii) promote greater agronomic efficiency through community-based research and extension, advice, improved planting materials and the distribution of improved animals	10 maize drying facilities and 6 drying facilities for rice (111%). 10,000 farmers trained in agricultural practices (111%). 451 households with biogas systems (100%).
iii) re-stock livestock, introduce improved breeds and provide artificial insemination services	8,833 animals distributed (156%).
iv) irrigation development through mini-dams, ponds or cisterns and distribution systems to provide water for irrigation	701 ha of marshland developed and fully operational. 4 hillside irrigation schemes covering about 1,118 ha developed. 1,819 ha developed on marshland and hillside (90.9%). 198 water ponds installed and distributed

v) soil and water conservation through by progressive terracing, contour trenches and anti-erosive hedging of farmland through the planting of agroforestry trees and cuttings of penissetum.	Protection of 652 ha of land through land husbandry techniques (97%). 18,556 ha of land protected (104%). 13.4 million of forestry and agroforestry trees produced and planted (90%). 40,000 seedlings planted and reforestation on 323 ha of public land (73%).

Note: Targets reached at project end are mentioned in parenthesis.

Using satellite data to analyse land cover changes in Kirehe District

Technical terms and acronyms

- Sentinel 1: Sentinel is the name of the European Space Agency mission. This mission includes several satellites. Sentinel-1A and Sentinel-1B are the two SAR (Synthetic Aperture Radar) satellites.
- WGS84 / UTM zone 345N Projection (EPSG Code: 32635): This is one of the available Reference Coordinate System. Link: http://spatialreference.org/ref/epsg/wgs-84-utm-zone-35n/
- TOA reflectance: Top of atmosphere reflectance. This is the calibrated value that expresses the unitless ratio of reflected versus total power energy. This value is measured (or derived) not at the surface level (otherwise it would be called BOA - Bottom of Atmosphere -) in order not to influenced by atmosphere conditions.

  Mid-infrared, near infrared and RED spectral bands: A multispectral image is one that captures image data within specific wavelength ranges across the electromagnetic spectrum. The wavelengths may be separated by filters or by the use of instruments that are sensitive to particular wavelengths, including light from frequencies beyond the visible light range, i.e. infrared and ultra-violet. Spectral imaging can allow extraction of additional information the human eye fails to capture with its receptors for red, green and blue.

  - **Blue**, 450-515...520 nm, is used for atmosphere and deep-water imaging, and can reach depths up to 150 feet (50 m) in clear water.
  - **Green**, 515...520-590...600 nm, is used for imaging vegetation and deep-water structures, up to 90 feet (30 m) in clear water.
  - **Red**, 600...630-680...690 nm, is used for imaging man-made objects, in water up to 30 feet (9 m) deep, soil, and vegetation.
  - **Near infrared**, 750-900 nm, is used primarily for imaging vegetation.
  - **Mid-infrared**, 1550-1750 nm, is used for imaging vegetation, soil moisture content, and some forest fires.
- SRTM or GTOPO DEM: SRTM -> Shuttle Radar Topography Mission Digital Elevation Model.
- GTOPO -> Global Arc Second Elevation Digital Elevation Model.
- USGS server: The **United States Geological Survey** (**USGS**) is a scientific agency of the United States government.

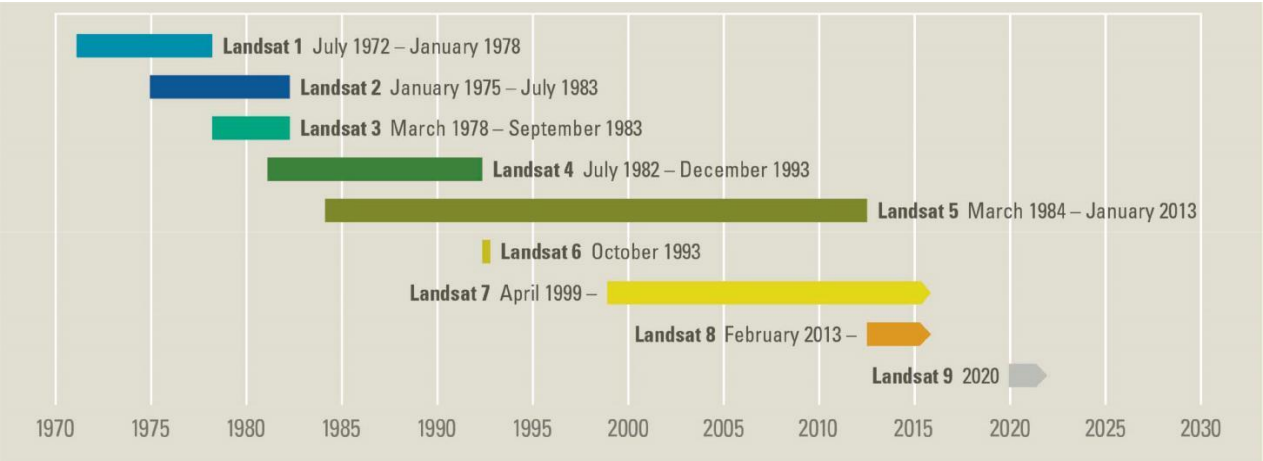
Data

Data Selection

In order to find a reliable source of information for both the 2016 and 2009, the Landsat Mission was chosen.

For the first year of this analysis, a Landsat 5 image was used while for the second one, a Landsat 8 image was relied upon. In figure 1 a timeline of all Landsat missions is shown.

Figure 1
Landsat missions



Source: SARMAP.

After having selected the data source, a search was performed on all available images that are not affected by the cloud-cover / cloud-shadow effect (which is really strong over Rwanda) and that represents with a good approximation the same situation of the terrain.

In figure 2, Kirehe District is shown with respect to the Landsat frames that are needed to cover the entire area. It's worth mentioning that since the frames are along the same Landsat Path, the images are acquired on the same date.

The final selected images are:

2009

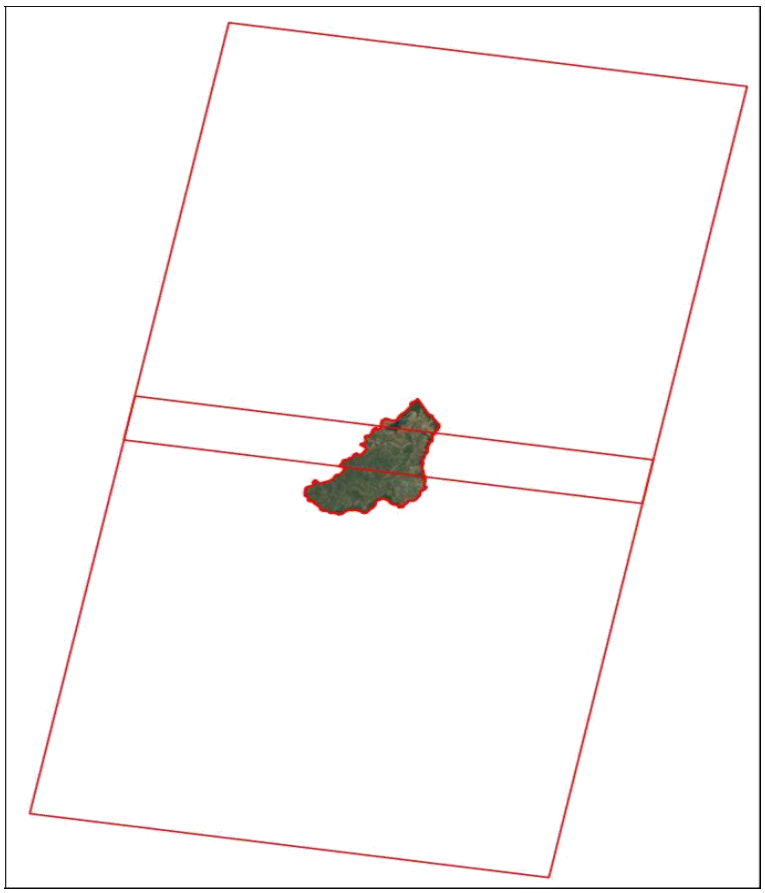
- LT51720612009176MLK00
- LT51720622009176MLK00

2016

- LC81720612016180LGN02
- LC81720612016280LGN02

In addition, a SAR (synthetic aperture radar) derived colour composite was used to account for further changes that took place in 2017 for which reliable optical image was not available. One of the main characteristic of SAR images is that they are not heavily affected by cloud and thus, a robust temporal analysis can be performed. To compute this analysis that is summarized in the proposed colour composite image, the whole 2017 sentinel 1 series of images (acquired every 12 days) was taken into consideration.

Figure 2
Path 172 – Row 61, 62



Source: SARMAP.

Data processing
Both the optical and SAR data were processed using MAPscape, a Sarmap owned and developed software. All images were geocoded using the WGS84 / UTM zone 345N projection (EPSG Code: 32635).

