Independent Office of Evaluation

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Ethiopia

Community-based Integrated Natural Resources Management Project in Ethiopia

IMPACT EVALUATION

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IFAD
Investing in rural people

Federal Democratic Republic of Ethiopia

Community-based Integrated Natural Resources Management Project

Impact Evaluation

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Photos of activities supported by the Community-based Integrated Natural Resources Management Project.

Front cover: A household supported for income and livelihood diversification with fruit trees and horticulture crop production, Chena Model Watershed.

Back cover: An example of aggravation of gully formation, when the maintenance of physical structures is not assured, and there is no provision for safe outlets for excess runoff, Chena Model Watershed (left); One of the three water pumps installed by the project, Tsebelu Watershed (right).

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Preface

This report presents the findings of the impact evaluation of the Community-based Integrated Natural Resources Management Project (CBINReMP) in Ethiopia, undertaken by the Independent Office of Evaluation of IFAD (IOE) in partnership with the International Food Policy Research Institute. This type of evaluation product draws from primary data collection using robust techniques to undertake analysis, and as such provides a solid body of evidence, which also benefits IOE's other products. The evaluation used a quasi-experimental approach and combined econometric and qualitative techniques. In addition, it used geo-spatial analysis to assess changes related to selected biophysical indicators.

The project's aim to enhance access by poor rural people to natural resources was highly relevant to the country and Amhara regional context, as land degradation was considered to be a major cause of declining agricultural productivity, food insecurity, and poverty of the country. The evaluation found a statistically significant increase in incomes and dietary diversity of households from watersheds where a higher number of integrated interventions were implemented. For the rest of the beneficiaries, however, the results were not different from those of non-beneficiaries, thereby showing that the overall economic impact of the project was limited. This limited impact on incomes was the result of an absence of coherence and synergies among activities, the lack of effective involvement of more vulnerable groups, the low investment of the project per beneficiary household, and the nature of natural resource management projects, which have a longer gestation period. Further, although climate change adaptation practices and technologies were successful, an opportunity was missed by not introducing them in all the 650 sub-watersheds.

Moving forward, the impact evaluation recommends adopting a Master Plan for integrated participatory watershed management as an effective rural development approach, to enable the involvement of all stakeholder groups in the management, planning and implementation processes. It calls for prioritizing the inclusion of women, youth and vulnerable groups, especially in the design and implementation of natural resource management interventions, where benefits can disproportionately accrue to those who own land or have more access to natural resources.

This impact evaluation was initially led by Shijie Yang, IOE Evaluation Analyst, with support from James Gasana, senior consultant, and Chiara Calvosa, consultant. Hansdeep Khaira, IOE Evaluation Officer, finalized the report. Internal peer reviews in IOE were conducted by Johanna Pennarz, Lead Evaluation Officer, and Fabrizio Felloni, IOE Deputy Director, who also ensured that the report met IOE's quality standards. Cristina Spagnolo, IOE Evaluation Assistant, provided valuable administrative support. IOE is grateful to IFAD's East and Southern Africa Division, both at headquarters and the in-country office, and the Government of Ethiopia, for their insightful inputs into the evaluation process and the valuable support they provided to the IOE mission.

I hope that the findings of this impact evaluation will enable IFAD's operations to contribute to the long-term sustainability of natural resources in Ethiopia and to the access to these resources by the poor rural people whose lives depend on them.

Indran A. Naidoo
Director
Independent Office of Evaluation of IFAD

The issue of heavy workload and long working hours in farm operations and household chores remained unaddressed by the project.

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Annexes

Currency equivalent, weights and measures

Currency equivalent

Currency unit = Ethiopian Birr (ETB)
1 US$ = 29.343 ETB (September 2019)

Weights and measures

1 ton	=	1,000 kg
1 hectare (ha)	=	2.47 acres

Abbreviations and acronyms

AECID	Spanish Agency for International Development Cooperation
ANRS	Amhara National Regional State
AWPB	annual work plan and budget
BoANR	Bureau of Agriculture and Natural Resources
BoARD	Regional Bureau of Agriculture and Rural Development
BoEPLAU	Bureau of Environmental Protection, Land Administration and Use
BoFED	Bureau of Finance and Economic Development
CBINReMP	Community-based Integrated Natural Resources Management Project
CCA	climate change adaptation
CCM	climate change mitigation
CHIRPS	Climate Hazards Group InfraRed Precipitation with Station Data
COSOP	country strategic opportunities programme
CWC	community watershed committee
EPLAUA	Environmental Protection Land Administration and Use Authority
GEF	Global Environment Facility
GIS	geographic information system
IFPRI	International Food Policy Research Institute
IGA	income-generating activity
IOE	Independent Office of Evaluation of IFAD
M&E	monitoring and evaluation
MTR	midterm review
ORDA	Organization for Rehabilitation and Development of Amhara
PCR	project completion report
PDR	project design report
PFM	participatory forest management
PMU	project management unit
RPCMU	regional project coordination and management unit
SLM	sustainable land management
SLMP	Sustainable Land Management Programme
SWC	soil and water conservation
TER	terminal evaluation report
TOC	theory of change

Map of the project area

Federal Democratic Republic of Ethiopia

Community-based Integrated Natural Resources Management Project

Impact evaluation

IFAD

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.

Map compiled by IFAD | 26-10-2020

Executive summary

A. Project background

1. In line with the IFAD Evaluation Policy and as decided by the Executive Board, in 2019-2020, the Independent Office of Evaluation of IFAD (IOE) undertook an impact evaluation (IE) (the seventh such evaluation to date). This was the first IE of a project principally concerned with natural resource management. The project selected was the Community-based Integrated Natural Resources Management Project (CBINReMP) in the Federal Democratic Republic of Ethiopia. In conducting the evaluation, IOE collaborated with a renowned international research institute, the International Food Policy Research Institute (IFPRI).

2. **The project.** The goal of the project was to reduce poverty for rural households in the Lake Tana watershed. The objectives were: (i) to enhance access by poor rural people to natural resources (land and water); and (ii) to improve agricultural production technologies, mainly through the adoption of sustainable land management practices. The project targeted all rural households in the Lake Tana watershed engaged in agriculture, a total of 450,000 rural households. The target group included farmers with landholdings averaging 1 hectare or less, the near landless, the landless, and women and youth, particularly unemployed.

3. CBNIReMP was implemented through four components: component A – community-based integrated watershed management; component B – institutional, legal and policy analysis and reform; component C – efficient and effective project coordination and management; and component D – climate change initiatives.

4. **Project costs and financing.** At approval, the total IFAD financing was US$13.12 million, which included a highly concessional loan of US$6.6 million and a Debt Sustainability Framework grant of US$6.6 million. Other sources of cofinancing included a grant of US$4.4 million from the Global Environment Facility, the Government's contribution of US$2.7 million, the beneficiaries' contribution of US$5.2 million, and a grant of US$1.77 million from the Spanish Agency for International Development Cooperation. The total project cost was US$27.31 million.

5. **Time frame.** CBINReMP was approved by IFAD's Executive Board on 30 April 2009 with a 7-year implementation period. The project was granted a no-cost extension of 18 months bringing the actual completion date to 30 September 2018 and the closing date to 31 March 2019.

6. **Implementation arrangements.** The implementation was under the responsibility of the decentralized regional administration of Amhara in collaboration with the Institute of Biodiversity Conservation, non-governmental organizations and community-based organizations under the guidance of the Ministry of Agriculture and Rural Development.

B. Evaluation objectives, methodology and process

7. **Objectives**. One of the principal aims of the IE was to provide evidence for the thematic evaluation of IFAD's support to smallholder farmers' adaptation to climate change. The other important aim was to gather robust evidence on the extent to which natural resource management projects with a strong focus on community participation influence the socio-economic situation of beneficiaries. The IE was intended to: (i) measure changes, positive or negative and direct or indirect, and their effect on individuals, households and communities, and ascertain whether this effect could be attributed to the concerned interventions; and (ii) identify the factors responsible for the performance of the project.

8. **Process.** The evaluation was conducted in collaboration with IFPRI because of the institute's research credentials, ownership of satellite data sources and country presence and experience in Ethiopia. The evaluation process included a scoping

mission and a qualitative assessment mission to finalize the sampling design, geo-spatial analysis design, and the questionnaire for the household and community surveys. An Ethiopia-based organization was selected to collect data through survey and focus group discussions.

9. **Methodology**. The IE used the full set of IOE project evaluation criteria, as stipulated in the IOE Evaluation Manual second edition (2015). Rural poverty impact was evaluated using four impact domains: household income and assets; human and social capital and empowerment; food security and agricultural productivity; and institutions and policies.

10. In the absence of proper baseline survey data, a quasi-experimental design method was used to estimate average treatment effects through comparison of beneficiaries and a control group. The IE used a variety of data collection methods to strengthen the rigour underpinning the results; quantitative and qualitative data, and a geographic information system (GIS).

11. The qualitative data were collected from 24 micro-watersheds with 416 respondents – comprising 360 men and 56 women – using a semi-structured questionnaire for the community focus group discussions and direct observation with ground-based photo monitoring. In addition, 10 key informant interviews were conducted. The quantitative data were collected at both the household and the community levels. The total sample size of the household survey was 1,665 households, comprising 887 treatment and 768 control households.

12. The IE followed a three-stage sampling strategy to draw sample households from treatment watersheds. A list of sample *kebeles*, watersheds and households were drawn randomly at each stage respectively. The control group community watersheds and households were selected from neighbouring treatment *kebeles*.

13. The evaluation also made use of agro-climatic and geo-spatial data to assess whether control or treated watersheds exhibited important differences regarding vegetation cover changes and soil water retention mapping (irrigation or other water management strategies).

14. The evaluation relied on matching estimates to control for initial heterogeneity between watersheds and households. Subsequently, to estimate the treatment effects, a doubly robust estimation method that combines propensity score matching (PSM) estimation and regression-based methods (PSM Weighted Regression) was used. This allowed the evaluation to better account for the observable individual characteristics that are correlated with project participation and the outcomes. The variables for the matching of treatment and control group cases were subsequently selected using the least absolute shrinkage and selection operator regression model, a method for selecting variables to be included in a regression in a way that maximizes predictive value.

C. Main findings

15. **Relevance**. The CBINReMP's objectives were highly relevant to the COSOP (2008) and IFAD's 2007-2010 Strategic Framework. The project's logic model was based on a comprehensive analysis of Lake Tana watershed problems and aimed to address land degradation. Thus, the objectives were relevant to the country and to the Amhara regional context, as land degradation was considered to be a major cause of declining agricultural productivity, food insecurity and poverty in the country. The project also aimed to address one of the major causes of land degradation, namely, land tenure security. However, despite the overall design clarity and appropriate adjustments made, several weaknesses remained. The design was ambitious, and activities were highly dispersed without definite pathways to impact. A master plan for an integrated landscape approach was absent, which would have strengthened planning and coherence among the interventions. Climate change adaptation activities were added without ensuring synergy and complementarity with other

interventions. No poverty-mapping exercise or vulnerability assessment was undertaken to justify selection and determine how best to ensure maximum participation of the vulnerable households.

16. **Effectiveness.** Overall, the achievement of outcomes related to the project's objectives was mixed. The project was expected to contribute to poverty reduction through three pathways. Pathway 1 aimed to enhance the climate resilience of watersheds. The effectiveness of this approach was uneven among the model and non-model watersheds. The model watersheds (five out of the 24 watersheds) were implemented by the Organization for Rehabilitation and Development in Amhara. In these watersheds, the evaluation found improved soil fertility and increased adaptation to climate change. However, similar results were not found in non-model watersheds.

17. Pathway 2 included participatory watershed management, reducing land degradation, deforestation, overgrazing and overexploitation of wetlands. The project contributed to the improvement of natural resource management by implementing 650 micro-watershed plans. It also successfully promoted the construction of soil and water conservation structures in off-farm degraded areas. However, the project used a piecemeal approach to achieve pathway 2 outcomes. For instance, more attention was paid to off-farm and less to on-farm conservation, and the trees planted to reduce deforestation were insufficient in number to offset the deforestation rate in the area.

18. Pathway 3 followed a socially inclusive approach combining natural resource management with improved economic livelihoods for vulnerable groups. Here, the project contributed to secure land tenure within natural resource management interventions. Land certificates created an institutionalized incentive for farmers and reduced land disputes. However, the project's contribution to agricultural production and sustainable livelihoods was limited due to its insufficient focus on on-farm soil and water conservation, farm inputs and forage production. The employment opportunities created for the vulnerable groups were also limited.

19. **Efficiency.** The project had an 11-month delay at start-up, which affected its disbursement path and implementation, leading to the 18-month extension. Disbursements were slow throughout the project life, mainly due to weak linkages between the regional and federal management units and the high turnover of staff. However, at completion, overall disbursement rates were above 90 per cent for all financiers and nearly 100 per cent for the IFAD funds. The cost per beneficiary household was US$87 spread over the almost 10-year period of the project. Cost-effectiveness was negatively affected for some activities. For instance, some of the structural soil and water conservation measures were not properly designed, while some of the physical structures were overdesigned and thus unable to be completed within the allocated budget.

20. **Rural poverty impact.** The evaluation assessed impacts related to household income levels, crop and livestock yields, women's empowerment, dietary diversity and empowerment of beneficiaries. Since the degree of participation of beneficiaries in the various project activities varied considerably across targeted watershed communities, the evaluation also looked at effects on high- and low-participation treatment groups to understand how gains from the project were distributed among beneficiaries.

21. The evaluation found that households with higher participation in project activities had significantly higher incomes than the non-beneficiary households. The incomes of high-participation households were, on average, 17.8 per cent higher than those of the non-beneficiary group. One reason for this was the higher milking cow productivity observed among the high-participation groups. Similarly, higher participation groups also had greater dietary diversity. Dietary diversity is especially

important among populations in the project areas whose starchy staple-based diets lead to micronutrient deficiency.

22. On the other hand, when all beneficiaries are considered (both high- and low-participation), the evaluation did not find statistically significant differences between the incomes of beneficiary and non-beneficiary groups. The limited project impact on incomes could be related to the nature of the project and the type of interventions and/or the low investment per beneficiary household. Natural resource management interventions have longer gestation periods and therefore it can take longer for associated income effects to become visible; at the time of this evaluation these had not materialized.