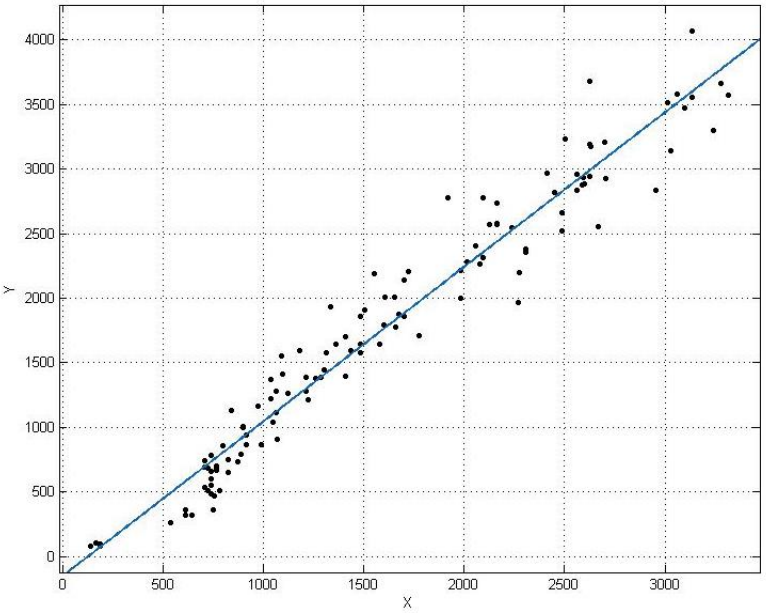
Processing Optical data
The following processing steps were performed:

- Data download,
- Data import into internal data format,
- Conversion from digital number into TOA reflectance,
- Derivation of Vegetation, Water, and Bare Soil Indexes,
- Mosaicking and cartographic transformation,
- Sample Selection (cut to the area of interest).

In addition to these basic processing steps, a false colour composite image using mid-infrared, near infrared and RED spectral bands was created to highlight vegetation properties. Furthermore, since the 2009 and 2016 acquisitions were made by different satellites, a transformation to the second image was performed in order to make it similar to the first one in terms of reflectance.

This transformation was performed finding a polynomial function that fits selected points with the same properties on both acquisitions and applying it to second image. After some tests, it was decided to use a linear model in the form of y=a*x + b, where a= 994.5 and b=1751. The quality of fit is expressed by an adjuster R-square value of 0.9499. In figure 3, the fitting model is shown.

Figure 3
Obtained transfer function



Source: SARMAP.

Processing SAR data

To optimize the data quality, SAR data were processed using a multi-temporal approach. It is worth mentioning that all processing steps described below were carried out in an automated way without any operation intervention. Digital elevation model (DEM) data are necessary for the data processing: if not provided by the user, the SRTM or GTOPO DEM data are automatically downloaded from the USGS server and embedded in the processing.

Starting typically from single look complex data – ground range data alternatively – the intensity processing included the following steps:

- Data import into internal data format,
- Time-series co-registration,
- Time-series speckle filtering,
- Terrain geocoding and radiometric calibration,
- Radiometric normalization,
- Anisotropic non-linear diffusion filtering (ANLD),
- Mosaicking.

Starting from Single Look Complex data, the coherence processing included following steps:

- Import into internal data format,
- Data pair co-registration,
- Coherence generation,
- Terrain geocoding,
- Anisotropic non-linear diffusion filtering (ANLD),
- Mosaicking.

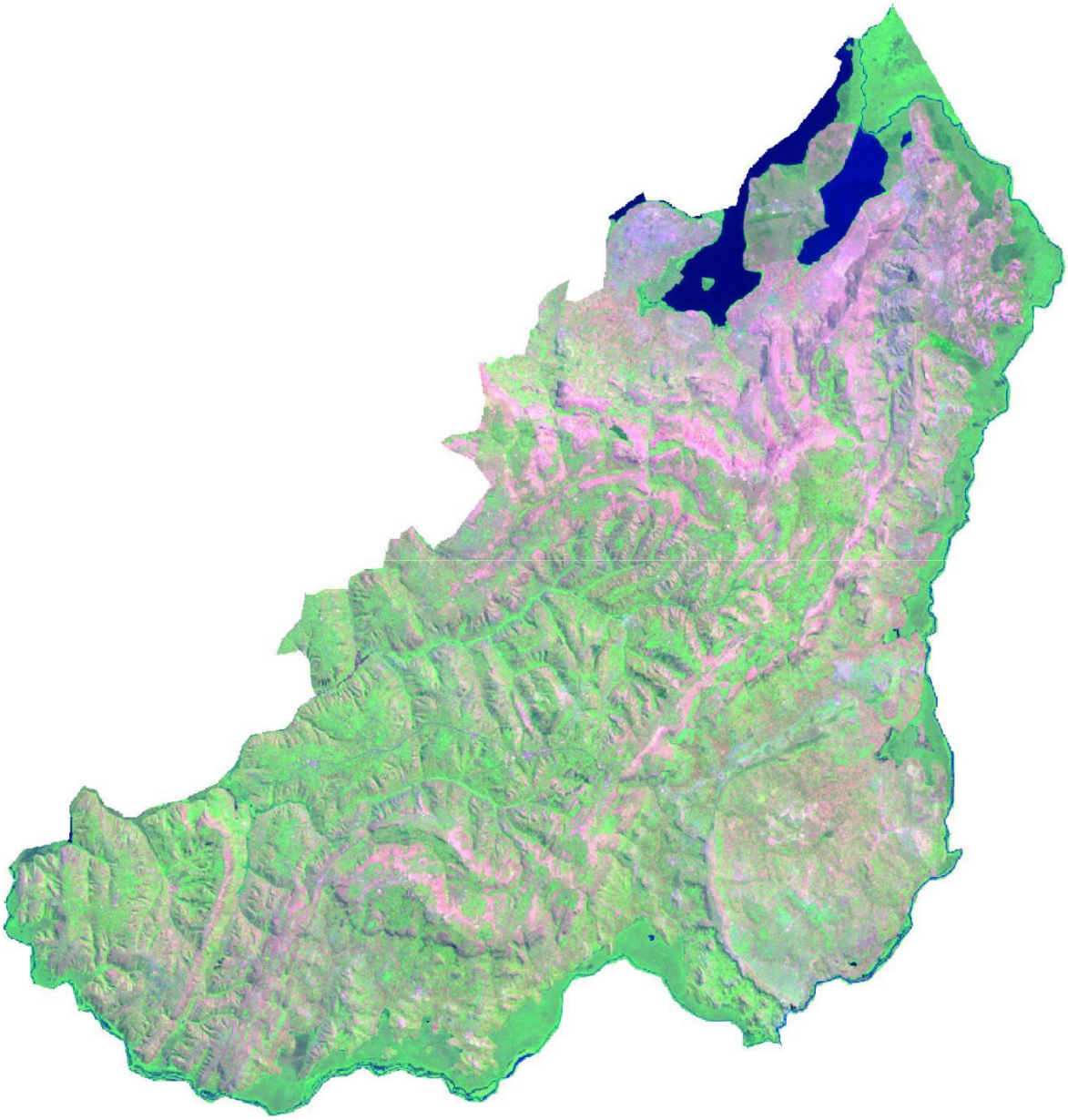
After the basic processing, statistical descriptors were derived over the entire series in order to create the temporal colour composite described above.

Analysis

General Considerations

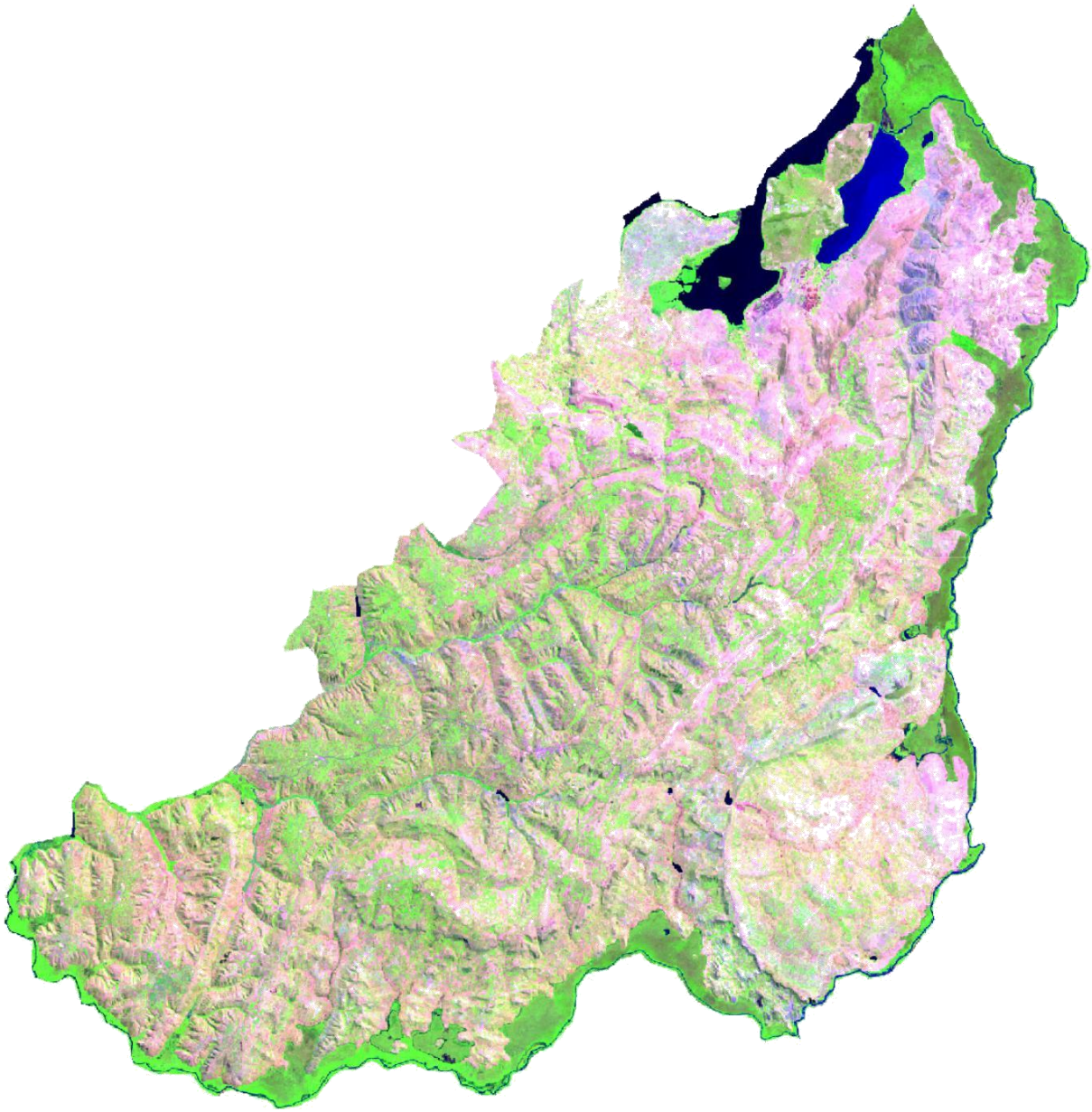
A visual analysis of the processed images was performed to identify major and evident changes in the land cover type between the considered periods. In figure 4 and figure 5 respectively the 2009 and 2016 optical images are shown.