23. At the same time, analysis of geo-spatial data showed that there was an improvement in vegetation coverage over the 7-year period of observation. This greening of the watersheds over time could be associated with improved anti-erosion techniques or common land rehabilitation and might lead to improved livelihoods in the longer term.

24. **Human and social capital and empowerment.** The project created groups of beneficiaries to provide labour, but there was no true empowerment in terms of their participation in decision-making. The project mobilized beneficiaries into groups for carrying out community works (in return for "cut-and-carry" fodder from communal land). The evaluation's survey results showed that beneficiary groups spent visibly more time on communal terrace construction, cut-off drainage and tree planting than non-beneficiaries. The project however did not invest in supporting community-level institutions such as watershed management committees that could have played an important role in planning and implementing the activities that concerned them. Instead, planning was done through a top-down approach led by the Government and implementation was carried out through local extension systems that had little or no capacity.

25. **Institutions and policies.** The project contributed to enhanced stakeholder collaboration at various levels. It strengthened institutional coordination of regional agencies that have complementary mandates relating to integrated watershed management. Further, it provided an important case for the effective collaboration between regional government and a civil society institution on climate resilience-related interventions. However, the project did not implement the anticipated activities to support policy and regulatory reforms, and it missed the opportunity to address the long-term problem of overgrazing on communal lands.

26. **Sustainability of benefits**. The results achieved in terms of land ownership and rights to manage and use common land were a significant step towards sustainability. The enhanced capacity of government agencies, the increased sense of community ownership and sensitization on sustainable land management also contributed to sustainability. However, communities often do not have the tools, equipment or resources to maintain biophysical and vegetation structures. The income-generating activities are expected to be unsustainable in the absence of marketing analysis, clear rights of resource usage and sufficient private sector engagement. Finally, soil and land management principles are yet to be mainstreamed into regional policies, strategies and plans in order to sustain project benefits.

27. **Innovation**. The project operationalized for the first time the Government's guidelines related to mass mobilization of community labour for the restoration of degraded natural resources, but it also took the guidelines a step further by providing incentives in the form of rights to cut-and-carry fodder from communal land. This was innovative, given that past use of community labour in the country did not have such an incentive scheme. The smallholders also benefited from the innovative approach of including land certification as part of sustainable land management. On the other hand, innovations in the context of Amhara region such as introducing wetland management and conserving traditional crop species through gene banks

were respectively not implemented and not functioning at the time of the evaluation mission.

28. **Scaling up**. The mass mobilization approach had the potential to reach out to a larger number of communities, to increase their capacities and learn from the project, but this scaling-up process did not take place. The project design also anticipated that best practices in sustainable land management and natural resource conservation would be collected and disseminated for replication and adaptation, but the evaluation found no examples of experiences capitalized upon and disseminated beyond the project area.

29. **Gender equality and women's empowerment**. The provision of land certificates contributed to women's empowerment. Within the target area, almost all woman-headed households were provided with land certificates. Additionally, wherever family land was registered, co-ownership was assigned to both husband and wife. This guarantees equal rights and protects women's rights if their husbands divorce them or pass away. Women's empowerment was also visible in their role in household decision-making on land use and the income generated by the activities at the household level.

30. However, women's participation in income-generating activities was limited. This was partially due to the difficulty in mobilizing young girls, caused by low community awareness. Technologies introduced by the projects, such as biogas, energy-efficient stoves, and water-lifting technologies reduced women's workloads. However, the number of women benefiting could not be ascertained due to lack of gender-disaggregated data. Women's representation in decision-making bodies across the different *woredas* and *kebeles* was not visible. The land use committees, a requirement to ensure women's representation, were never formed. The evaluation's community survey further confirmed the low participation of women as watershed community members, showing that only 12 per cent of the members in the treatment communities were women, similar to the composition in control communities.

31. **Environment and natural resource management.** The project aimed to contribute to natural resource management through climate-smart approaches, improved governance of natural assets, and livelihood diversification to reduce vulnerability and build resilience. The project effectively supported climate adaptation practices such as changes in cropping pattern, forage cut-and-carry on enclosed areas and off-farm income-generating activities, which also contributed to more diverse livelihoods. The project contributed to an effective system of communal pasture governance through informal community by-laws and supported land registration through landholding certificates. Indirectly, land certification activities also reduced land degradation and decreased communal land pressure by supporting farmers' investments in their plots. However, area closures were not matched with complementary strategies and regulatory measures, leading to overgrazing on communal land. Similarly, the project did not support the creation of buffers to protect riverbanks or suitable agroforestry measures to mitigate sediment discharge into streams from adjacent agricultural croplands or livestock-grazing areas.

32. **Adaptation to climate change**. The project successfully supported adoption of climate-resilient farming practices, including the diversification of farming systems through fruit tree planting in a small number of micro-sheds. In these cases, there were clear linkages between adaptation and mitigation resulting from synergies between off- and on-farm activities, increased farming systems' resilience and improved ecosystem services. Beyond these model micro-sheds, the project made no attempt to introduce sustainable soil management practices, such as crop residue management or the rotation of cereal crops with legumes. The value added of the project compared with government-led mass mobilization for climate adaptation in agriculture was limited. The community survey shows marginal improvement of the

project communities in climate adaptation outcomes compared to the control communities, except for the reduction of flood risk.

33. **Performance of partners: Government**. The project was designed in collaboration with the Government and implemented through a participatory approach with strong involvement of government representatives at all levels. The direct implementation and close involvement of the structures of the Amhara regional government played an important role in developing the above sense of commitment at both the field and the regional level. On the other hand, collaboration between the Ministry of Agriculture and other related government agencies was less than optimal. The availability of local *woreda* staff charged with the responsibility of overseeing activities was limited because they had other competing assignments. There were also challenges related to financial accounting, due to lack of adequate capacity of the project management unit (PMU). Although, the PMU was generally responsive to recommendations made by the supervision missions and proactive in solving implementation issues, it was set up late and generally reported a high staff turnover throughout the life of the project. This affected the overall performance, particularly as a result of the weak quality of the financial management and monitoring and evaluation (M&E).

34. **IFAD**. IFAD's implementation support was adequate to resolve implementation bottlenecks, and was based on a good understanding of the project area and a collaborative approach. IFAD reviewed procurement and annual workplans and budgets in a timely manner and there were no delays in responding to withdrawal applications. The supervision missions positively contributed to the project disbursement rates of 100 per cent and provided useful recommendations to improve project financial management. A strong country presence and the trust built with government stakeholders at different levels were also acknowledged by different partners. On the other hand, critical issues from the project design remained unaddressed and affected the overall effectiveness: absence of a master river basin management plan, over-complexity of component A, and a weakly designed targeting approach. Moreover, IFAD could have made more effort to deal with the delays in undertaking the baseline survey and make the M&E system work well.

D. Conclusions

35. **The high degree of participation in the project activities demonstrates that overall the project designed the right activities; however, it could not ensure equal participation for all.** The project implemented a wide range of activities focusing on participatory watershed management, pasture and forage development, soil and water conservation, and biodiversity and ecosystem protection. Beneficiaries who participated in a larger number of activities experienced perceptible income increases, but participation clearly varied across watersheds. This could be due to two reasons: one, the level or quality of implementation differed across watersheds, and two, the activities were simply too numerous to ensure full participation by all beneficiaries.

36. **The limited impact on incomes of beneficiaries is also related to the nature of natural resource management projects and the low investment per beneficiary household.** Although the goal of the project was to increase incomes of beneficiaries, this was essentially a natural resource management project aimed at improving access of the poor to natural resources and adoption of sustainable land management practices. Such interventions can have relatively longer gestation periods and therefore income effects take longer to become visible. It is likely that at the time of this evaluation, these either had not materialized or were too small to be detected using the statistical power of the sample. It is also likely that the relatively low cost per beneficiary household did not result in perceptible changes to their incomes. The project did promote some income-generating activities but the magnitude of this activity was quite limited.

37. **There was a lack of coherence and synergies among the different activities; this was partially caused by the absence of a master river basin management plan.** While a micro-watershed was an appropriate level for participatory watershed management implementation, watershed management analysis and planning should have been undertaken at the river basin level. As land uses in the Lake Tana watershed include upland agriculture and lowland agriculture landscapes, tree plantations and forests, and grazing land, a master management plan based on an integrated landscape management approach would have ensured a comprehensive rehabilitation of natural resources, including on-farm and off-farm lands.

38. **The success of climate change adaptation practices and technologies showed that an opportunity was missed by not introducing it for on-farm production improvement in all the 650 sub-watersheds.** Climate is a cross-cutting issue and was considered as such when the need to add a component to the design of the project was felt. The approach of implementing this component through technology clusters in five model micro-watersheds was a good choice, given that the selected technologies were already known. However, an opportunity for implementing climate-related activities in all project areas was missed. Further, the model micro-watersheds were not used as start-up areas to train the extension agents who would disseminate those technologies to the greatest possible extent in their assigned *woredas*, based on the principle of action-learning.

39. **While the project improved women's access to land certificates, little evidence was found that the project significantly empowered women and youth**. Inclusion of women and resource-poor young people is of paramount importance for watershed development to become truly participatory in both implementation and impacts. In this regard, the project provided important support for land certification rights for women. However, project design and implementation did not have a strategy for targeting women's needs. Women participated in project activities alongside men, but they were not sufficiently represented in watershed committees, which weakened their role in community decision-making. Similarly, the project failed to make an impact on youth, for example though income-generating activities, entrepreneurship, or organizing them into cooperatives.

40. **The nature of the project and its design made it challenging to evaluate impact.** The wide geographical reach, covering 650 watersheds, and the large number of activities required an enormous amount of data to be collected to track and report through the project M&E system. As a result, the system was not able to cover all relevant aspects and some gaps existed. For example the M&E system provided incomplete information about targeted watershed communities and lacked distinct lines between the project's interventions and the support provided to communities through other mechanisms. This, along with the selection biases because of non-random placement (targeting) of the project, self-selection of beneficiaries, possible spatial spill-over effects of project benefits to non-treatment communities and the project's phased roll out, posed obstacles in conducting the IE.

E. Recommendations

41. **Recommendation 1. Adopt a master plan for integrated participatory watershed management as an effective rural development approach, to enable the involvement of all stakeholder groups in the management planning and implementation processes.** The holistic nature of an ecosystem requires holistic management since one sector's activity can affect another. A master plan could serve as a framework for the design of an integrated approach to maximize the coordination, complementarities and synergies of implementation efforts from different parties. A livelihoods vulnerability assessment should inform the process for its elaboration to understand the stress factors on the farming systems and natural resources in the watershed, and the capacities of the rural households to cope with those stresses on their assets. It is also recommended that

watersheds be developed in clusters defined by the demarcation of the drainage areas within the wider watershed. The key criterion to be used for selecting the micro-watersheds is that the intervention should be essentially a community-organized process.

42. **Recommendation 2. Watershed management projects should prioritize the inclusion of women, youth and vulnerable groups in the design and implementation of the management plan of their watersheds.** Watershed development projects tend to be biased in favour of those who own and have access to land and other productive resources. Without attention to the poor and landless, inevitably the greatest benefits will flow to those who are relatively better off. Hence, it is important to develop farm typologies based on adequate poverty and livelihoods analysis, including gender analysis, to identify context-specific women's needs and to determine the most effective pathways for change. To increase equity between landless, nearly landless and farmers with land, a differentiated targeting approach to the vulnerable groups should be provided. Linking livelihoods to natural resource development objectives is key, and opportunities should be sought/provided for those marginal groups, balancing technical objectives with consideration of social inclusion and equality.

43. **Recommendation 3. For projects that have their principal focus on natural resource management, align the length of the project's duration with the time frame of the watershed management plan in order to fully see the effects on beneficiaries' incomes.** Results from natural resource management interventions can take longer to come to fruition than results from other interventions, and the expected effect on income may not always be visible immediately after the project's completion. This does not allow time for undertaking course-correction, if needed, and also limits learning from the project. Allowing for sufficient implementation time for such projects can be one way to see a fuller effect on incomes before a project's completion, and this can be achieved by ensuring that the duration of the project is at least as long as the time frame required for the implementation of a major part of the master plan.

44. **Recommendation 4. When adding new cross-cutting components to a project after its implementation has already started, ensure that they are holistically integrated into the project rather than appearing as a separate project implemented in a fragmented manner.** When adding components and activities to a project already under implementation with the aim of addressing a cross-cutting theme, avoid introducing them through a separate and geographically targeted component, but rather ensure their full integration in all project components where relevant. In order to integrate the added intervention in the existing project strategies, a review and possible revision of the theory of change is of the utmost importance. In the case of an added cross-cutting component such as for climate change adaptation, the revision of the design should set clear foundations for its integration, including clarifying how impact pathways take into consideration both the new and the existing components. It would also require appropriate implementation assumptions, not only with regard to the participatory involvement of target communities, in the case of watershed development, but also contribution to the enabling policy framework.

45. **Recommendation 5. The design of watershed management projects should embed M&E elements that can better facilitate impact studies.** It is important to better track where projects will be implemented, where they will not, and the reasons for those decisions. In this manner, when conducting IEs, one can control for those differences in analysis, and the unobservable component of potential programme placement bias is minimized. Another element that can help ex post impact evaluation of projects like CBINReMP that have a wide reach and relatively high number of activities is to track which type of interventions take place in which project areas (in this case, in which watersheds). Finally, to conduct good quality

geo-spatial analysis, an accurate depiction and delineation of project boundaries – in this case watersheds – through digitization of existing physical watershed boundary maps to filter out non-agricultural land from imagery at a localized level, is crucial.

IFAD Management's response[1]

1. Management welcomes the overall findings of the impact evaluation (IE) of the Federal Democratic Republic of Ethiopia's Community-based Integrated Natural Resources Management Project (CBINReMP), conducted by the Independent Office of Evaluation of IFAD (IOE).

2. Management agrees with the report's assessment of the overall performance of the project as moderately satisfactory (4). Evidence is provided that beneficiaries experienced improved incomes, especially in those areas where there were high levels of participation. Management agrees with the observation that natural resource management interventions have longer gestation periods and therefore it can take longer for associated income effects to be visible. Nonetheless, the project successfully supported adoption of climate resilient farming practices and climate adaption practices. Management notes that the wide geographical scope and range of implemented activities made it challenging to properly evaluate the impact.