Figure 4
Landsat 5 2009 colour composite



Source: Landsat.

Figure 5
Landsat 5 2016 Colour Composite



Source: SARMAP.

In general, in both images it is possible to recognize the following colours:

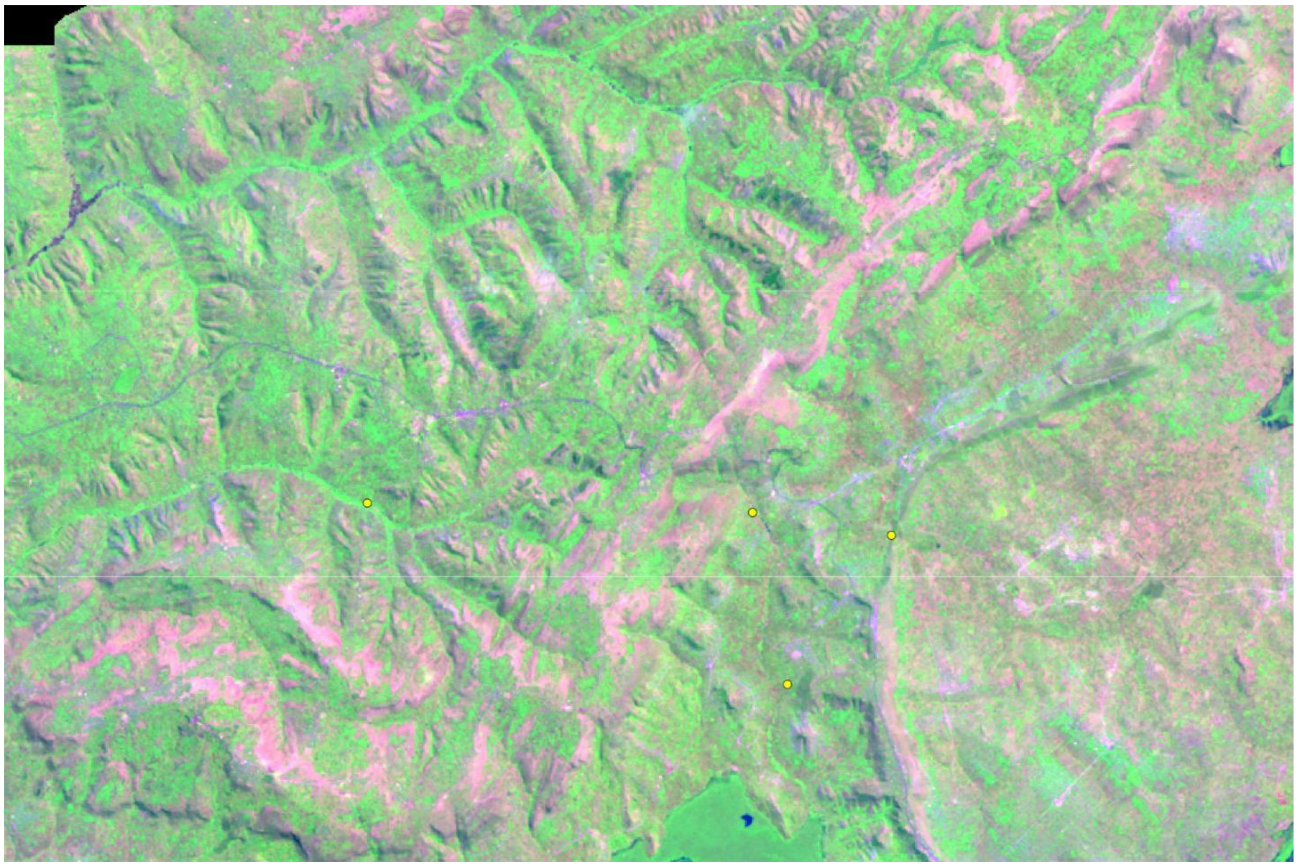
- Green: strong vegetation (can be related to sparse forest / agriculture / wetland cover with vegetation),
- Dark green: compact forest (natural or planted),
- Pink: open areas (including savanna with detached trees, bushland or similar ecosystems, and area with scattered trees and shrubs),
- Dark blue/blue: water bodies (rivers, streams, lakes and ponds),
- Violet/purple: agriculture.

A first consideration can be made over the general situation: in the 2016 image, it seems that the season was a bit delayed with respect of 2009, with the consequence that the 2009 image looks greener. The yearly seasonal rainfall anomalies referred to in the IFAD PPE report perfectly confirm this consideration. Even with this effect that made the comparison harder, it is possible to assert that, without substantial changes in the landscape, there was an expansion or intensification of the agricultural area. This is also supported by the creation of some dams and basins to collect the water to be used for cultivations.

Focus on dams and basins

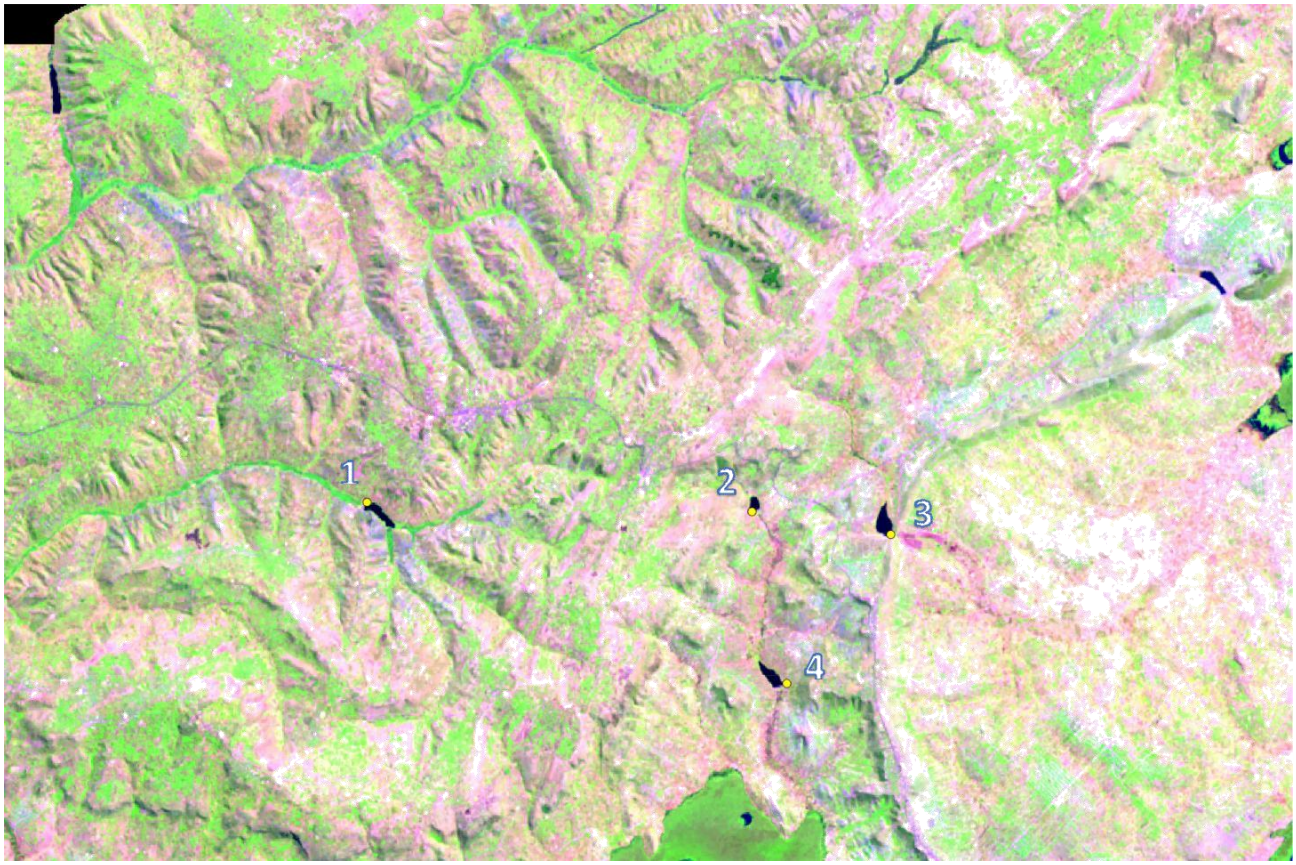
In figure 6 and figure 7, a zoomed area is shown where basins were built between 2009 and 2016. The almost black shapes of the infrastructures are clearly visible on the 2016 image. A picture that shows the actual situation was taken in the area marked with yellow dots and shown below.