3. The evaluation has provided IFAD with valuable lessons. It is recognized that with new designs more emphasis will be placed on simplifying components and ensuring holistic integration of newly added components/activities in later stages of the project cycle. Most notably, ensuring the inclusion of women, youth, and the vulnerable groups in the design and implementation of the management plan of their watersheds cannot be overemphasised.

4. Management agrees with the view that the project has been implemented with overall strong government participation and regional leadership, although with staffing shortages and a high staff turnover especially in the early years. An important lesson learned was to ensure inter-service coordination between Amhara National Regional State (ANRS) agencies, which have complementary mandates in the various aspects of natural resource management, and rural development.

5. Management welcomes the recommendations of the IE, which have, and will continue, to contribute to improving country programme performance. Management's views on the proposed recommendations are as follows:

    a) **Recommendation 1. Adopt a Master Plan for integrated participatory watershed management as an effective rural development approach, to enable the involvement of all stakeholder groups in the management planning and implementation processes.**

    Agreed. Management agrees that the use of the master plan as a framework for the design of an integrated participatory watershed management project maximizes the coordination, complementarities, and synergies of implementation efforts from different parties. Watershed management planning also enables multi-phase programming that facilitates investment at scale. A similar mechanism is now being piloted under the Lowlands Livelihood Resilience Project (LLRP), where inclusive and participatory analyses and consultations serve to develop comprehensive range management plans that can serve as entry points and basis for planning strategic investments and livelihood support initiatives in the various units. Moving forward, the planned new investment under IFAD12 can build on the lessons from this and similar approaches in other national programmes.

[1] The Programme Management Department sent the final Management's response to the Independent Office of Evaluation of IFAD on 15 January 2021.

b) **Recommendation 2. Watershed management projects should prioritize the inclusion of women, youth, and the vulnerable groups in the design and implementation of the management plan of their watersheds.**

Agreed. Management acknowledges the importance of this recommendation to leverage IFAD's comparative advantage, namely; targeting the poorest and most vulnerable groups in rural areas. Particular emphasis should be placed on mechanisms to target, monitor and enable the most vulnerable groups to actively participate and benefit from the project interventions. In this context, in the second phase of the Participatory Small-Scale Irrigation Development Programme (PASIDP), under which the natural resources management practices of CBINReMP have been included, a more deliberate targeting strategy is being implemented, including pilot application of household methodologies and activities targeted specifically at the rural youths. The new design for financing under IFAD12 will build on this further and specify a practical pathway to ensuring that key target groups receive the special attention they require to ensure inclusive community wide participation to deliver effective outcomes for IFAD's key target groups. The above mentioned participatory entry-point for LLRP is expected to deliver valuable lessons on the effective use of community-based processes to deliver targeted outcomes on households' livelihoods.

c) **Recommendation 3. For projects that have their principal focus on natural resource management, align the length of the project's duration with the time frame of the Watershed Management Plan in order to fully see the effects on beneficiaries' incomes**

Agreed. Management acknowledges that incomes of smallholder producers will only change significantly once investments to improve watershed management are implemented. Reduced runoff and soil erosion translates into improved soil texture, water and nutrient retention and soil fertility. This process can take years depending on the degree of degradation and techniques used for restoration/rehabilitation. Based on the experience of CBINReMP, beneficiaries started to reap the economic benefits by the end of the seven-year project, particularly when there were higher levels of participation. In this context, Management agrees that aligning project duration with watershed management plans is important and should be reflected in design. In Ethiopia, IFAD and the Government have adopted a programmatic approach, as recommended and agreed within the 2015 Country Programme Evaluation. Notably, the new investment under IFAD12, will continue to build on the previous phases of PASIDP, especially to strengthen institutional aspects and business capacity development within a watershed management approach. Of particular interest, PASIDP II is currently exploring ways to pilot payment of ecosystem services as part of its approach, in order to secure a sustainable water flow, which is expected to be further integrated in the IFAD12 investment.

d) **Recommendation 4. When adding new cross-cutting components to a project after its implementation has already started, ensure that they are holistically integrated into the project rather than appearing as a separate project implemented in a fragmented manner.**

Agreed. Management would like to point out that this recommendation has already been reflected in the COSOP 2017-2021. Small-scale irrigation and pastoral community development requires a more holistic perspective, including a full watershed approach, improved natural resources management and emphasis on access to finance, markets and technologies to improve economic sustainability. This will also be addressed in the new COSOP to be drafted in 2021. Furthermore, IFAD will continue to proactively apply the restructuring policy and pursue additional financing to integrate emerging activities into ongoing projects in a holistic and

seamless manner. An example was the Pastoral Community Development Project (PCDP III) which was restructured in 2018 to accommodate additional financing. This involved a comprehensive review of outputs and outcomes, as well lessons and targets, for all activities across financing sources to determine a fully consistent and holistic implementation plan until completion.

e) **Recommendation 5. The design of watershed management projects should embed M&E elements that can better facilitate impact studies.**

Agreed. Management acknowledges that it is important to accurately track and document which type of activities happen where through geo-spatial data collection methods. Not only to assess the effects by evaluating the impact (ex post), but even more to enable Project Management Units (PMUs) to capitalise on best practices during the projects lifetime. Over the recent years, IFAD's country team has strengthened its capacity to enhance monitoring and evaluation (M&E) capabilities of PMUs. Besides regular supervision missions, continuous technical and operational support has been provided through periodic M&E sessions, additional trainings, and technical assistance missions (e.g quality assurance and MIS development for PASIDP II). IFAD has introduced innovative methods, such as Sensemaker and the Poverty Probability Index (PPI), into PMU's M&E systems, to foster learning and greater attention to the analyses of outcomes and impact.

6. Management commends IOE for a thorough and comprehensive evaluation. Management remains committed to internalizing the IE findings and lessons learned to further improve the performance of IFAD-funded programmes in Ethiopia.

Federal Democratic Republic of Ethiopia
Community-based Integrated Natural Resources Management Project
Impact Evaluation

I. Evaluation objectives, process and methodology

1. **Background.** In line with the IFAD Evaluation Policy and as decided by the Executive Board, the Independent Office of Evaluation of IFAD (IOE) undertakes one impact evaluation every year. In addition to contributing to the repository of impact evaluations, each successive IE harnesses internal learning by taking cognizance of the experience of its predecessor in its design.[1] In 2019–2020, IOE undertook its seventh impact evaluation in partnership with the International Food Policy Research Institute (IFPRI). The project selected for the IE is the Community-based Integrated Natural Resources Management Project (CBINReMP) in Ethiopia. The project was selected using a comprehensive selectivity framework.[2] The goal of the project was to reduce poverty. Its objectives were to enhance access by poor rural people to natural resources (land and water), and improve agricultural production technologies, mainly through the adoption of sustainable land management (SLM) practices.

2. **Objectives of the evaluation.** The overall goal of the impact evaluation for CBINReMP was to assess how the project performed, understand the reasons for its performance and, in so doing, provide policy-relevant information for the design and implementation of future IFAD-funded projects. The main objectives of the evaluation were to:

   i) measure and establish if the project interventions had a welfare effect on individuals, households and communities, and whether this effect could be attributed to the concerned interventions. To this end, an attempt was made to evaluate all effects – positive or negative, direct or indirect, intended or unintended;
   ii) identify which factors were responsible for the performance – both successful and unsuccessful – of the project; and
   iii) provide evidence for the thematic evaluation of IFAD's support to smallholder farmers' adaptation to climate change.

3. The results of the evaluation are expected to contribute to better-informed decision-making and learning about successful approaches to increased incomes and reduced poverty and to promote greater accountability for the performance of IFAD-supported projects. In particular, this Impact Evaluation contributes to provide evidence about performance on natural resource management, watershed management and overall climate change adaptation (CCA) initiatives, which also enriches the current literature by adding more empirical evidence. It also adds to IFAD's database of impact evaluations, thus strengthening IFAD's empirical knowledge of the agricultural and rural sectors.

4. **Process.** The steps followed in this impact evaluation are outlined below:

   i) A preliminary assessment of the project was conducted, involving creating a data inventory and reviewing the methodology of the impact assessment conducted by the project. This was followed by a desk review of project

[1] This impact evaluation builds on IOE's experience with impact evaluations in Kenya (2018) and Georgia (2017).
[2] Based largely on the selectivity framework, IOE normally undertakes impact evaluations of projects within three years of their completion date and that: (i) are not selected for impact assessment by IFAD Management; (ii) will also be included as part of the project portfolio analysis in forthcoming Country Strategy and Programme Evaluations or corporate-level evaluations, to enhance the latter's evidence base; (iii) have innovative development approaches (e.g. institutional, social, technological) that merit deeper analysis and documentation; and (iv) offer enhanced opportunities for learning about what works and what does not in promoting sustainable and inclusive rural transformation.

documentation and an online discussion with IFAD's country director and other relevant IFAD staff.

ii) Collaboration was sought with IFPRI to conduct the study considering IFPRI's research credentials, ownership of satellite data sources to complement the absence of robust baseline data, and country presence and experience in Ethiopia.

iii) A scoping mission to Ethiopia was undertaken to meet with IFAD and key project staff in Addis Ababa.

iv) A qualitative assessment mission was undertaken using a semi-structured questionnaire for the community focus group discussions among 24 micro-watersheds.[3] The findings from this mission and the project data collected helped to finalize the sampling design, geo-spatial analysis design, and the questionnaire for the household and community surveys.

v) A competitive bidding process was launched to select a company to undertake the quantitative data collection; an Ethiopia-based organization was selected. The company undertook a household survey and also conducted a semi-structured community survey at the watershed management committee level under the supervision of IFPRI and IOE. The data was analysed by IFPRI in collaboration with IOE.

vi) With the preliminary survey findings after the data analysis, IOE had planned a validation mission to discuss its preliminary results within IFAD and with the Programme Management Department and government authorities in April 2020. However, due to the COVID-19 pandemic and the related travel restrictions, the mission could not be undertaken as planned. The validation was undertaken remotely by IOE and IFPRI, with the support of IFPRI country office staff.

vii) The draft of the impact evaluation was internally peer-reviewed in IOE, subsequent to which the first draft was shared with IFAD and the Government. All relevant comments were addressed, and a final report was prepared.

5. The **theory of change** (ToC) was the point of departure for this impact evaluation (displayed in Annex III). It articulates the causal pathway from outputs to outcomes (short and medium to long term) and finally to impact. To reconstruct the ToC, the evaluation used the information from the project design report (PDR), interviews and field visits during the missions, but also drew many elements from discussion with key stakeholders in the country. It was presented for validation in the first debriefing on preliminary findings. The goal of the project was to reduce poverty and its objectives were to enhance access by poor rural people to natural resources (land and water), and improve agricultural production technologies, mainly through the adoption of SLM practices. Accordingly the ToC highlights three pathways to reach the goal and objectives of the project, as described in Annex II, which are: (1) Pathway 1: "Farming practices; (2) Pathway 2: "Watershed management"; and (3) Pathway 3: "Improved livelihoods".

6. **Methodology**. Following guidelines of the IOE Evaluation Manual second edition (2015), impact was evaluated using the four impact domains under rural poverty impact criterion: (i) household income and assets; (ii) human and social capital and empowerment; (iii) food security and agricultural productivity; and (iv) institutions and policies. This is an ex-post impact evaluation conducted after completion of the

[3] Lake Tana's inflow comes from four perennial rivers: Gilgel Abbay, Megech, Gumara, and Rib River. Each river gets its inflow from its basin, which comprises sub-basins determined by the major tributaries. In the terminology used for Lake Tana watershed system by Abebe (2014) and Bogale (2020), a sub-basin comprises several watersheds, and depending on further ramifications of lower-level tributaries, these watersheds comprise sub-watershed and micro-watersheds (see Annex taken from Abebe, 2014) (see Annex X). CBINReMPs field activities were conducted at watershed, sub-watershed and micro-watershed levels. The three terms will be used in the text depending on the relevant level for the analysis.

project activities. Lacking proper baseline survey data of beneficiary communities and households, the evaluation used a quasi-experimental design method to estimate average treatment effects through comparison of beneficiaries and a "control" group (for details, see the section below under "Impact evaluation design: data and methodology").

7. The other criteria evaluated were: relevance, effectiveness, efficiency and sustainability of benefits; gender equality and women's empowerment; innovation and scaling up; environment and natural resource management; adaptation to climate change; overall project achievement; and performance of partners (IFAD and Government). In line with the Evaluation Manual, the above criteria were rated on a scale of 1 to 6, with 6 representing highly satisfactory and 1 highly unsatisfactory.

Impact evaluation design: data and methodology

8. The impact evaluation used a mixed-method approach. Both quantitative and qualitative data were collected, with the latter being collected prior to quantitative data collection to help inform the design of the quantitative survey. Moreover, the qualitative data were used to inform the interpretation of the quantitative results. Additionally, a geographic information system (GIS)-based method was used to assess the biophysical indicators as outlined in the ToC. Overall, the evaluation was divided into two phases: a qualitative assessment phase conducted in September and October 2019; and a quantitative assessment phase with the survey data[4] and geo-spatial data carried out in March 2020. The detailed methodology of the quantitative assessment and sampling design are presented in Annex IV, a discussion of descriptive statistics is presented in Annex V, and results and lessons learned are presented in Annex VI. Similarly, for the qualitative survey, a separate summary report documenting in detail the findings are available in Annex VIII. Relevant findings have been incorporated into the main body of this document.

9. **Qualitative assessment and data.** The qualitative data analysed in this report were collected from 21 September to 15 October 2019 among 24 micro-watersheds in the Amhara region with 416 respondents (360 men and 56 women).[5] In addition, 5 out of the 24 watersheds were implemented by the Organization for Rehabilitation and Development in Amhara (ORDA) under Component D- adaptation to climate change. Two survey instruments were used: (i) a semi-structured questionnaire for the community focus group discussions; and (ii) a direct observation form with semi-structured questionnaire and ground-based photo monitoring. In addition, 10 key informant interviews were conducted.

10. The qualitative assessment used a stratified sampling (i.e. *woreda*[6] and types of intervention) to select the micro-watersheds. The **analysis** of the qualitative data entailed a manual synthesis of questionnaire notes using thematic, content, and narrative analyses to provide a robust picture of different aspects.

11. **Quantitative assessment and data**. The quantitative data were collected at household and community levels. The total sample size of the household survey was 1,665 (887 treatment households and 768 control households).

[4] Since the watersheds implemented by ORDA were not well spread in Lake Tana Watershed, random sampling could not be carried out, and hence the quantitative survey only sampled Bureau of Agriculture-led 650 watersheds. However, the five watersheds under ORDA were separately assessed by the qualitative survey.
[5] Among the 24 focus group discussions, 12 were conducted by the IOE-IFPRI team, together with a national consultant, and the other 12 were conducted by the national consultant using the same survey instruments.
[6] The Amharic term *woreda* means district. It is a third-level of the administrative division of Ethiopia after zones which in turn are divisions of the regional states.

12. The IE followed a three-stage sampling strategy to draw sample households from treatment watersheds.[7] A list of sample *kebele*s,[8] watersheds and households was drawn randomly at each stage, respectively.

13. The control group community watersheds and households were selected from a list of non-intervention *kebeles* neighbouring the selected treatment kebeles (based on similarities in agro-ecological conditions). Following the establishment of the sample frame for control group communities, the same three-stage sample selection procedure was followed for the control group sample selection (Table 1).

Table 1
Sampling design and distribution

Description	*Treatment group*	*Control group*	*Total sample*
Number of *woredas*	14	14	28
Number of *kebeles*	37	31	68
Number of watersheds	74	64	138
Number of households	887	768	1,665

Note: Of the 1,674 households identified from the sampling frame for interview, 1,665 were available and willing to complete the household survey, implying a response rate of 98.9 per cent.

14. **Questionnaires and survey implementation.** The community-level data were collected from 136 sample micro-watersheds. One key informant (typically head of household) was interviewed for collecting the household-level data, while several respondents were sought to provide the information relating to the community survey questionnaire (typically, two members of the community watershed committee, one or two elders from the community, and women and youth representatives).

15. **Geo-spatial data**. The evaluation also made use of agroclimatic and geo-spatial data to assess whether control or treated watersheds exhibited significant differences regarding vegetation cover changes, soil water retention mapping (irrigation or other water management strategies) or were impacted by relative annual rainfall differences.

16. Due to the unavailability of the shapefiles,[9] new watershed area data were created. The total sampled watershed area was "re-created" from the watershed centroid GIS coordinates and information provided by respondents to the community questionnaire: distance from the north to south edge, proxied by walking time.[10]

17. To capture changes in the landscapes due to interventions, the evaluation utilized satellite remote-sensing images from MODIS, LandSat and a derived dataset called

[7] CBINReM was implemented in watersheds covering four zones (West Gojjam, Central Gondar, South Gondar and Awi) around the Lake Tana sub-basin. Specifically, the project covered 24 intervention *woredas* or districts. Only the land certification component was implemented in all the five *woredas* of South Gondar zone, and implementation took place at the *kebele* level with no information on the list of watersheds covered by the project within these *kebeles*. Thus, the quantitative impact assessment was limited to the 17 *woredas* with watershed-level information on implementation activities. Within these 17 *woredas*, the project reportedly reached about 177 *kebeles* and 527 community or micro-watersheds; these *kebeles* and micro-watersheds constituted the sampling frame for treated or project watersheds.

[8] The Amharic term *kebele* means ward. The *kebele* is a fourth-level of the administrative division of Ethiopia after the *woreda*.

[9] According to the PDR, interventions for all targeted 650 watersheds were designed using geo-spatial information. However, none of the area shapefiles needed to geographically identify micro-watersheds could be provided by the project managers or local authorities.

[10] Given the application of a uniform walking time, imposed boundary form and typical variations in respondent estimation, these estimates should be taken with a fair degree of possible error. For instance, although watersheds should be discrete objects, many watersheds had overlapping boundaries or centroids that did not seem to conform to topography. This has implications for treatment and control groups since they were subsequently modelled, in some instances, as overlapping. Regardless of these limitations, remote-sensed data was derived from these rectangles and consists of five major variables: time trend, variation of cropping patterns, mean and median of observed annual observed greenness, and relative rainfall variation.

Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS). Table 2 provides a summary of key remote sensing data collected and analysed using the satellite images.

Table 2
Description of remote-sensed variables (2013–2019)

Name	*Description*	*Interpretation*
NDVI(*)/NDWI(**) Slope	Univariate time-series regression estimate	Time trend (positive increasing—negative decreasing)
NDVI/NDWI Standard Deviation	Distribution of observations from mean	Are variations of cropping patterns (water retention) larger/smaller?
Mean	Global mean value	Average observed greenness / rainfall (annual)
Median	Global median value	Average observed greenness
Precipitations sum (annual)	Total annual rainfall during the m*eher* crop season	Measures relative rainfall variation

(*) Normalized Difference Vegetation Index is an index that measures the state of plant health based on how the plant reflects light at certain frequencies, given that some waves are absorbed and others are reflected. A zero NDVI value means no vegetation and close to +1 (0.8 - 0.9) indicates the highest possible density of green leaves. (**) Normalized Difference Water Index is a satellite-derived index from the Near-Infrared (NIR) and Short Wave Infrared (SWIR) channels. The SWIR reflectance reflects changes in both the vegetation water content and the spongy mesophyll structure in vegetation canopies, while the NIR reflectance is affected by leaf internal structure and leaf dry matter content but not by water content (Gao, 1996).

18. One caveat is that as the data capture the entire watershed and do not allow for spatial heterogeneity within the watershed (i.e. individual plots), the statistical analysis is restricted to statistical differences contrasting treatment and control watersheds. Owing to these limitations, the geo-spatial data are used to provide complementary, contextual information to interpret the results of the quantitative impact assessment based on the household survey data but could not be directly used for the estimation of the treatment effects.

Identification of sources of bias strategy

19. To evaluate the impact of the project on household income, agricultural productivity, and other social and economic indicators, the impact evaluation attempted to account for potential observable sources of selection bias. In doing so, the impact assessment had to face the challenges identified in the previous section:

    a. selection bias because of non-random placement (targeting) of the project;
    b. self-selection of project beneficiaries;
    c. possible spatial spillover effects of project benefits to non-treatment communities; and
    d. a phased roll-out approach.

20. Firstly, to account for the non-random placement of the project, the evaluation assured control for the observable community-level characteristics and geographical attributes that were exogenous to the project. However, it acknowledges that the evaluation cannot account for all possible unobservable confounders. Secondly, in the context of this evaluation, all households living within the targeted watersheds were considered as beneficiaries, so the results can be considered as "intent-to-treat" effects. Hence, self-selection of the beneficiaries to take part in the community watershed activities was not a sampling challenge.

21. Thirdly, since project interventions were planned at the *kebele* level, they could have benefited both targeted and non-targeted watersheds within a treated *kebele*. The evaluation checked for the potential spatial spillover effect due to the *kebele*-level planning. It did not find any systematic pattern that could point at significant spillover

effects owing to the project's design (as the results show in Annex VI, Table A.1). Lastly, it was not possible to account for any influence of the phased roll-out of the project interventions. Only post-project information of beneficiary households, community characteristics, and overall benefits they received were available, but not how or when they were phased in.

22. An additional challenge was to identify a proper control group in light of the way beneficiary watersheds were selected. As stated above, the initial selection of watersheds gave priority to those with higher perceived resource degradation. As explained further below, control group watersheds were randomly selected from a list of non-project watersheds. Since the non-project watersheds would likely face less resource degradation, this could influence the assessed outcomes, given possible difference in key initial conditions. To account for this potential "mismatch" in conditions between treatment and control group, the household and community survey questionnaires included questions regarding the (perceived) state of natural resource degradation at the start of the project (10 years ago), and this information was used in the matching procedure, minimizing such differences.[11]

23. The evaluation relied on matching estimates to control for initial heterogeneity between watersheds and households, based on the probability of a watershed and household participating in CBINReMP conditional on the watershed's observable co-variates. Subsequently, to estimate the treatment effects, a doubly robust estimation method was used that combines propensity score estimation and regression-based methods (PSM Weighted Regression) (Wooldridge, 2007; Wooldridge, 2010). The doubly robust estimation method allowed the evaluation to better account for the observable individual characteristics that are correlated with project participation and the outcomes, while assuming that unobservables are also balanced between the participants and control group on average.

24. **The first step consisted of matching treatment and control groups at the watershed/community level.** Since each *kebele* was assumed to include a pool of qualified micro-watersheds and households possessing similar characteristics as those of project communities and households, the community-level propensity score was adopted to find counterfactual communities outside the project area but either within the same *kebele* or a control watershed from neighbouring *kebele*. A restriction was applied to the communities within the same district to assure geographical similarity and spatial proximity between project watersheds and potential control watersheds. Matching parameters were derived from the community-level data.

25. Selection of the matching variables was undertaken with due caution because if the project's objectives were met, some of the variables might have changed because of the project. Since CBINReMP was a nine-year project, it might have affected virtually any variable one could think of at the household level, including variables that are often used in matching models such as household demographic characteristics, asset holdings or production variables. Therefore, it was decided that variables measured in the community survey would be used, since they largely reflected pre-treatment variables that could be measured. Since the community or watershed level was the targeted unit of intervention, it made sense to also develop propensity scores at that level. After controlling for these variables, the remaining variation in characteristics of watersheds should be considered as approximately random, rather than due to unobservable differences between selected and control watersheds.

26. The variables for the matching of treatment and control group cases were subsequently selected using the Lasso regression[12] model. The Lasso model is a

[11] Given the long period, some caution is needed in interpreting recall values.

[12] The Lasso (least absolute shrinkage and selection operator; also Lasso or LASSO) regression is a regression analysis method used to carry out both variable selection and regularization in order to enhance the prediction accuracy and interpretability of the resulting statistical model. The term was coined by Robert Tibshirani (1996).

method for selecting variables to be included in a regression in a way that it maximizes predictive value.

27. **The second step was to use the propensity scores to estimate the predicted probability of inclusion for each watershed.** For each individual in a watershed, the propensity score indicates the predicted probability that the household belongs to a treated watershed community rather than to a comparison group of non-treated watersheds. The propensity scores P are then used as weights for the comparison observations; that is, while each treatment observation receives a weight of one, the control-group observations receive a weight $\frac{P(X)}{1-P(X)}$. The intuition is as follows. Watersheds that have observable characteristics indicating that they are not likely to be chosen as participants receive very low weights in the regression, whereas observations with observable characteristics suggesting that they should be good comparisons to treatment observations receive a great deal of weight. By placing higher weights on non-recipient observations that have characteristics more like participants and lower weights on non-participants that have characteristics less like participants, observable characteristics were balanced between participants and non-participants, even if they were unbalanced before weighting. Using the weights, a balance test among observable characteristics – both those included in the propensity score estimation and those that were not – was conducted to ensure that observable characteristics were balanced after applying the weights based on propensity scores. Details on the variables included in propensity scores and a balance table for observables prior to treatment are included in Annex VI (Table A.2).

28. **Testing for treatment or degree of participation.** The project implemented wide range of activities focusing on participatory watershed management, pasture and forage development, soil and water conservation, and biodiversity and ecosystem protection. However, evidence shows that the degree of participation in the various project activities varied considerably across targeted watershed communities. Thus, the Rural Poverty Impact section further explores this impact heterogeneity by distinguishing between "high-" and "low-participation" treatment groups based on the degree of participation in a project-related activity.

29. **Limitations.** The impact assessment faced challenges, which in turn created some limitations for the present evaluation. First and foremost, the lack of a proper baseline survey,[13] incomplete information of the treated watersheds, and often lack of clear distinction lines between the project's interventions and support provided to communities through other mechanisms made it very difficult to identify the true impact of CBINReMP. For this reason, although the project may have had indirect effects, not all effects may have been captured or reported in this document.

30. Four additional challenges had to be faced: including possible selection biases because of non-random placement (targeting) of the project, self-selection of project beneficiaries, possible spatial spillover effects of project benefits to non-treatment communities, and the project's phased rollout. As discussed earlier, the first three challenges could be addressed to a large extent. The last challenge could not be addressed having only an after-the-project survey to undertake the impact assessment.

[13] When projects are not randomized, having baseline data becomes essential. Ideally, the baseline data collection can then be used later in efforts to match participants or participant communities with like members of the control group. In this impact evalution, to overcome this challenge, as mentioned above, matching was undertaken using uncomfortable assumptions about the types of variables that would not have changed and using recall data, which are subject to well-known errors such as telescoping.

II. The project

A. Context

31. **Country context**. Ethiopia is a landlocked country with a land area of 1.13 million km^2 and a very diverse topography. It is the second most populous country in sub-Saharan Africa with about 80 million people, 90 per cent of whom live in the highlands, which constitute about 50 per cent of the total land area. The country's economy experienced a strong, broad-based growth averaging 10.3 per cent a year from 2006/07 to 2016/17, compared to a regional average of 5.4 per cent. Industry, mainly construction, and services accounted for most of the growth,[14] while poverty reduction was driven primarily by agricultural growth and the Government's basic service provision and rural safety nets. Poverty rates declined from 55.3 per cent in 2000 to 33.5 per cent in 2011 (World Bank). Nevertheless, Ethiopia is still one of the poorest countries in the world, with an annual per capita income of US$170. It ranked 169th out of 177 countries on the 2007–2008 Human Development Index. Poverty is evenly distributed throughout the country, with a Gini coefficient of 0.2515 and roughly 44 per cent of the country's population living below the national poverty line, although differences exist between rural and urban areas. Ethiopia's economy is highly vulnerable to climate change and rainfall variability. It is estimated that unless steps to build climate resilience are effective, climate change will reduce Ethiopia's gross domestic product (GDP) growth by 0.5 per to 2.5 per cent each year.[16]

32. **Agricultural and rural development sector context.** The agriculture sector accounts for about 42 per cent of total GDP and is characterized mainly by rainfed (95 per cent), low-input low-output subsistence farming systems. Smallholder farmers account for about 96 per cent of total agricultural production. Despite relatively high growth over the past decade, the agriculture sector is still characterized by its subsistence nature and low productivity. The reasons for the low productivity are many and complex and include: severe land degradation, poor farming practices, deforestation causing severe erosion, population pressure (both human and livestock), perceived insecurity of land tenure, and variable rainfall.[17] Agricultural systems are highly dependent on climate and, therefore, are vulnerable to extreme climate events. According to a World Bank estimation, droughts alone can reduce GDP by 1 to 4 per cent, and rising population densities are placing added pressure on these fragile ecosystems through land degradation. Hence, environmental degradation, as exhibited in land and water resource degradation together with biodiversity loss and forest loss, represents a key challenge. Ethiopia loses some 2 billion tons of fertile soils annually to land degradation,[18] and the siltation of water bodies is already a major threat to irrigation development.[19] Recent estimates using satellite imagery show that land degradation hotspots over the last three decades cover about 23 per cent of the land area in the country.[20] Agricultural productivity has continued to decline, especially in the highlands, which was largely attributed to poor land management practices that have led to severe land degradation.[21] Much of the increase in agricultural production can be attributed to expansion, often into marginal areas with lower production potential and on hillsides, resulting in soil erosion and land degradation.[22] About one third of rural households farmed less than 0.5 ha in rainfed agriculture, which was insufficient to produce enough food to meet the intake requirements of the average household. Most

[14] http://www.worldbank.org/en/country/ethiopia/overview.
[15] PDR, 2009.
[16] CSPE, 2016.
[17] PDR, 2009.
[18] National Action Plan to Combat Desertification.
[19] PDR, 2009.
[20] Gebreselassie, Kirui and Mirzabaev, 2016.
[21] CSPE, 2016.
[22] PDR, 2009.

agricultural production was used to meet household consumption needs, and most households experienced a prolonged "food gap" during the pre-harvest period.