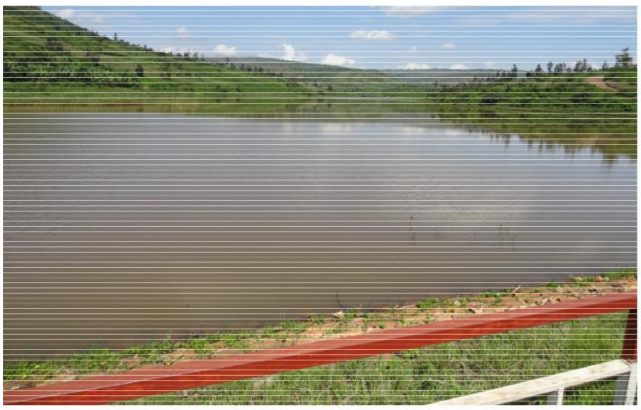
Figure 6
Zoom area 2009



Source: SARMAP.

Figure 7
Zoom area 2016





3

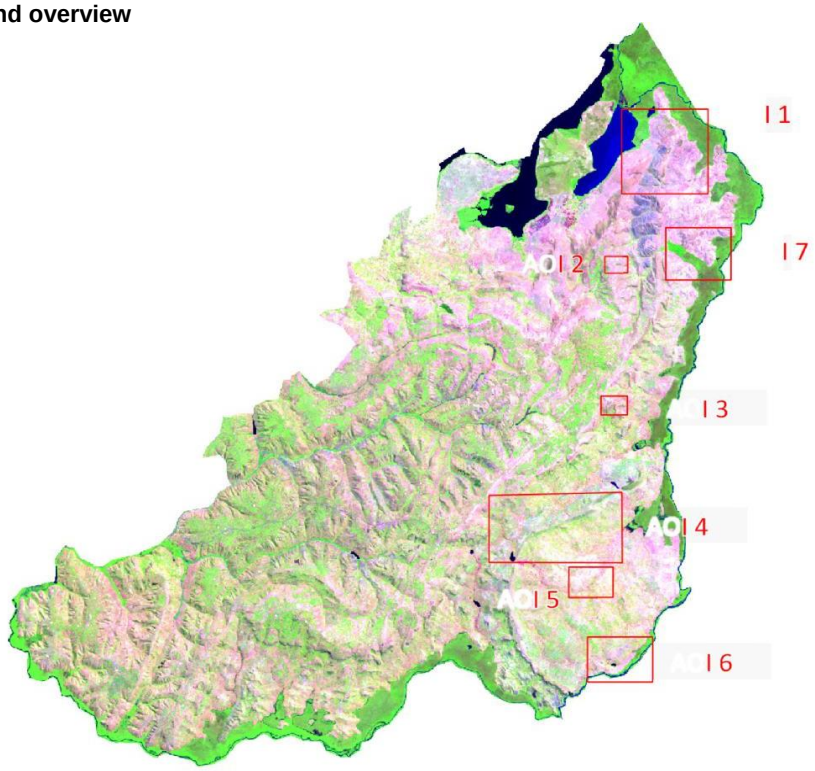
4

Source: SARMAP.

Focus on identified areas

In figure 8 the 2016 image with some selected areas of interest (AOI) where it was possible to observe changes in the land cover characteristics is shown. Those areas were further investigated and a close-up of each AOI is commented here below.

Figure 8
AOI position and overview

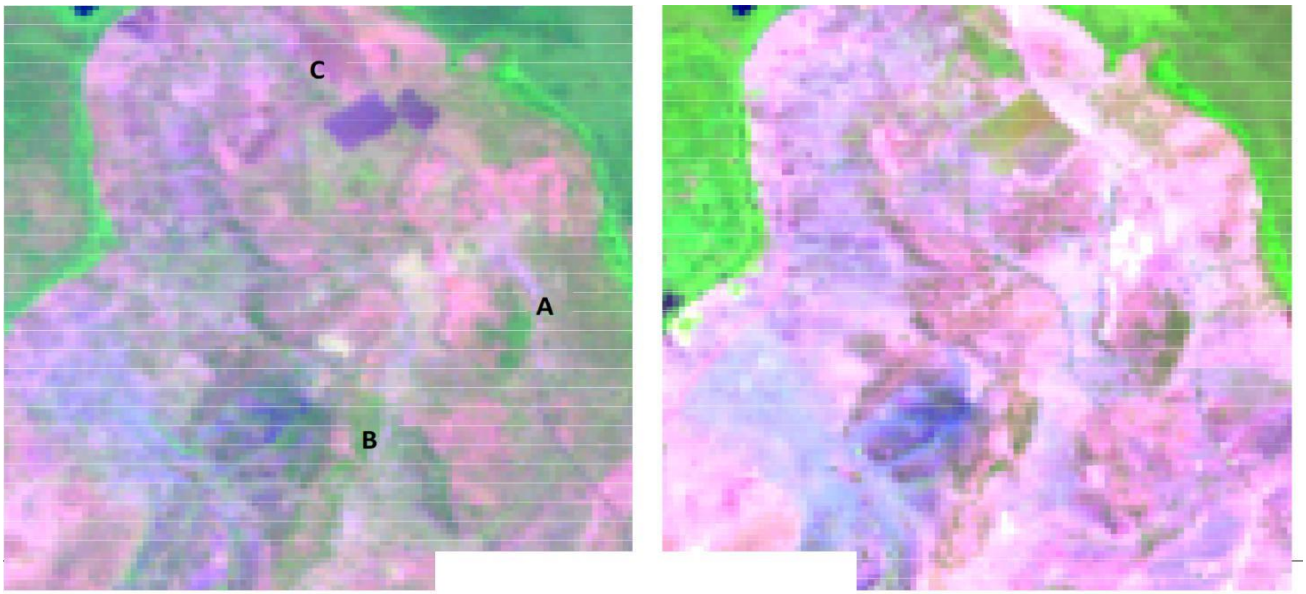


Source: SARMAP.

AOI 1

In this AOI, the general situation is very similar but it was possible to see a slight decrease of the forested area around points A and B while on the other hand a relatively new planted area appeared at point C. The generally "greener" situation of 2009 image is strictly linked with the agricultural status of the season.

Figure 9
Left: 2009 - Right: 2016

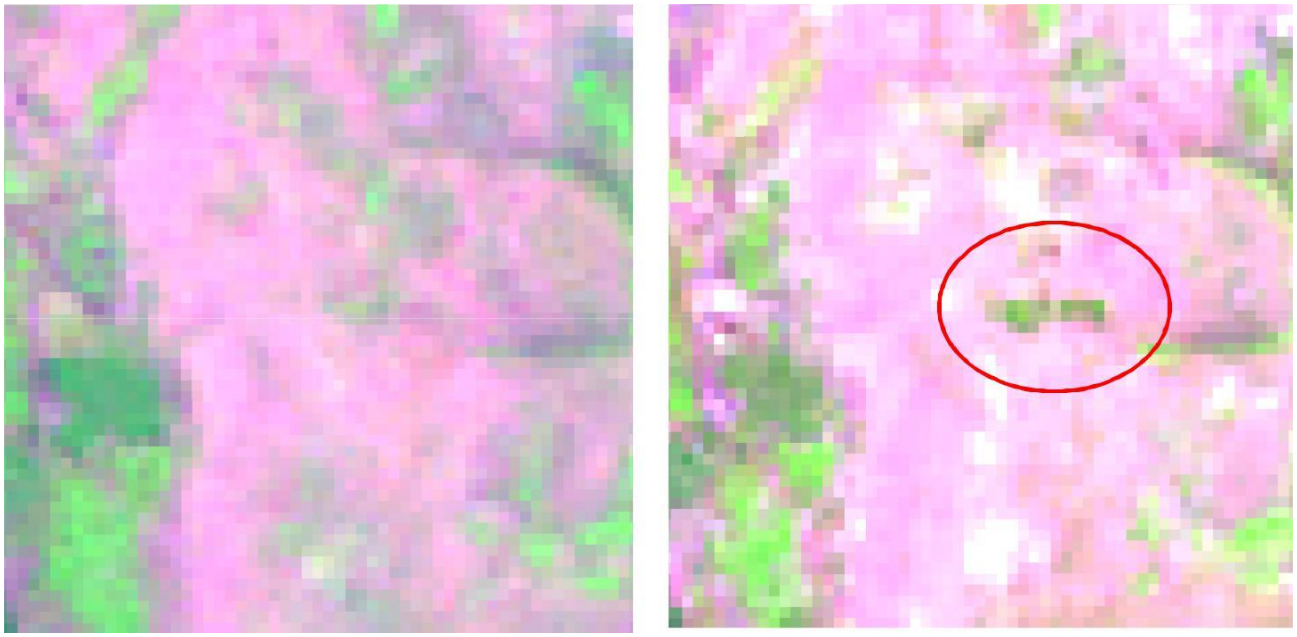


Source: SARMAP.

AOI 2

In this case, an area of a tree plantation, marked with the circle on the right image, was developed through the considered timeline and appeared well consolidated in 2016.

Figure 10
Left: 2009 - Right: 2016

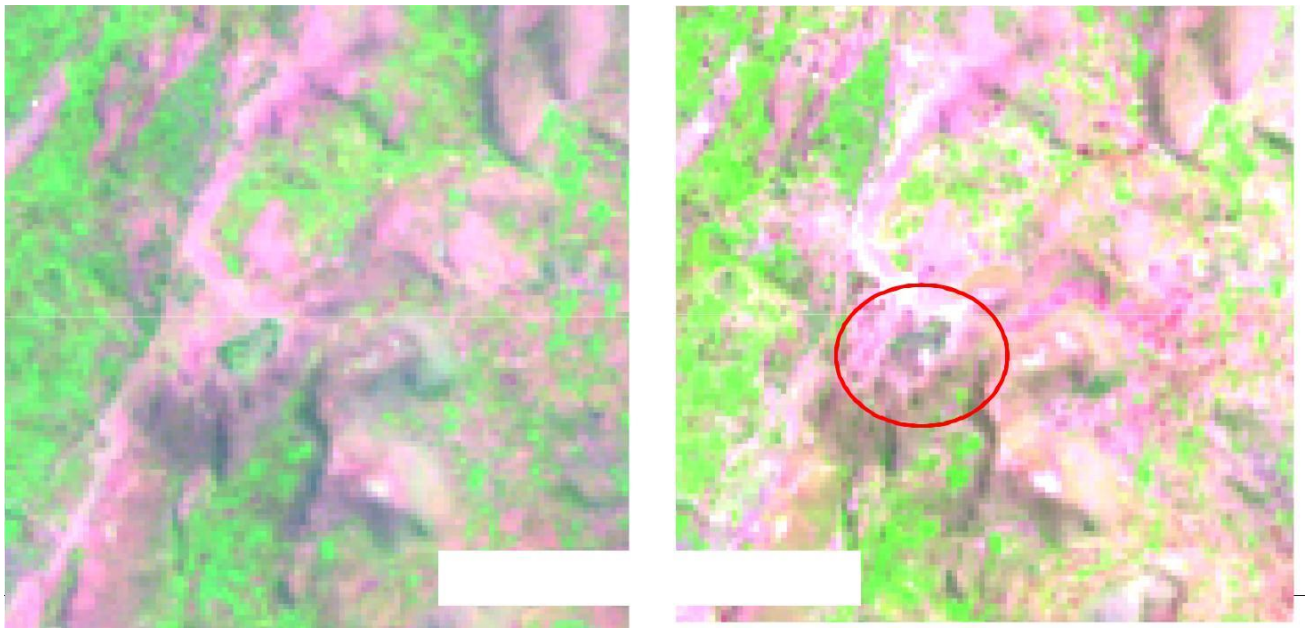


Source: SARMAP.

AOI 3

Here is an example of forest degradation. The area seems to be converted into agriculture.

Figure 11
Left: 2009 - Right: 2016

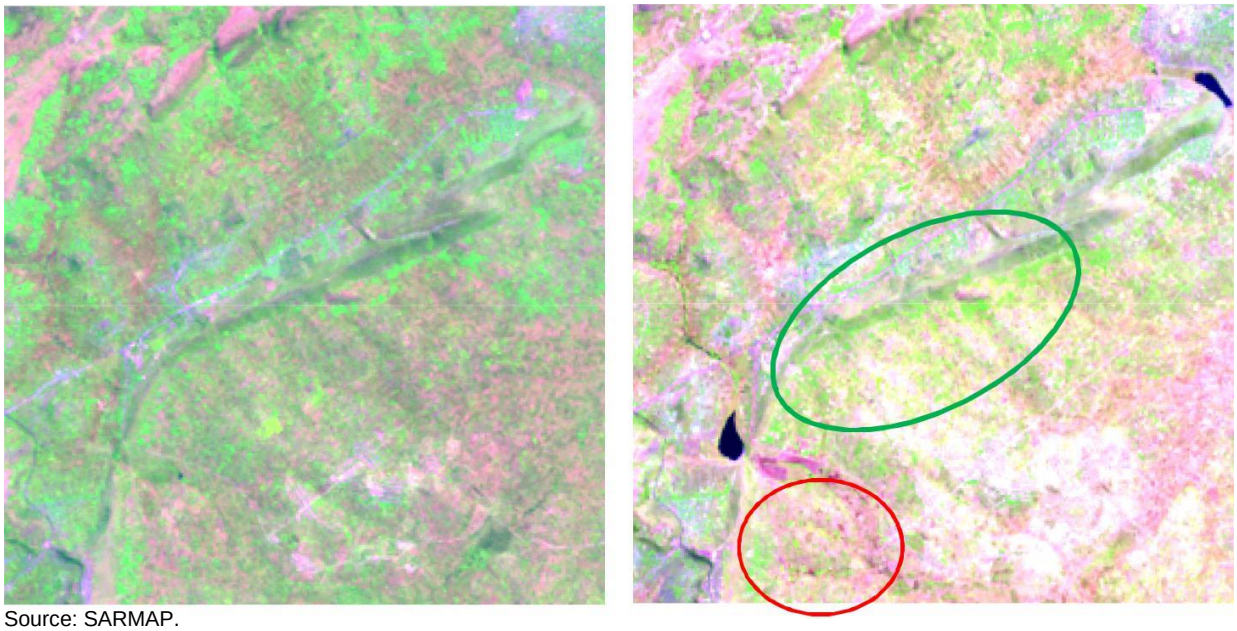


Source: SARMAP.

AOI 4

In AOI 4 it was possible to observe some changes probably associated with the creation of basins. In both red and green circles, marked on the right image, portions of natural sparse forest were substituted by new agricultural fields or young trees plantations.

Figure 12
Left: 2009 - Right: 2016



Source: SARMAP.

AOI 5

In figure 13 and figure 14, the situation related to 2009 and 2016 is shown together with the corresponding very high resolution optical image. Even if the two different sources didn't match perfectly in terms of time of acquisition, the migration of the natural vegetation to new agricultural areas appears as a clear trend.