33. The urgent need to address some of these issues provided the rationale for IFAD's involvement in development assistance to Ethiopia with through CBNIReMP.

B. Project objectives, target, components and costs

34. **Project objectives.** Different project documents defined the goal and objectives differently. The goal of the project was to reduce poverty for about 450,000 rural households in the Lake Tana Watershed (President's Report, Financing Agreement, and PDR). However, this was reduced to 312,000 households in part of the PDR (2009) and later carried throughout the project lifetime until the project completion report (PCR).[23] The Global Environment Facility (GEF) project identification form also defines the objectives differently.[24]

35. The President's Report formulated two objectives as follows: (i) to enhance access by poor rural people to natural resources (land and water); and (ii) to improve agricultural production technologies, mainly through the adoption of SLM practices.[25]

36. Both the PDR and the President's Report defined the policy and institutional objectives as: (i) to promote integrated watershed planning and SLM and to mainstream the experiences and lessons learned into regional and national agricultural development policies and strategies; and (ii) to establish a participatory process for land administration and land-use planning, promote secure land tenure to reinforce a sense of ownership, and improve institutional capacity at community, village, district and regional levels.

37. Based on these objectives, the project sought to identify and remove barriers to SLM by promoting and mainstreaming best practices that would restore and improve natural resource conditions. Measures to be introduced were to include conservation agriculture, agroforestry, controlled grazing, erosion control, improvement of grazing lands and afforestation. Alternative rural energy sources, conservation of energy, and employment opportunities outside agriculture were also be promoted.

38. **Components.** At approval, the project had three components: (i) community-based integrated watershed management; (ii) institutional, legal and policy analysis and reform; and (iii) efficient and effective project coordination and management. A fourth component was added in 2011 through additional financing by the Spanish Agency for International Development Cooperation (AECID) to support climate change initiatives. Subsequently, CBNIReMP was implemented through four components, as follows:

39. *Component A: community-based integrated watershed management*. It aimed at promoting sustainable natural resource management within the Lake Tana Watershed through: (a) improved land administration and certification for all rural households in the 21 districts of the Lake Tana Watershed ; (b) watershed planning and management in 13 *woredas* covering 650 micro-watersheds for a total area of 227,500 ha; (c) establishment of a database of existing land use patterns and natural resources; (d) improved pasture and forage management in 630 sites covering 9,450 ha of communal grazing lands; (d) rehabilitation of 18,900 ha of degraded community forests; (e) participatory forest management (PFM) covering some

[23] The right understanding of this discrepancy is that the total number of project stakeholders is 450,000 farming households that would all benefit from land certification support, while 312,000 is the subgroup that is targeted by other project integrated development activities, which are its purpose.

[24] The project objectives identified in GEF Project Identification Form (2007) are: To increase household income in Lake Tana Watershed through Sustainable Land Management (SLM) practices. This encompass creating an enabling environment for SLM, strengthening tenure security and addressing the problem of household energy, while improving land productivity and ecosystem integrity and simultaneously conserving globally significant biological diversity and protecting international water sources.

[25] The PDR defined the project's objective in the main text as "to combat land degradation in the LTW through the introduction of natural resource conservation measures and the promotion and upscaling of sustainable land management practices". However, it did not take this definition in the logical framework in its Annex 1.

10,000 ha in five sites of public forests; (f) off-farm soil and water conservation measures to rehabilitate 32,500 ha; and (g) biodiversity conservation.[26]

40. *Component B: institutional, legal and policy analysis and reform*. It aimed at creating an enabling environment and institutional capacity at local (*kebele*, *woredas*/district, and regional) levels to mainstream SLM principles into regional policies, strategies and plans for agriculture, forestry and water management. This was expected to be achieved through: (a) strengthening the capacities of public institutions and community-based organizations; (b) training about 25,000 unemployed youths and women to undertake off-farm income-generating activities (IGAs) and linking them to IFAD-financed rural finance and agricultural market projects for access to finance and markets; and (c) reviewing policies and legal framework for natural resource management and environmental conservation, and enacting reforms.

41. *Component C: efficient and effective project coordination and management.* It aimed at supporting general project coordination, daily implementation of activities and reporting as well as overall project financial management. Linkages with other ongoing development programmes, particularly at national level, were supposed to be developed and promoted under this component.

42. *Component D: climate change initiatives.* It aimed at mainstreaming climate change in the project activities and was articulated into two subcomponents: adaptation to climate change; and mitigation of climate change.

43. **Project area.** The project area comprised the entire Lake Tana Watershed (LTW) in the Amhara National Regional State (ANRS) with 21 *woredas* and 347 *kebeles*. Lake Tana's elevation is approximately 1,800 metres, its surface approximately 3,000 km^2 with an average depth of 9 metres and accounts for almost half of total water surface in the country. LTW covers 15,000 km^2, of which about 55 per cent was cultivated land, 21 per cent water bodies, 19 per cent grasslands and shrub-land, and 0.4 per cent natural forest cover. The project area was also characterized by encroachment on fragile hillsides, insecurity of land tenure, population pressure which increased land fragmentation, and biomass energy dependence which deprived soils of organic materials.[27]

44. **Target group**. At design, the target group comprised all rural households in LTW engaged in agriculture for a total of 450,000 rural households (or approximately 2.25 million people, equal to 13 per cent of the region's total population). However, raising the incomes of some 312,000 households living in the watershed area was explicitly stated in the project's goal.

45. The target group included farmers with landholdings averaging 1 ha or less, the near landless, the landless, as well as women and youth, particularly unemployed. In addition, approximately 25,000 unemployed youth, including women, were expected to benefit from IGAs and employment opportunities outside agriculture. This was meant to be achieved through synergies to be developed with two other IFAD-funded investments in rural finance and agricultural marketing.[28] The main characteristics of the target group were: annual household per capita income of US$80 or less; marginal food security; limited access to agricultural inputs; and high vulnerability to climate change effects, particularly soil erosion. However, according to the PCR and findings from the qualitative assessment, all residents in the targeted watersheds were counted as beneficiaries, while the information of direct beneficiary

[26] In the midterm review, this component was reformulated under seven subcomponents: (a) Participatory watershed management; (b) Improved pasture and participatory forest management; (c) Off-farm soil and water conservation; (d) On-farm soil and water conservation; (e) Biodiversity and ecosystem conservation; (f) Participatory integrated wetland ecosystem conservation; and (g) Land certification.
[27] 2009 IFAD Project Design Report.
[28] The Rural Financial Intermediation Programme (2001–2010) and the Agricultural Market Improvement Programme (2004–2010).

was absent or no systematic household targeting approach was used at the community level[29] (for details see the Relevance section).

46. **Programme costs and financing.** At approval, total IFAD financing of CBINReMP was US$13.12 million, comprising a highly concessional loan of US$6.6 million and a Debt Sustainability Framework (DSF) grant of US$6.6 million. Other sources of cofinancing are detailed in the two tables below and include the following: a grant of US$4.4 million from the GEF; the Government's contribution of US$2.7 million including duties and taxes; beneficiaries' contribution of US$5.2 million mainly in the imputed value of labour time and materials; and an AECID grant of US$1.77 million. The total financing from IFAD, GEF and AECID was US$19.37 million, and the total project cost was US$27.31 million, which is an average investment of US$87.53 per household.

47. At completion, the following disbursements were reported: IFAD loan of US$6.6 million; IFAD DSF grant of US$6.6 million; GEF grant US$3.97 million; AECID grant US$1.64 million; Government counterpart funds of US$1.16 million; and beneficiaries' contribution estimated at US$34.26 million. The total actual cofinancing by the donors was US$18.81 million, and total project costs US$54.23 million. As reported by the GEF terminal evaluation report (TER), the GEF grant was fully integrated into the CBINReMP IFAD investment, and the annual work plan and budgets (AWPBs) were also fully integrated into project reporting, processes and structure.

Table 3
Project costs: estimated amount and actual expenditures by source of contribution (US$ million)

Source of funding	*Type of financing*	*Estimated amount (US$ m)*	*Estimated amount (% of total)*	*Actual expenditure (US$ m)*	*Expenditure (% of total)*	*Disbursements (% of estimated amount)*
IFAD	Loan	6.60	24%	6.60	35%	100%
IFAD	DSF Grant	6.60	24%	6.60	35%	100%
GEF	Grant	4.40	16%	3.97	21%	90%
AECID	Grant	1.77	6%	1.64	9%	93%
Total cofinanciers		*19.37*	*71%*	*18.81*	*100%*	*97%*
Government		2.71	10%	1.16		
Beneficiaries		5.23	19%	34.26		
Total		**27.31**	**100%**	**54.23**		

Source:[30] Progress review and MTR for estimated amounts; IFAD reporting systems and PCR for actual amounts.

[29] For example, the biogas in some watersheds was targeted at those who have more livestock.
[30] When inconsistencies are found, IFAD's reporting systems are used as the preferred source.

Table 4
Estimated amount and actual expenditures by component (US$ million)

Components	*Planned (US$ m)*	*Planned amount (% of total)*	*Actual amount (US$ m)*	*Actual (% total)*
A. Community-based watershed management	19.29	71%	39.80	73%
B. Institutional, legal and policy analysis and reform	3.15	12%	4.11	8%
C. Project coordination and management	3.05	11%	6.19	11%
D. Climate change initiatives	1.82	7%	4.12	8%
Total*	**27.31**	**100%**	**54.23**	**100%**

* Includes all sources of financing including national government and beneficiaries.
Source: PR and MTR for estimated amounts; IFAD reporting systems and PCR for actual.

C. Project implementation

48. **Time frame.** CBINReMP was approved by IFAD's Executive Board on 30 April 2009 with a seven-year implementation period. IFAD financing was signed between the Government of Ethiopia and IFAD on 19 June 2009 (Loan No. 777, Grant No. 8032). It became effective on 17 March 2010, with 31 March 2017 and 30 September 2017 as the initial completion and closing dates, respectively. On 20 December 2016,[31] the project was granted a no-cost extension by 18 months to allow the completion of some activities, bringing the actual completion date to 30 September 2018 and the closing date to 31 March 2019. In addition, the AECID financing was granted a three-year extension, bringing its completion date from December 2014 to March 2017. Both extensions were justified to allow the termination of key activities, which suffered delays at start-up. Consequently, CBINReMP's overall implementation was around 10 years.

49. **Changes during project life.** Several changes took place during project implementation:

- Adjustments introduced within Component A without changing the activities by the 2015 MTR:[32] (i) a rearranging of some project subcomponents, merging the activities between subcomponents A.3 (off-farm soil and water conservation) and A.4 (on-farm soil and water conservation) into one subcomponent A.3; (ii) moving the off-farm employment opportunities activities from component B into component A and renaming it subcomponent A.4; (iii) revising some logframe targets; and (iv) reallocated the budget among all 10 categories of expenditures for all three lines of financing (i.e. IFAD, GEF and AECID);[33]
- Three amendments to the financing agreement: (i) loan proceeds re-allocation on 5 December 2012 to allow the reallocation of funds among categories of expenditures and the addition of new categories of eligible expenditures; (ii) extension of completion and closing dates on 20 December 2016; and (iii) reallocation of unallocated funds as of 13 March 2017 in order to smooth the related project implementation; and
- At operational level, the main change relates to the undertaking of the baseline survey, which took place only after two years of the project's life and did not include two watersheds.

50. **Implementation arrangements.** CBINReMP was designed to be implemented as a stand-alone project with linkages to the flagship Sustainable Land Management Programme (SLMP) of the Government, cofunded by several donors. The

[31] Ref. 2016 Amendment to financing agreement.
[32] MTR Report and PCR.
[33] MTR Appendix 4.

implementation of all four components was under the responsibility of the decentralized regional administration in collaboration with the Institute of Biodiversity Conservation, NGOs and community-based organizations under the guidance of the Ministry of Agriculture and Rural Development. Within the regional administration, the three main implementing agencies identified at design were the Regional Bureau of Agriculture and Rural Development (BoARD)[34] the Environmental Protection, Land Administration and Use Authority (EPLAUA), and the Bureau of Finance and Economic Development (BoFED).[35] The Regional SLM platform, chaired by BoARD's head, was to be established providing opportunities for knowledge-sharing between the local and national levels. The project oversight was to be provided by the CBINReMP regional steering committee chaired by the Head of BoARD, which was expected to be a member of the SLM platform, with the aim of ensuring coordination between the project's activities and national SLM policies. The regional steering committee was to include heads of other regional bureaus in order to facilitate knowledge exchange and synergies. The Project Coordination Unit was to be established in BoARD, and focal points from BoFED and EPLAU were to be appointed to work in collaboration with project management unit (PMU) staff at regional, zonal and *woreda* levels.

51. Community participation was a strong feature in the project design and related implementation arrangements. It was foreseen at an early stage of commencement of project activities, particularly for the watershed management and land-titling activities which, at design, envisioned a thorough consultative process with targeted communities. However, mission findings reported a rather supply-driven process (discuss in the Relevance section).