Figure 13
Top: 2009 - Bottom: corresponding VHR optical Image

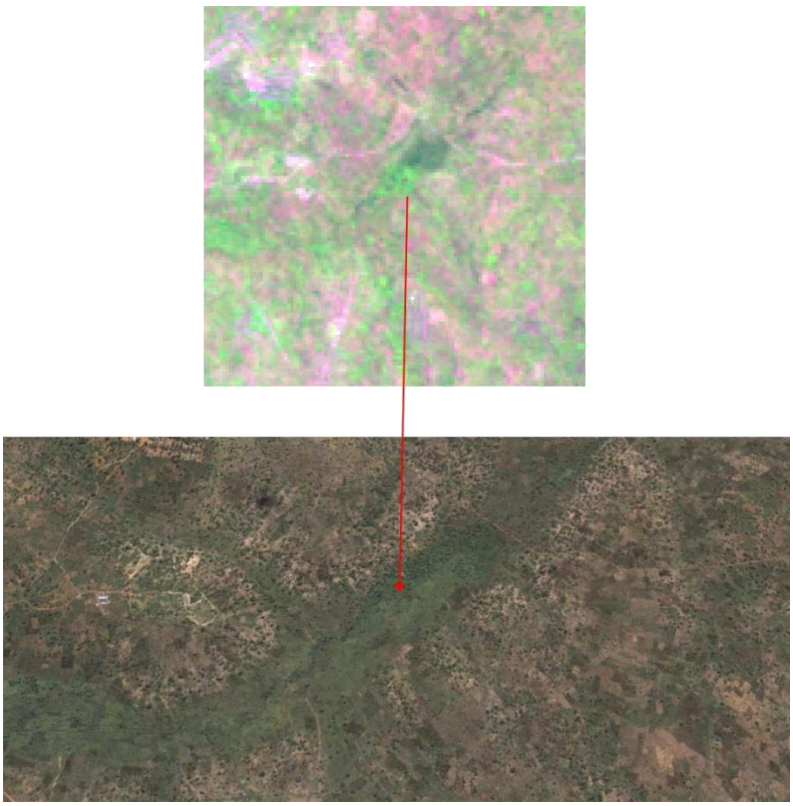
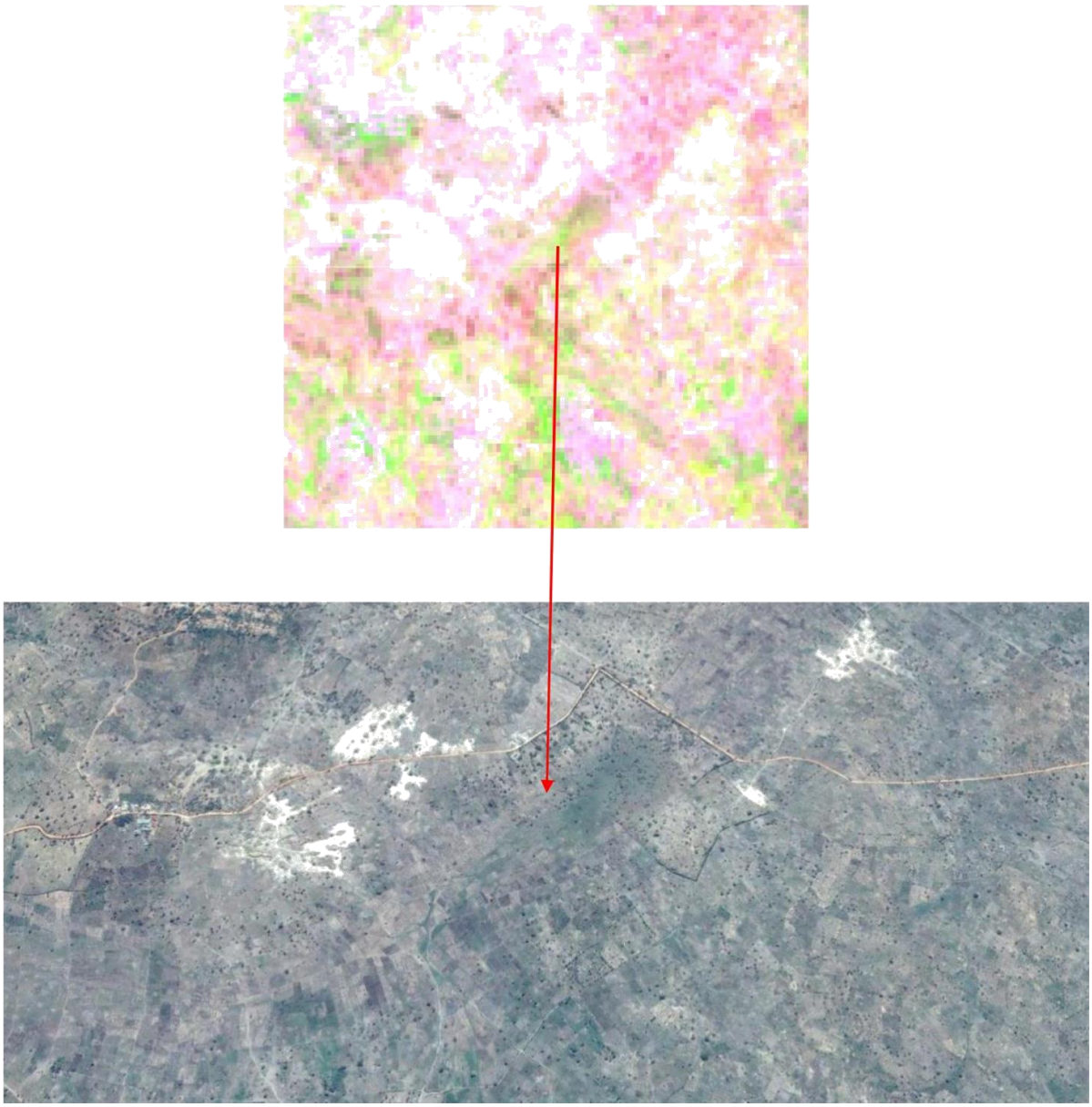


Figure 14
Top: 2016 - Bottom: corresponding VHR optical image

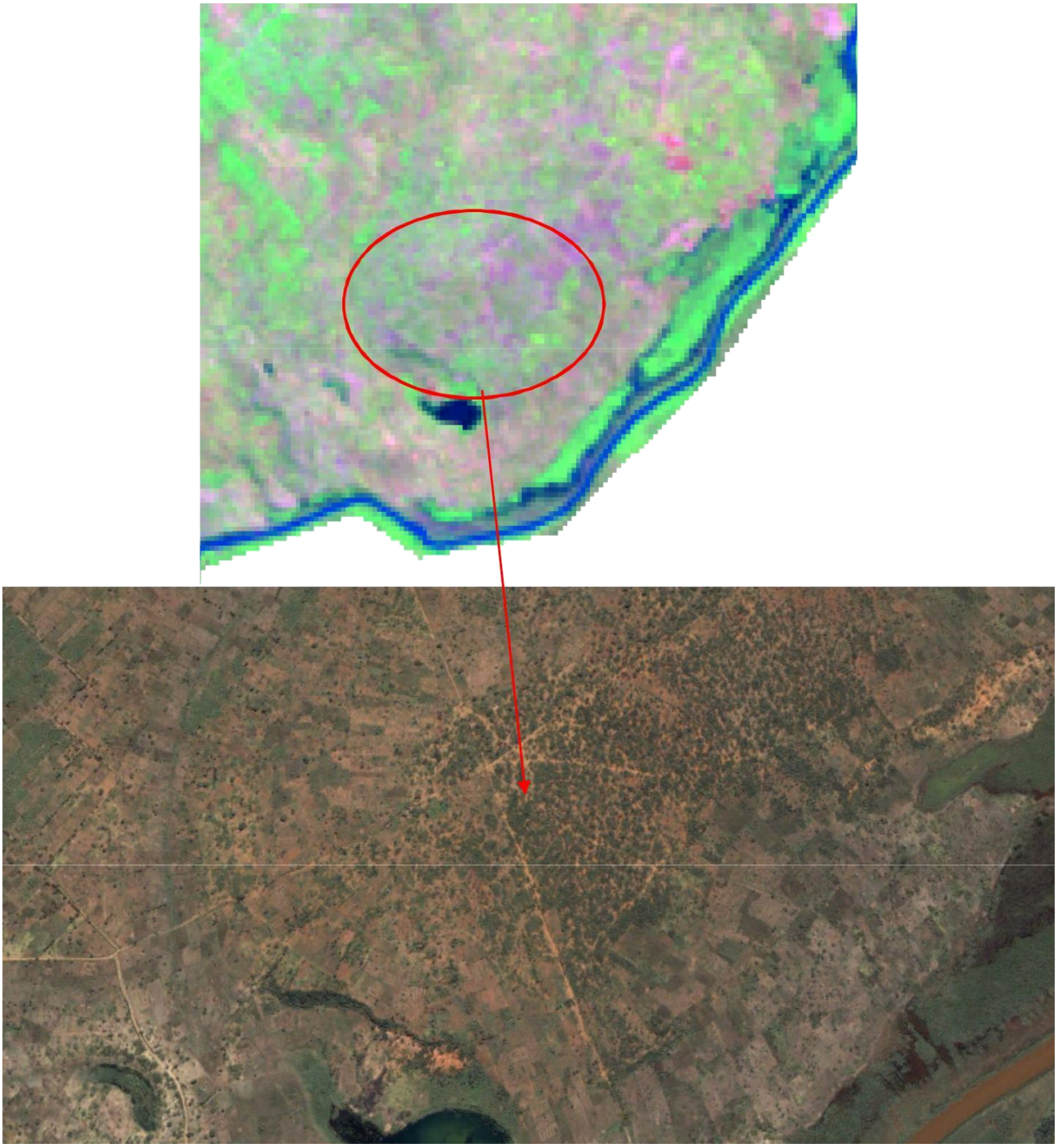


Source: SARMAP.

AOI 6

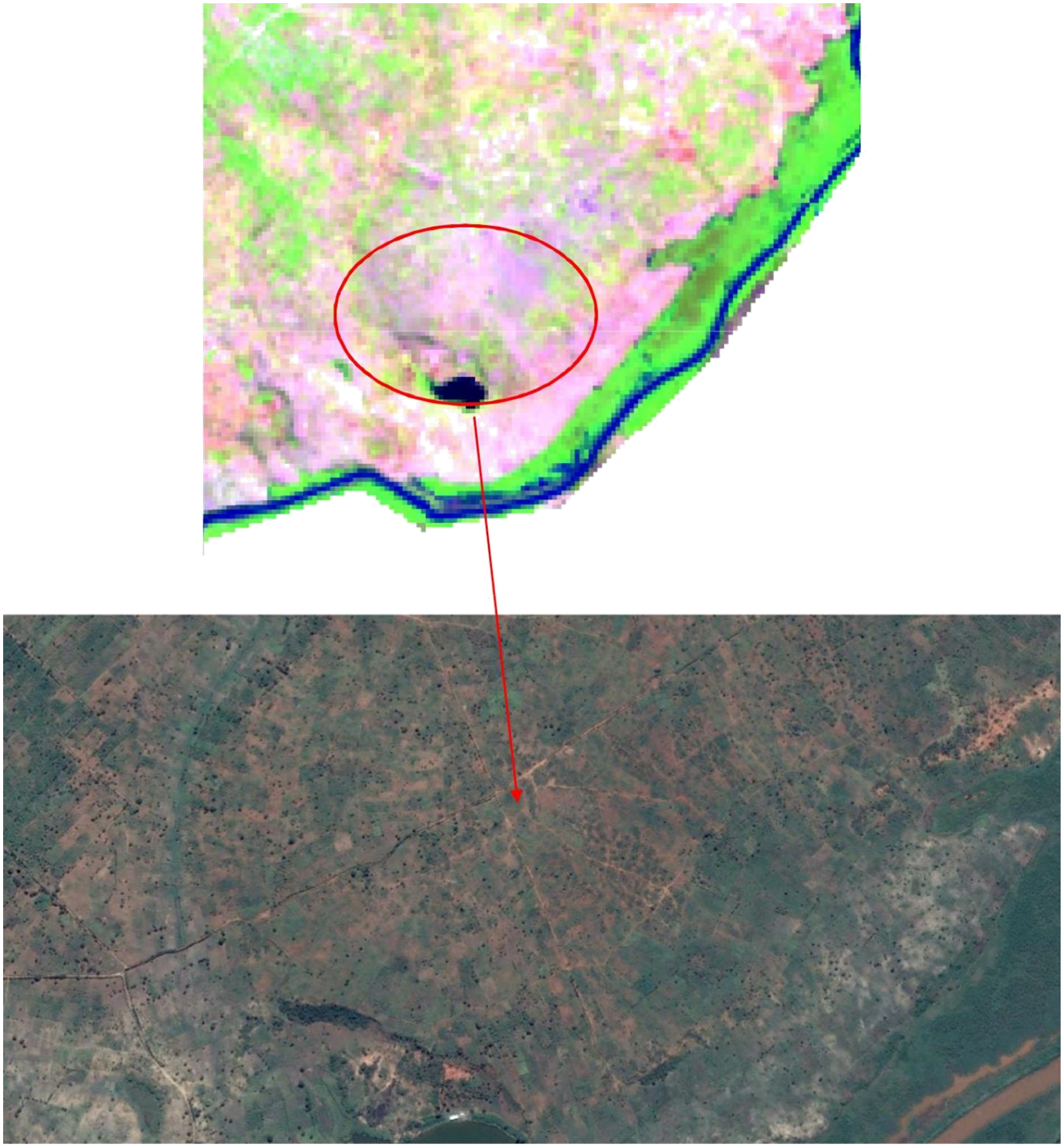
The same trend shown for AOI 5 could be verified also inside AOI 6. In Figure 15 and Figure 16, the area located at the north of the pond (marked with the circle) was transformed from a sparse forest to a terrain for agriculture. In 2009 colour composite, the image shows a slightly different shade of green that corresponded to the previously existing forest.

Figure 15
Top: 2009 - Bottom: corresponding VHR optical image



Source: SARMAP.

Figure 16
Top: 2016 - Bottom: corresponding VHR optical image

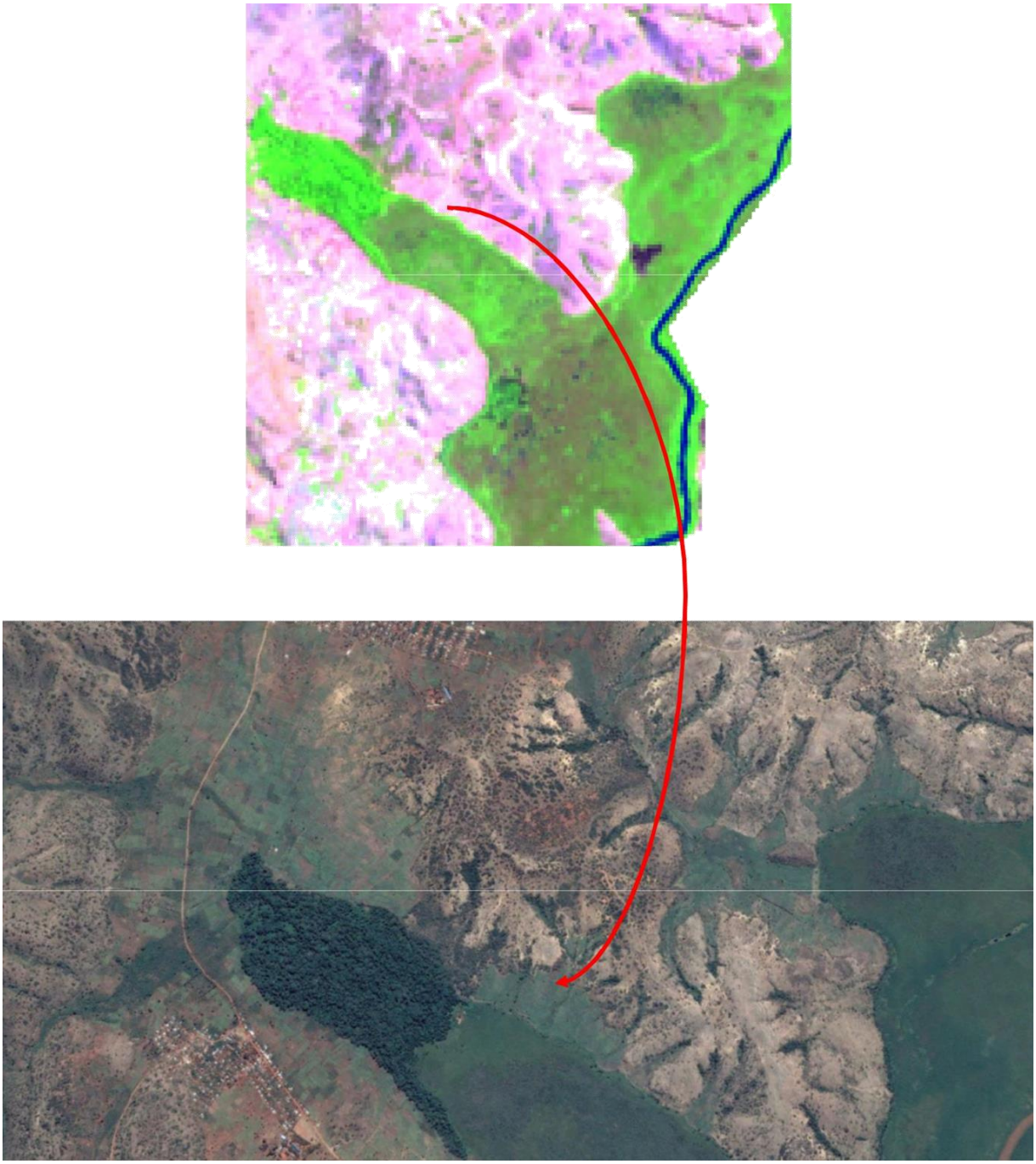


Source: SARMAP.

AOI 7

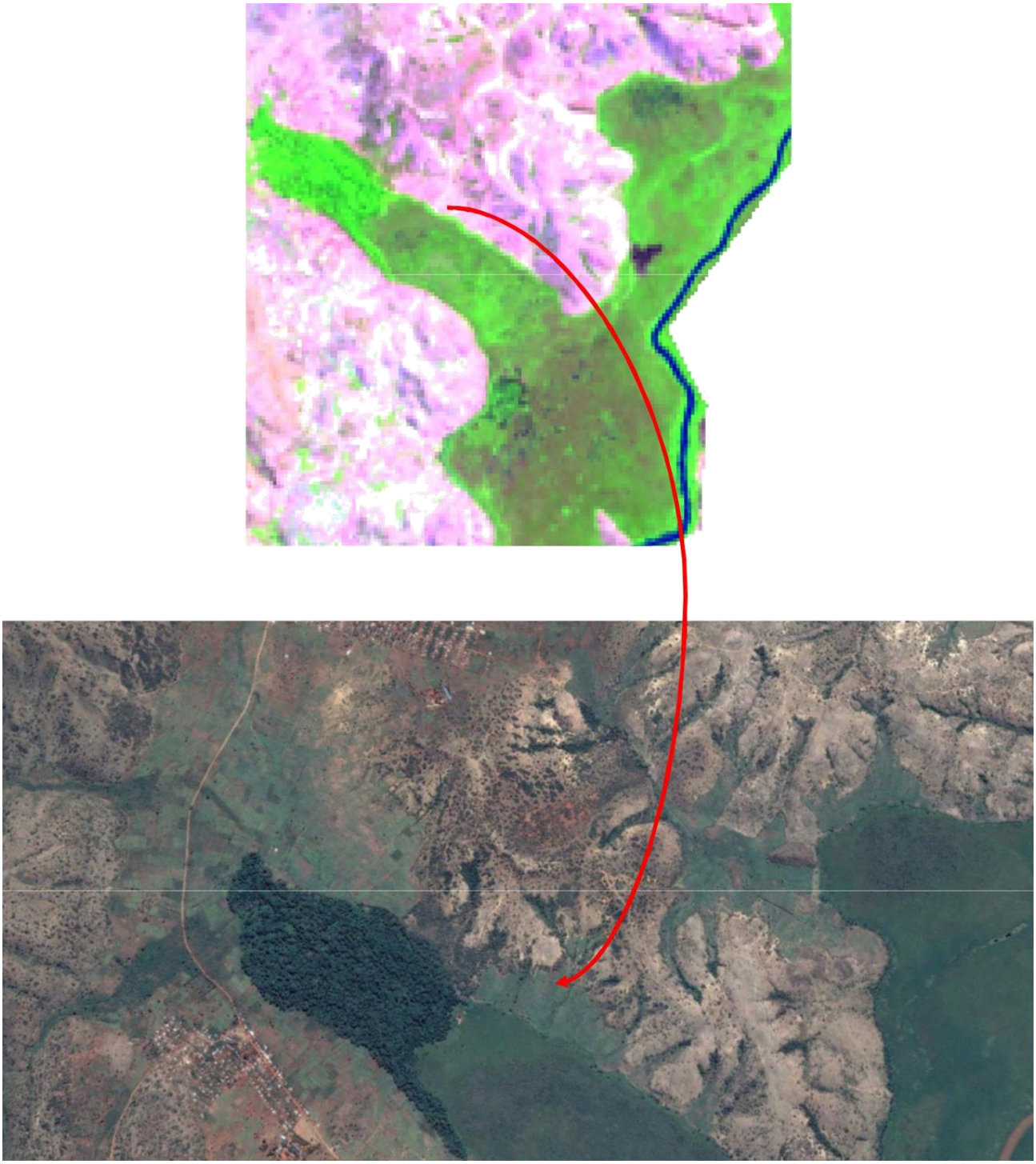
In figure 17 and figure 18, a similar situation to those presented above is shown. In this case, relatively large portions of a natural forest placed close to the large wetland area along the border with Tanzania were converted to agriculture.