52. **Implementation progress.** CBINReMP experienced significant delays at start-up. This was due to the complexity of the project design, PMU understaffing, late receipt of funds from the federal level and bottlenecks in the Government's approval process (particularly at the level of the national SLM Platform), which in turn caused delays in receiving approvals.[36] Despite the initial delays, adjustments that were made positively affected project implementation, which was judged as satisfactory by the MTR and PCR. In particular, the community-based integrated watershed management and adaptation to climate change components made significant achievements by the end of project's life. With reference to component B and the activities related to institutional, legal and policy analysis and reform, progress has been slow overall. For example, the Regional Conservation Strategy and the Regional Action Plan for Combating Desertification were developed later than originally foreseen. With reference to linkages between physical and financial performance, some inconsistencies were highlighted by the MTR,[37] which were consequently settled. Overall, adjustments made throughout implementation show the responsiveness and flexibility of the project to retain relevance, particularly vis-à-vis government priorities and beneficiaries' needs.

53. Overall, implementation progress benefited from direct implementation by the structures of the Amhara regional government. This, in turn, generated a strong sense of ownership by the regional administration structures, from regional government to *kebele*.

54. **Project monitoring and evaluation.** At design, the establishment of a results-based monitoring and evaluation (M&E) system was set as a condition for the approval of the AWPB from the second year of project life. CBINReMP's M&E system was not set up in time, and its less-than-optimal quality posed challenges in terms

[34] PDR. However, the PCR refers to the Ministry of Agricultural and Natural Resources and the regional Bureau of Agriculture and National Resources (BoANR).
[35] Ethiopia is a federation of nine regional state governments and two chartered cities. The key government institutions consist of line ministries and bureaux at the federal and regional levels, respectively (Source: 2008 COSOP).
[36] MTR.
[37] Some financial execution was not updated and the related physical activities not reported.

of adequately tracking the project's outreach and achievements. Baseline data collection also experienced significant delays and was not completed until 2014.

55. The logframe developed at design presented the following issues: (i) outcomes for components were not defined,; (ii) higher-level linkages between project outputs and goal were not clearly established; (iii) logframe indicators were not time-bound; (iv) indirect or proxy indicators were not provided in situations where it was not possible to observe and measure project results directly; and (v) assumptions were not adequate with regards to external conditions that needed to be met for changes to happen along the causal pathways.[38] In addition, linkages between IGAs and watershed management activities were found to be indirect.[39] The IOE Country Programme Evaluation of Ethiopia highlighted the problem that CBINReMP's results framework inexplicably incorporated targets for SLMP as a whole rather in terms of what CBINReMP would contribute. Clearly, the SLMP targets would only be achieved beyond the CBINReMP.[40] Several adjustments to the logframe were requested by the MTR to introduce measurable targets and harmonize them. Improvements to the project's M&E system were subsequently acknowledged by the 2017 supervision mission.

56. **Project outreach and delivery of outputs.** CBINReMP's target group at design consisted of 450,000 rural households. Specifically, the project was expected to contribute to raise incomes of 312,000 households living in the LTW. At completion, the project overall benefited 908,075 households (against the 450,000 targeted), but no clear figure was reported regarding the specific target of 312,000 households.[41] With reference to the number of women benefiting from project activities, it should be highlighted that a gender disaggregation is not clearly reported in the project's physical progress table but only in some Results and Impact Management System indicators.

57. Overall outreach effectiveness was satisfactory for all components. Most targets were met under component A and, in several cases, exceeded. Outputs under component B were below expectations. Finally, outreach effectiveness under component D was generally higher than originally envisaged. Less positive results were generally reached for the IGAs and the involvement of women and youth.

58. Project delivery of outputs is summarized in the two tables below. Table 5 presents the comparison of selected project outcomes as set at appraisal versus results reported in the PCR and mission findings. Table 6 provides a sample of gender-disaggregated data.

[38] For example, assumptions like "Minimum internal or external shocks" and "No significant increase in effects of climate change, i.e. flooding, drought" for the Purpose, and "Stabilization of or reduction in livestock population" and "No major institutional restructuring" for the Outputs, are ambiguous as far as informing on pre-conditions for achieving impacts is concerned.

[39] 2017 IFAD supervision mission.

[40] Considering that CBINReMP would meet its objectives, the Country Programme Evaluation considers Strategic Objective 1 objective to be met in spirit.

[41] The project's outreach is reported in the project documents for each component and most of the subcomponents with a clear indication of achievement rate vis-à-vis the appraisal targets.

Table 5
Comparison of selected project outcome indicators

	Appraisal targets	*PCR outputs*
Households reached	312 000	908 075
Youths and women groups organized and supported for income-generating activities	25 000	10 133
Land under improved management practices (ha)	117 520	217 661
Wetland management plans developed	29	19
Village/community plans formulated	650	650
Watershed plans completed	650	650
Self-help group trained and engaged in alternative income-generating activities	25 000	10 133
Rehabilitation of seriously degraded communal land (ha)	32 500	23 949
Farmland treated with soil and water conservation (ha)	125 125	143 990
Demonstrated improved pasture management (ha)	8 055	6 379
First-level land certifications issued	282 305	287 704
Second-level land certifications issued	1 100	9 577
Regional strategies, policies and legislation revised	6	4

Table 6
Selected gender-disaggregated data

	Appraisal targets	*PCR outputs*
People receiving services promoted or supported by the project		
Males	1 045 350	2 114 796
Females	1 024 650	1 761 160
People trained in natural resource management		
Males	19 475	35 572
Females	9 334	17 061
Government officials and staff trained		
Males	4 010	8 349
Females	1 198	3 016
People in savings and credit groups formed		
Males	1 850	2 495
Females	660	1 316

Source: PCR-Results and Impact Management System

III. Main evaluation findings

A. Project performance and rural poverty impact

Relevance

59. IOE defines relevance as 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.

60. **Relevance of objectives.** CBINReMP's objectives were highly relevant to the country and Amhara regional context, as land degradation was considered to be a major cause of declining agricultural productivity, food insecurity and poverty of the country. The project's objectives were meant to be achieved mainly through components A and D, which tackled several causes of watershed degradation, including: overexploitation of farmlands and high livestock densities which led to soil compaction, impeding regeneration of vegetation and accelerating sheet, rill and gully erosion and general loss of vegetation cover. Achievement of these objectives was linked to the intention to develop institutional capacity at all levels (from *kebele* to central government) and revise regional strategies, policies and legislation to mainstream SLM under component C. This latter objective is considered relevant within the project area severely affected by land degradation, but also in the whole country.

61. **Alignment with national policies.** CBINReMP's objectives were relevant and aligned with the national policies of ensuring food security and combating poverty. At the time of its design, the Government of Ethiopia was promoting the Plan for Accelerated and Sustained Development to End Poverty for 2005 to 2010, which placed agriculture and SLM at the centre of its development agenda. CBINReMP contributed to the following objectives of the plan in the agriculture sector: market-based agricultural development; specialized support services for differentiated agroecological zones; and special efforts for pastoral development. The project was also in line with Ethiopia's Climate Resilient Green Economy Strategy,[42] which calls for "Promoting area closure via rehabilitation of degraded pastureland and farmland, leading to enhanced soil fertility and thereby ensuring additional carbon sequestration (above and below ground)". With reference to the project area, CBINReMP's primary objective was fully aligned with and responsive to the Amhara Regional Conservation Strategy (1999), specifically with its objectives of improving land tenure and fostering a participatory approach to land use planning.

62. **Coherence with other donor projects.** CRBINReMP's objectives were fully aligned with the Government's SLMP of the Government of Ethiopia, a flagship programme with the objective of reversing land and environmental degradation.[43] They were also coherent with those of other donors' initiatives in the country grouped under the umbrella of the national SLM Platform established by the Government and chaired by the Minister of Agriculture. Other donors involved in the SLMP in the Amhara region included the World Bank, KFW Development Bank, Canadian International Development Agency, the European Union and Deutsche Gesellschaft für Internationale Zusammenarbeit. In addition, since its design, CBINReMP was conceived as a constituent part of the Strategic Investment Programme for Sustainable Land Management in sub-Saharan Africa coordinated by the GEF.

63. **Relevance to the COSOP and IFAD strategies.** Project objectives were coherent with the 2007–2010 IFAD Strategic Framework and the 2008 COSOP in that they intended to enhance access of poor rural people to: (i) natural resources (land and

[42] Federal Democratic Republic of Ethiopia (2011). Ethiopia's Climate-Resilient Green Economy - Green economy strategy. https://www.undp.org/content/dam/ethiopia/docs/Ethiopia%20CRGE.pdf.
[43] SLMP was a multi-donor programme for a total of US$150 million to support the Government's efforts in alleviating poverty and mainstreaming SLM practices.

water); and (ii) improved production technologies and support services. To a lesser extent, the project contributed to the third COSOP strategic objective (reliable financial services made available to poor rural households) by strengthening savings and credit groups and indirectly by supporting land tenure for men and women.

64. **Relevance of project design.** The project's logic model was based on a comprehensive analysis of Lake Tana watershed problems and the needs of the local communities. The project design document presents an in-depth analysis of rural development in general in Amhara and Lake Tana Watershed health in particular. Specifically, watershed was characterized by poor agricultural practices, deforestation and overgrazing in the context of high and increasing population pressure, increased land fragmentation, encroachment on fragile hillsides, overexploitation of wetlands, insecurity of land tenure, and dependence on biomass energy. One of the major causes of land degradation was the lack of land tenure security, which discouraged investments in land improvements and encouraged overexploitation of communal land and natural resources.[44] The design addressed this issue by providing support to land tenure security. Although improved land tenure is not sufficient for the sustainable use of natural resources, improved land tenure security in Ethiopia has proven necessary. Empirical research results reported by Yirga (2008)[45] showed that land tenure significantly increases the probability and intensity of soil conservation efforts as measured by physical soil and water conservation (SWC) structures in Ethiopia's highlands. Furthermore, public assistance with sharing costs of these structures, and access to information on soil degradation are essential for farmers to make a long-term investment in SLM.

65. **Design changes made during project implementation were appropriate in simplifying implementation and seeking better synergies.** During project implementation, some changes were made to the project's scope. Firstly, with the funding from AECID, the design was updated and adapted to the changing context, with the need to take into account CCA and climate change mitigation (CCM). Component D was added to support adaptation to climate change and, through this, the project promoted climate-smart crop production systems, improved livelihoods, and alternative/renewable energy sources and alternative energy technologies such as biogas and improved cook stoves. Secondly, the merger of subcomponent A.3 (Off-farm soil and water conservation) and subcomponent A.4 (On-farm soil and water conservation) reduced the reporting workload. Lastly, all activities related to off-farm employment opportunities and IGAs from all other components/subcomponents were moved to A.4; this further simplified the design and improved implementation efficiency.

66. **Despite the overall design clarity and appropriate adjustment made, several design weaknesses remained.** Firstly, component A was complex, with eight subcomponents showing a high dispersion of activities. It covered a range of interventions spanning multiple themes at the LTW level, which did not show clear pathways to impacts. Such a dispersion reduced focus and brought in risks for project implementation. It posed challenges to the availability of expertise for implementation and required either a complex project management structure or complex implementation partnerships. Indeed, as confirmed by project supervision reports, the complexity of the project design, supplemented with a lack of capacity, partially caused a slow start-up.[46] Furthermore, as respective indicators in the Logical Framework show, the Project was developed with a focus on the technical aspects of rehabilitation of degraded land, in order to address the immediate causes of land degradation in LTW. This focus was highly relevant to the context. However,

[44] Ali, D. A., Deininger, K. & Goldstein, M. (2014); and Deininger, K. & Jin, S. (2006).
[45] Yirga, C. (2008). Land tenure security and adoption of natural resource management technologies in Ethiopia. Holetta Agricultural Research Center, EIAR, P.O. Box 2003, Addis Abeba, Ethiopia. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.520.7831&rep=rep1&type=pdf.
[46] For example, participatory forest management started at slow pace since it was a new concept in the region, and there was no forestry expert assigned to the project to guide the implementation of related activities.

strengthening resilience to climatic shocks did not translate into the design until the addition of Component D.

67. **Secondly, the absence of a master river basin management plan[47] weakened the planning and coherence among the micro-watershed interventions.** The analysis made in the project documents showed Lake Tana Watershed development to be highly relevant. Realizing this importance, the adequate level for watershed management analysis and planning would be the river basin level according to the landscape pattern, while the micro-watershed is the appropriate level to plan participatory watershed management implementation.

68. Lake Tana's inflow is fed by four perennial rivers: Gilgel Abbay (Little Nile River), Megech River, Gumara River and the Rib River. As these rivers' watersheds are under multiple uses, the longitudinal downstream and lateral river dynamics and impact are amplified by the interactive land uses in sub-watersheds. These land uses include upland agriculture and lowland agriculture landscapes, tree plantations and forests, and pasturelands, whose management requires an integrated landscape approach. The high intensity of their interaction is the main factor for sedimentation in the lake. Therefore, addressing the health of the lake requires appropriate management of the upstream land use mosaics. The Lake Tana watershed management master plan would be the glue that bonds the long- term ANRS commitment to continue considering regional environmental and developmental impacts in its long-term strategies. As pointed out by other watershed studies, giving priority to local people is a good step. Still, many people were being called on to make decisions without seeing the broader picture. To avoid some of the risks of misusing the participatory approach, there was need for the intermediate levels – regions and districts – to adopt a science–participatory approach in treating watersheds from a holistic perspective (Bonnal, 2005).

69. The project design included the establishment of a database to document and map existing land use patterns and the overall status of land degradation in the Lake Tana Watershed. The data would then be used to prioritize the implementation of watershed management and treatment plans. Although the database was completed and stated as being of good quality, hardly any use was made of this concrete geo-referenced information in the selection and prioritization of field interventions. By the time the evaluation started, the shapefiles of the data were missing.

70. **Thirdly, component D was added without synergy and complementarity with other interventions, which limited the extent of CCA practices in the project**. Component D was added through financial support from AECID, and was then implemented like a separate project by the Organization for Rehabilitation and Development in Amhara, although it was geographically complementary. While it was highly relevant to the global, national and regional contexts in light of increasing awareness of the impacts of climate change, it lacked an adequate identification and appropriate integration in the project design. Opportunities were also missed to introduce measures that were identified for SLM in the PDR such as conservation agriculture, agroforestry, controlled grazing, and improvement of grazing-land practices in a wider area.

71. **Fourthly, the design lacked activities to monitor the hydrological effects of SWC and land rehabilitation interventions on river flows and Lake Tana silting.** This was a significant gap because the project was premised, among other environmental benefits, on the hypothesis that by managing Lake Tana watershed, there would be improvements in the hydrological regulation of rivers flowing into the lake. Soil erosion is a powerful land degradation process in LTW; it provides significant flows of solid material to water channels and streams of the watershed. The quantity of these materials in water runoff increases in the rainy seasons, due to agropastoral activities and continued loss of vegetation cover. The accumulations

[47] Or more operationally, a master plan for each of the four Lake Tana river basins.

of soil erosion materials have negative impacts on downstream farmlands and is a factor of Lake Tana sedimentation and turbidity. Consequently, it is important to have measurements of seasonal variations of soil removals at certain points in order to have data on the weight of runoff sediments that are transported each year to lower lands and Lake Tana. This would allow the effectiveness and efficiency of the implementation of management plans in the LTW to be established, and decisions to be made regarding necessary corrections in land management approaches.

72. **Relevance of targeting. While the overall geographic scope – Lake Tana watershed – was clear and relevant, the selection of the 650 micro-watersheds lacked a clear approach**. Lake Tana is the source of the Blue Nile and is critical to the livelihoods of its inhabitants and to the economy of Ethiopia, in view of its potential in natural resources, crop and livestock production, and livelihoods.[48] However, the choice of the micro-watersheds on which to base project implementation was not completely grounded on the hydro-climatic conditions in Lake Tana Watershed**.** A review of both the PDR and project implementation manual could not shed light on the process of selection of the 650 micro-watershed communities which were ultimately selected as beneficiaries. The PCR indicates that the micro-watershed selection was based on the "level of degradation of the watershed, the presence of gullies that are beyond the capacity of smallholding farmers to restore, and *woredas* with no intervention from other projects/donors" (PCR, 2019). However, no complete listing of micro-watersheds existed or was provided, although – according to the project implementation manual – the ANRS has been said to have identified 800 "micro-catchment areas" belonging to the Lake Tana Watershed (IFAD, 2009c).

73. **A clear typology of categories of the households in the target population was not developed for targeting at design or at implementation**. The PDR only states that the "target group included farmers with landholdings averaging 1 ha or less, the near landless, the landless as well as women and youth, particularly unemployed". However, no poverty-mapping exercise or vulnerability assessment was carried out to justify this selection and determine how best to ensure maximum participation of the vulnerable households and to respond to the needs of different segments of the rural poor. Since most watershed programmes have a clear hierarchy of benefits and beneficiaries,[49] there is a need to place these issues at the centre of a participatory process and to ensure an inclusive approach.

74. **The project design's inclusive approach was not supported by a differentiated targeting method to the nearly landless farmers.** Other than the land-based approach, the project design highlighted the need to provide opportunities to the landless or near landless poor, including women and youth. This inclusive approach is commendable, considering that the project benefits would unequally benefit farmers who have access to land if only a land-based intervention was introduced. However, neither the PDR nor the project implementation manual elaborated a differentiated approach to target the near landless and the landless farmers. According to the PDR, a database was supposed to be produced during the first year of project implementation to permit identification of the near landless and landless households.[50] In reality, this did not take place during implementation, partially because no resources had been allocated for conducting such exercise. The lack of clearance on this point later brought in difficulties in project implementation. Furthermore, in the cases where free inputs were provided, no targeting mechanism

[48] Bijan, D. & Shimelis, G. S. (2011). Combined 3D hydrodynamic and watershed modelling of Lake Tana, Ethiopia, J. Hydrol., 398, 44–64. https://doi.org/10.1016/j.jhydrol.2010.12.009.
[49] On this, see for example FAO. (2006). The New Generation of Watershed Management Programmes and Projects. FAO Forestry Paper 150. http://www.fao.org/tempref/docrep/fao/00g9/a0644e/a0644e00.pdf.
[50] These households were expected to be primarily targeted for certain activities, including participatory forestry management, reforestation of degraded communal lands and allocation of public forests to community groups or individuals.

was disclosed on how to distribute these inputs and who would be prioritized when the resource was scarce.

75. **In sum,** the objectives of CBINReMP remained relevant to IFAD's country strategy, the Government's national and regional policies, and the development needs of the local community. The design centred on a landscape approach[51] to deliver rural poverty reduction, climate resilience, and sustainable development practices, which is relevant for achieving the project's development objectives. However, the relevance of the design was weakened by the absence of a master river basin management plan, over-complexity of component A, weak internal coherence between different activities/elements, and a weakly designed targeting approach. The targeting of beneficiary watersheds/households lacked a typology approach and poverty-mapping to ensure inclusiveness. As a result, resources were thinly spread among a large number of watersheds, leaving some degraded land un-rehabilitated. Considering this narrative, the evaluation rates the relevance of the project as ***moderately satisfactory*** *(4).*

Effectiveness

76. In assessing effectiveness, this evaluation aims to determine the extent to which the project's objectives were achieved.[52] The findings in this section were determined based on the triangulation of several data and information sources as described in the methodology section.

77. **Effectiveness in meeting objectives.** A development intervention's effectiveness in terms of meeting its objectives is assessed through the achievement of its outcomes. Effectiveness is reviewed according to the main result areas identified in the ToC, and the results of the analysis for the three impact pathways are presented in continuation. They address the question of how the project contributed to achieving the desired development outcomes.

78. The overall objective of CBINReMP was to sustainably reduce poverty for about 312,000 rural households in 21 districts of Lake Tana Watershed. Its purpose was to increase household incomes and food security as a result of SLM and improved ecosystem integrity.

79. The project successfully delivered results in building biophysical soil and water conservation structures, and there was high community ownership of these structures. Similarly, delivery and beneficiary ownership of results in pasture regeneration on degraded land were good. The practice of community bylaws allowed tensions to be avoided regarding the use of regenerated pasture under area closure. However, the benefits were distributed unequally to the target households. The management of rehabilitated resources under area closures was insufficient, and there were maintenance problems of the physical structures in sloppy terrain where gullies had deepened and widened. While there was an improvement in the farming systems and soil and water conservation in the watersheds under ORDA, the project lacked a comprehensive approach for improving farming systems with a focus on sustainability. There are mixed results regarding the management of planted trees, as the project focused mainly on the production of seedlings but not on how to manage farm woodlots or integrate trees in the farming systems.

80. The results of the impact study indicate that the project had only very limited, quantitatively verifiable impact on rural livelihoods. However, even for those

[51] For references on landscape approaches in IFAD's projects, see for example: https://www.ifad.org/documents/38714170/40264252/climate_sun.pdf/15655fe0-d06f-434e-b4ea-df9017c93ef2 and https://www.ifad.org/documents/38714170/39150184/Climate-smart+smallholder+agriculture+What%27s+different_E.pdf/c8834f22-ec92-4042-b9ea-43bc36c49fa2.

[52] This is in line with the definition of effectiveness provided by the IOE Evaluation Manual, which states that it is "the extent to which the development intervention's objectives were achieved or are likely to be achieved, taking into account their relative importance".

beneficiaries, livelihood conditions had not become significantly more productive, diversified, resilient or sustainable than those of the comparison groups. The following paragraphs describe the achievements related to the impact pathways.

81. **Pathway 1: Increased resilience of watershed resource users**. The effectiveness along pathway 1 is assessed based on how the project introduced and mainstreamed CCA and CCM activities in its interventions.

82. The project's component D activities were subcontracted to ORDA. They were implemented in three highland *woredas* (East Estie, Farta, and Laygaynt) around Mount Guna in the east of Lake Tana. While Component D supported off-farm SWC activities similar to those under the second Objective 2, it also actively engaged the target communities in introducing new cropping practices in their farming systems and integrating them in on-farm SWC activities.

83. With regard to resilience to the impact of climate change, the project implemented activities aimed at mitigation such as tree-planting and regenerating vegetation under the area closure system on degraded land, and adaptation such as mixed cropping for production optimization, forage production, and fruit-tree planting. The evaluation observed vegetation cover improvements in off-farm land under area closure and on-farm SLM-treated land, indicating enhanced resilience to climate change events. As part of its strategy, the project integrated indigenous knowledge with scientific approaches, ensuring collaboration between subject matter specialists and farmers, thereby improving the community's capacity to adapt to climate change impacts and sustain livelihoods. It created 21 farmer research groups (target: 15) comprising 189 beneficiaries (target: 180) and conducted familiarization workshops with farmers.[53]

84. To promote climate-smart agriculture while combating land degradation, the project supported alternative IGAs in the form of promoting highland on-farm apple tree-planting. The project provided 26,405 grafted apple trees to 1,150 beneficiaries. However, apple-grafting was generally poor, and inadequate management of seedlings and vegetables was likely to result in low productivity. It also supported livelihood diversification by providing improved potato varieties. It provided 121,200 kg of potatoes and delivered them to 207 beneficiaries.[54] The effectiveness was good but uneven among the model and non-model watersheds, due to very different sources. In the model sub-watersheds, ORDA established clusters to achieve a rapid replication of adaptation practices. The various practices introduced include on- and off-farm SWC, mixed cropping for production optimization, forage production, and fruit and woody trees.

85. These practices promoted only in sub-watersheds supervised by ORDA allowed the increase in land productivity for the major crops, namely wheat, barley, triticale, maize. For example, in Argameher sub-watershed, the Project achieved good results in farming systems productivity through crop improvements, soil and water conservation structures, horticulture, fruit trees, and fodder crops, and use of compost. Crop diversification and outputs were significant. Farmers were able to improve soil fertility and increase productivity through diversification of crops, emergence of new crops, zero-grazing of livestock, horticulture, rehabilitated degraded land providing cut-and-carry fodder, and planting grasses and shrubs on bunds to provide fodder for livestock.

86. **Pathway 2: Intensification and extensification of river basin management.** The effectiveness along pathway 2 is assessed based on how the project addressed key issues identified in its design regarding Lake Tana watershed problems and the local communities' needs. These issues include participatory watershed

[53] GEF TER: Community-Based Integrated Natural Resource Management Project (CBINReMP). 2019.
[54] Ibid.

management, tenure security, land degradation, deforestation and overgrazing, and overexploitation of wetlands.

Outcome 1.1 Participatory watershed management partially achieved

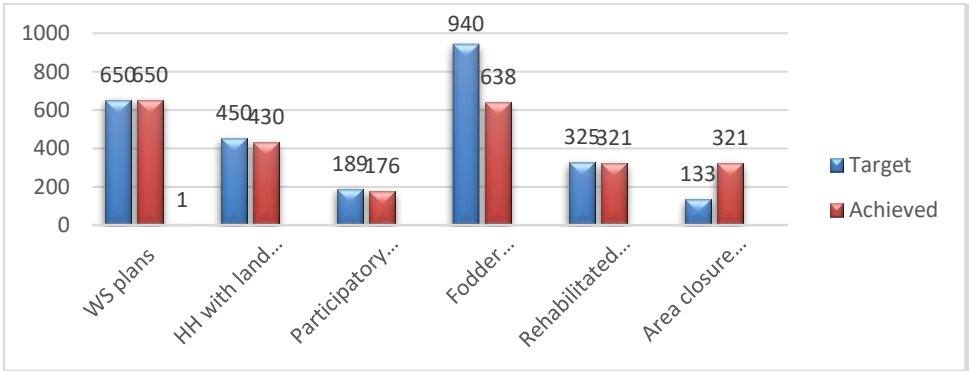
87. The project effectively used the participatory approach to implement activities aimed at sustainable management of Lake Tana watershed, which increased the resource user's responsibility. However, this approach was used in a community "mass mobilization" context, and the qualitative assessment confirmed that the participation stayed mainly at the implementation level. Under mass mobilization, participation was usually mandatory labour contributions only. In this context, the project added considerable value by promoting participatory planning and decision-making to some degree. In particular, the Watershed management committees Committees could play a planning and implementation role they did not play before. Among 24 communities visited by IOE-IFPRI's qualitative assessment, except for one community most communities felt there was some (50 per cent) or little (46 per cent) involvement from their side to influence the plan, as the planning took place mostly at *kebele* level. The planning process was described as "top-down", with government institutions making decisions that were subsequently communicated to the communities for implementation. Despite some initial resistance, the sensitization campaign and other enforcement mechanisms allowed increased participation in the implementation and maintenance activities. The project could have improved the quality and depth of community participation through more meaningful community engagement and consultation and technology extension.

Outcome 1.2 Improved pasture and participatory forest management in place

88. Rehabilitation and management of degraded lands. Rehabilitation of degraded land and sustainable natural resources in Lake Tana watershed were the focus of CBINReMP. These activities were implemented under components A and D. The expectation was that these activities would address the challenges of food insecurity, declining soil fertility due to soil erosion and loss of vegetation cover, and vulnerability to the impacts of climate change and climate variability.

89. The project contributed significantly to the improvement of natural resource management by supporting community-driven participatory planning and implementing 650 micro-watershed plans, treating 227,500 ha of land as per the target. As shown in Figure 1, five out of six key performance indicators listed in the logframe were almost achieved except for fodder production. Concerning tree-planting and forest management to rehabilitate degraded land, the PCR reported total production of 104 million fruit and forest seedlings and the establishment of 17,600 ha of tree plantations (93 per cent of the appraisal target) on degraded communal lands, gullies, farmland, and around churches, but does not describe the contribution of the seedlings to environmental functions and socio-economic needs.

Figure 1
Achievement of targets



Source: PCR.

90. Deforestation, overgrazing and overexploitation of wetlands. The project area suffered from severe land degradation problems resulting from overgrazing, deforestation, unsustainable agricultural practices, and overexploitation of wetlands. The project did not catalyse ANRS efforts to take measures to control deforestation and overgrazing on communal land. The evaluation team observed that while the project's results in regenerating vegetation by promoting the implementation of the area closure system, overgrazing intensified in the adjacent communal grazing lands. The increased grazing pressure accelerates deforestation. In many visited areas, the number of trees planted with the project's support was insufficient to offset the deforestation rate. In communities visited, most households still largely rely on crop residues for home energy needs, thus further accelerating land degradation and soil fertility loss.