Figure 17
Top: 2016 - Bottom: corresponding VHR optical image



Source: SARMAP.

Figure 18
Top: 2009 - Bottom: corresponding VHR optical image

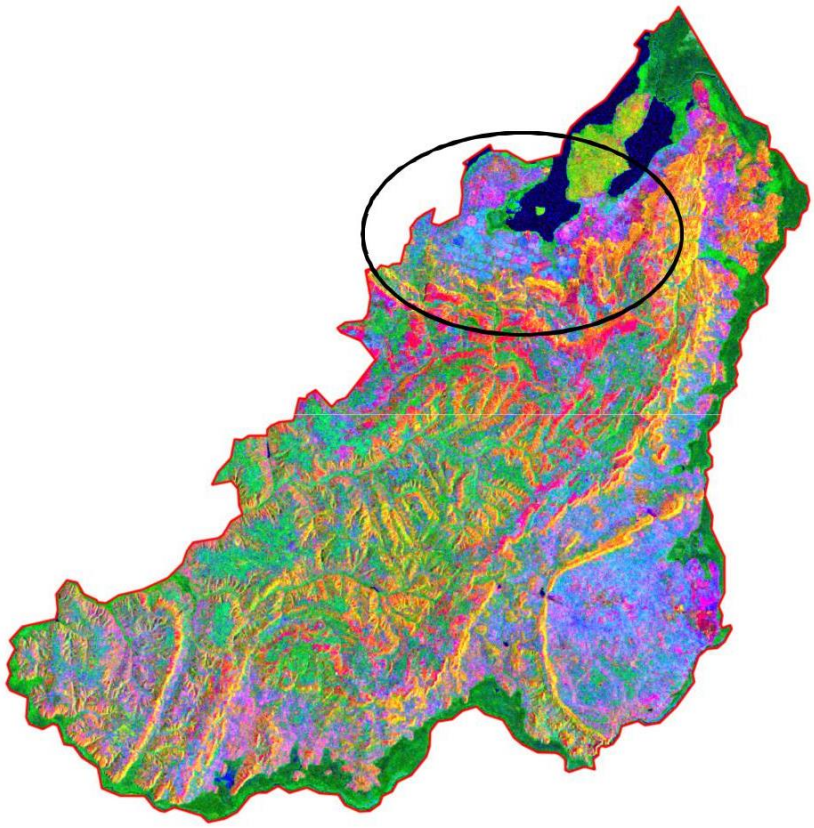


Source: SARMAP.

Further investigation

As anticipated in the data selection section, the analysis was completed with the study of the SAR derived temporal colour composite. This gave the opportunity to study, in a macroscopic way, the changes occurred during 2017. In figure 18 the aforementioned colour composite is shown.

Figure 19
SAR derived temporal colour composite



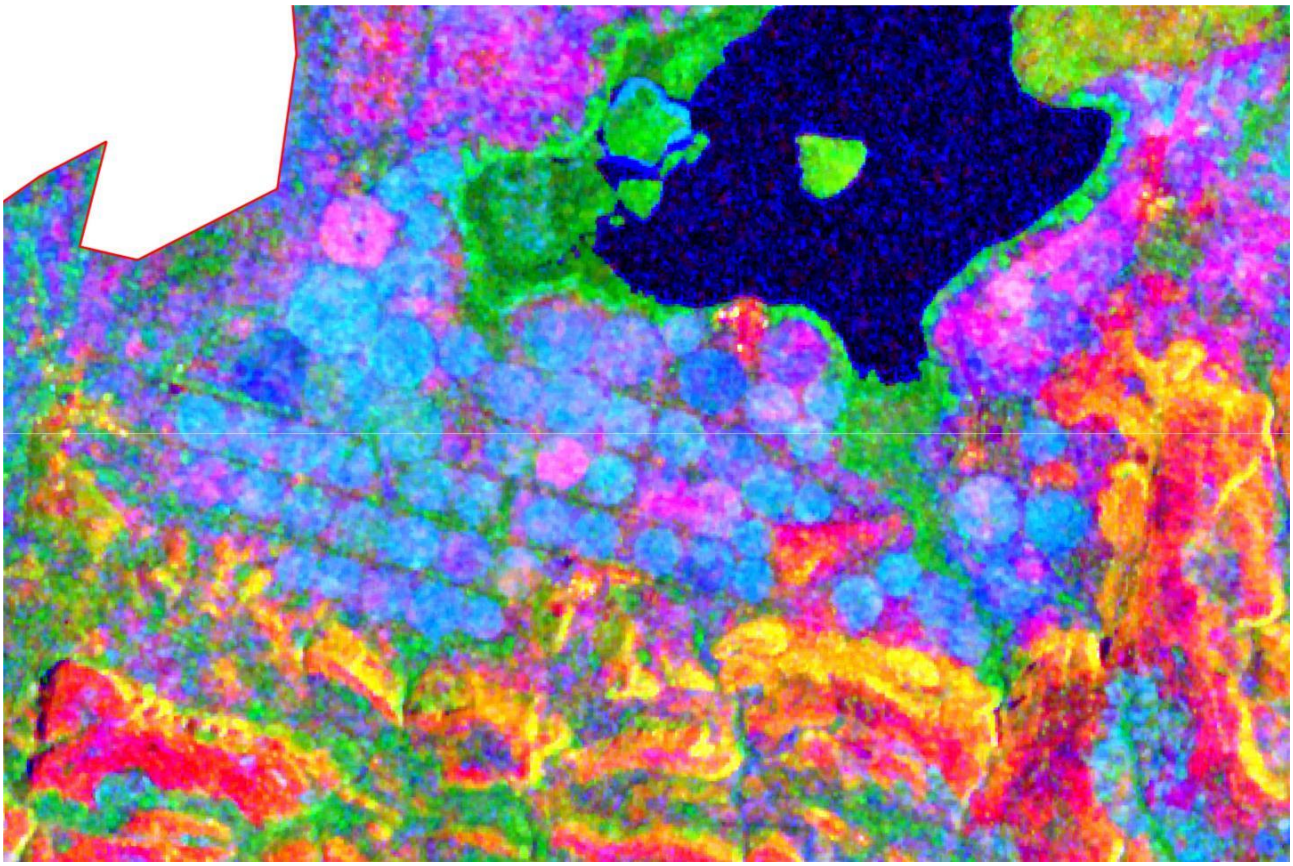
Source: SARMAP.

In the image it is possible to recognize different shades of colours that correspond to determined land cover types. Below is a brief description given for sake of clarity:

- strong green: forest
- yellowish green: perennial agriculture
- yellowish orange: highly green vegetation
- white/yellow: settlements and buildings
- cyan/red: agriculture
- cyan/green: agriculture (other crops)
- pink: open areas
- blue: water
- greenish blue: wetland/strong irrigated area.
- orange: open areas

It was interesting to note the area inside the black circle that appears slightly different if compared with the 2009 and 2016 images. In Figure 19, a zoom of this area shows the presence of particular patterns that indicates clearly the presence of an intensive agriculture activity, probably irrigation ramps.

Figure 20
Zoom of the SAR colour composite



Source: SARMAP.

Conclusions

Having analysed the data presented above, it can be concluded that although there was no evidence of a massive transformation of the examined area, it was still possible to find a general trend according to which relatively small areas were converted from natural vegetation to agriculture.

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ISBN 978-92-9072-913-6

IFAD internal printing services