91. In terms of the management of planted trees, the project focused mainly on seedling production, and not on how to manage farm woodlots or integrate trees in the farming systems. Consequently, there are mixed results of forestry interventions in the visited watersheds. For example, in Aba Gewudi Watershed, there is a good natural regeneration of trees in areas treated with biophysical structures or planted with introduced seedlings. The community protects the trees and pasture area closures alike. The situation in Fuafure WS (Chaba-7 *Kebele*) is the opposite. All the tree-planted areas have been overgrazed, and only an insignificant number of trees have survived. Members of the local community met told the evaluation team that today the planted area is more degraded than before planting due to intensified free grazing of both large and small ruminants. In Tsebelu WS (Surba), the evaluation observed a strong trend towards the degradation of biophysical structures planted with *Acacia decurrens* due to the pressure of free overgrazing.

92. Area closure and pastoral management enhanced the ecological changes of the area. The project's core strategy for the rehabilitation of degraded land was the soil and water conservation structures, area closure, and fodder cut-and-carry system. Cut-and-carry allowed community members to access green off-farm fodder and to use it as a supplement to feed their livestock or to sell to the market. In most of the 24 watersheds visited, the project effectively supported the area closure and the cut-and-carry system for rehabilitating the degraded land. The PCR reported about 32,124 ha (241.7 per cent of target) of degraded communal grazing land, which has been enclosed and was in good condition for the regeneration of forage species. The area closures were used as a source of fodder in the cut-and-carry system. According to community user groups' rules, the forage is cut once or twice per year and is shared equally by all community members. Those without animals can sell it on local markets or to neighbours. In some communities, user groups comprise only their unemployed landless youth who practice cow-fattening. With these interventions, the project set an effective system of communal pasture governance through informal community by-laws.

93. Overall, while achievements were made, the focus was on addressing the consequences but not the causes of natural resources degradation. For example, the mission team observed that road construction causes gullies downslope from culverts and other drains, leading to severe physical watershed degradation in many cases. It was observed that the damage caused to agricultural land by the diversion of concentrated runoff is an important issue requiring corrective measures since, in many cases, the impact is irreversible. However, land degradation caused by road infrastructure was not properly managed by the project. Little was done to prevent the gully formation until the gullies were already formed. This also raises the question about the overall coordination between the Ministry of Agriculture and other related government agencies in this national initiative (discussed further in the Institutions and Policies section).

Box 1
Lessons learned from area closure and pasture management

Findings from the evaluation mission noted that despite the overall success of area closure, three key questions arise on whether the benefits were equitable among community members, and the closure practice was sufficient for sustainable rehabilitation of degraded lands: (i) closure against grazing; (ii) community by-laws; and (iii) the cut-and-carry system.

i) The first question was whether restricting access to resources in one area did not induce a rise in extractive activity elsewhere if no measures were taken to control free grazing on adjacent rangelands. (Baylis et al., 2016; Deininger & Xia, 2016; Ostwald & Henders, 2014). In this regard, the evaluation agrees with Jenny Ferguson's (2014) paper[55] prepared for the project, which noted that "converting large areas of watershed into an exclosure results in a reduced size of the remaining communal grazing land that can still be used for free grazing. As a consequence, the grazing pressure on the open areas increases – at least until a functioning cut-and-carry system can produce sufficient forage as substitution". It was further rightly added that "exclosures do not provide alternative feeding resource for the whole community and might be seen critically by non-beneficiaries". Without such control measures, area closures may lead to fragmenting of communal lands into "green" pasture lands and overstocked and overgrazed lands, as seems to be the case in many project target watersheds today. In fact, in many cases visited by the evaluation team, communal lands that are contiguous to areas under closure have been further degraded mainly by overgrazing.

ii) The second question was the extent to which those three mechanisms alone were sufficient for sustainable forage off-take, without any other form of management, notwithstanding the fact that area closure brings back degraded land to production.

iii) While the cut-and-carry system has the potential of ensuring sustainable forage off-take, cutting is done only once or twice per year. Such long cutting return periods may satisfy those who have land or other means of livelihoods, but not the landless or the marginal farmers who have no other alternative means of livelihoods while they are waiting for their biennial cut-and-carry share. Those who have land could use crop residues in the meantime, or even use a better option of producing fodder on farm. A more equitable alternative could have been to use the area closure and the cut-and-carry system to provide livelihood to the landless and nearly landless community members organized in user associations with clearly institutionalized rights. Otherwise, if no other development options are supported, it appears that the area closures are used to a great extent to seal off the landless, who are likely to have no livestock, and the marginal farmers.

Output 1.3 Off-farm soil and water conservation partially enhanced the productivity of target communities

94. The project successfully promoted the construction of physical and biological SWC structures in off-farm degraded areas. The assistance it provided consisted in training community members and providing material needed to construct the biological and physical structures. Some 24,000 ha of degraded off-farm land have been rehabilitated by establishing 38,000 km of hillside terraces and stone bunds. Some 144,000 ha of cultivated land (115 per cent of target) have been treated with some form of SWC. The observations made in the field visits and discussions with communities revealed that SWC activities provide multiple on-site benefits by reducing runoff and soil loss, enhancing groundwater storage, and boosting crop yields in some cases. However, SWC activities mainly focused on off-farm structures, which did not sufficiently address land degradation challenges on cultivated hill slopes according to the ridge-to-valley approach (see Box 2).

[55] Jerry Ferguson (2014). *Biophysical assessment of the rehabilitation of overgrazed common lands for the CBINReMP* (unpublished paper).

Box 2
Findings from the direct observation of farming practice

Direct observation of the farming practice (see Table 2 in Annex IV) shows that many watersheds did not follow the ridge-to-valley principle, which could maximize watershed health. The concept consists in working with the natural hydrology of the watershed from ridge to lower parts of the WS in order to detain, divert, store or use rainwater.[56] The scenarios observed can be summarized as follows:

- Watershed treatment with SWC biophysical structures started at watershed ridge and ended in valleys, thus encompassing on- and off-farm lands in a continuum (e.g. ORDA Model watersheds);
- Treatment was only carried out towards the ridge of the watershed (e.g. Keteb watershed);
- Watershed management was only carried out toward the lower lands of the WS (e.g. Aba Gewudi watershed); and
- Watershed management was only carried out towards the ridge and downstream, but not in the middle part (e.g. Fuafure watershed).

Outcome 1.4 Biodiversity and ecosystem conservation fell short of its target

95. Conserving biodiversity and securing ecosystem integrity was part of the project. Interventions under this subcomponent aimed to contribute towards the conservation of agro-biodiversity and in-situ conservation of the ecosystem integrity, to minimize the loss of local varieties of agricultural field crops. The Ethiopian Institute of Biodiversity was the responsible implementing entity for gene bank biodiversity and ecosystem conservation, and output sought to conserve the rich flora in the Lake Tana Watershed by training farmers on gene bank management and biodiversity conservation.

96. The PCR reported a total of 120 community researchers facilitated (100 per cent of target), awareness raised with 684 individuals (74 per cent of target) on the advantages of community seed bank associations, and 9 campaigns (16 per cent of target) in protecting against invasive species. Field visits from the evaluation mission noted that the wetland plans were never implemented, and none of the gene bank were functioning.

97. Overall, the project focused on treating the symptoms of ecosystem degradation in a piecemeal approach, particularly with off-farm biophysical SWC, instead of addressing localized problems holistically according to the ridge-to-valley approach. With increasing population pressure, farming systems are increasingly put under pressure. There is a need to innovate and change to meet the demand for crop and livestock productions and various ecosystem services. This points to the need for an action research[57] approach to enable a co-analysis with communities of their current farming systems, learning from their experience and supporting them to design the improvements in their production systems and to share the experiences in a dissemination strategy.

98. **Pathway 3: Improved livelihoods.** The effectiveness along this pathway is built upon outcomes achieved from Pathway 1 and activities in improving poor rural people's access to natural resources (land and water) and enhancing agricultural productivity and sustainability of smallholder farming systems. As mentioned above, to achieve this, it requires a livelihood approach that integrates natural resource management into people's utilization of natural resources to make a living, and a

[56] Smyle, J.; Lobo, C.; Mine, G.; & Williams, M. (2014). Watershed development in India - Approach Evolving through Experience. The World Bank. Agriculture and Environmental Services Discussion Paper 04. http://documents.worldbank.org/curated/en/185611468259137769/pdf/880560NWP0Wate0Box385209B00PUIBLIC0.pdf.

[57] In this context, Action Research is understood as learning by doing: developers, extensionists and target groups identify a problem, plan together the search of a solution to resolve it, see how successful their efforts were, and if not satisfied, try again.

socially inclusive approach that allows women, youth, and other vulnerable groups (e.g. nearly landless and landless households) to benefit from the project's interventions.

99. **On-farm soil and water conservation.** The investment in soil and water conservation was unbalanced between on-farm and off-farm levels. The activities primarily focused on the off-farm level, thus limiting the project's effectiveness on agricultural production and on the prospects of increasing household income. While there was a great effort to promote SWC practices in off-farm degraded areas through community mass mobilization, insufficient attention was paid to introducing on-farm SWC structures integrated with cropping systems that can control soil erosion and enhance soil fertility. Similarly, little investment was allocated to support on-farm forage production, which could have fulfilled animals' requirements, reduced free grazing, and ensured natural resources protection. This is probably because SWC practices were introduced without prior assessment of the local population's problems and needs. This further questions the project's value addition if similar off-farm activities could have been conducted by Government-led mass-mobilization anyway. Overall, due to the focus on off-farm SWC activities, integrated approaches towards improved farming systems under subcomponent A3 were still at an emergent stage at project completion.

100. While area closure was effective for vegetation regeneration of degraded communal lands, SWC structures were not effective in preventing further land degradation. In on-farm contexts, it remained a challenge in most of the cultivated hill slopes to manage rainwater infiltration, spread run-off, and increase biomass and crop production. The project promoted practices that combine physical and biological SWC structures to integrate trees in the farming systems through multipurpose agroforestry.[58] However, at the household level, the project did not build farmers' capacity to adopt appropriate practices to increase on-farm production of fuelwood and fodder to meet their needs and thus reduce pressure on communal land resources.

101. The evaluation's field observations showed that while efforts were directed to off-farm physical structures that increased water retention, stabilizing gullies and retaining soil, less attention was paid to supporting the on-farm soil fertility and intensification of fodder production for zero-grazing. Using for assessment a multi-dimensional scorecard tool (Annex VII), IOE's field visits observed a high variation in both on-farm and off-farm soil and water conservation outcomes. Of a sub-sample of 12 sub-watersheds: (i) 41.7 per cent were rated moderately satisfactory to satisfactory for showing improved productivity and improved farming systems and providing multiple economic, social and ecological benefits to target groups; (ii) 33.3 per cent were rated moderately unsatisfactory for the lack of improvements in farming systems, and (iii) 25 per cent were rated between highly unsatisfactory to unsatisfactory, for unsuccessful biophysical soil and water conservation structures and a return to baseline conditions, and/or further land degradation and marginalization of the poor.

102. **Supporting of income generating activities.** IGAs suffered from critical issues that challenged their viability. IGAs aimed to offer alternative livelihoods by diversifying income sources and reducing land stress. This specifically targeted youth, women, and landless households. Employment opportunities were created for 10,133 landless youth and women (40 per cent of the appraisal target) through various IGA groups (PCR, 2019). Although an IGA implementation manual was prepared, skills training was conducted by the Amhara Vocational Training Institute,

[58] Agroforestry is a collective name for land-use systems and technologies where woody perennials (e.g. trees, shrubs, palms, bamboos) are deliberately used on the same land management unit as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. In agroforestry systems, there are both ecological and economic interactions between the different components. See: van Noordwijk M, ed. 2019. Sustainable development through trees on farms: Agroforestry in its fifth decade. Bogor, Indonesia: World Agroforestry (ICRAF). http://old.worldagroforestry.org/downloads/Publications/PDFS/B19029.pdf.

and various recommendations made during supervision and MTR missions to strengthen the capacity of IGAs, problems remained. Among others, the main issues include: (i) lack of business plan feasibility studies;[59] (ii) lack of ensured land access;[60] (iii) lack of quality or completion of housing infrastructure constructed for the IGAs; (iv) lack of credit and market access;[61] and (v) lack of economies of scale.

103. As an example, some IGAs supported youth's access to economic opportunities through cattle fattening. The project provided the support and skills youth needed to form associations and use area closures for cow fattening. However, beyond supporting the youth to start up these activities, no efforts were made to link them to dedicated institutions to scale up their activities. For example, difficulties were experienced in both input (feed) and market linkages, and microfinance to sustain their investments, empower them with entrepreneurship literacy, and organize them to federate their associations. The project's attempt to link the IGAs with IFAD-financed rural finance and agricultural market projects for access to finance and markets was unsuccessful due to a lack of proactive engagement from the implementing agency. As a result, the experience gained from IFAD's Pastoral Community Development Project in using IGAs to increase the involvement of the target groups in economic activities was not effectively used in diversifying livelihood opportunities and reducing stresses on the land due to design and implementation weakness.

104. **Tenure security.** The project effectively addressed the issue of tenure security by integrating land certification into natural resource management interventions, thus creating an institutionalized incentive for farmers. All the focus group discussions from the 24 micro-watersheds confirmed that the project addressed the targeted groups' needs in this regard. According to the PCR, at completion, the project had issued the first-level certification to 287,704 landholdings (64 per cent of the appraisal target). Importantly, rights were also recognized for women, regardless of their marital status, which promoted gender equality. All the community groups met by the evaluation team in the field recognized the contribution of land certification to improve women's access to productive resources and women's decision-making at the intra-household level. In addition, 25,370 cadastral surveys were completed, and 9,577 second-level certifications were issued. While, as it come out from all the focus group discussions, certifications reduced land disputes to a large degree, though not completely owing to some errors made during the certification process, there is little evidence that farmers changed their behaviour in land investment (e.g. adopting a more sustainable land cultivation practice) as a result of land security. The community members also discussed some flaws, including a return to the same production practices as before, due to the uncertainty of the land status, but only to a small scale. Overall, there is clear evidence supporting the improved land administration and certification for all the rural households residing in the project areas, particularly those who were granted the second-level certificates.

105. In sum, land security reduced land disputes and increased poor farmers' access to land resources, and potentially economic resources. Nevertheless, effectiveness in contributing to agricultural production and sustainable and better livelihoods was limited mainly due to the project's insufficient focus on the on-farm soil and water conservation investment, farm inputs, and forage production. The analyses from "effectiveness of targeting" and gender equality reveal an insufficiently inclusive approach to benefit women, youth, and other vulnerable groups (e.g. nearly landless

[59] All visited IGAs seem to have a business plan as per the earlier recommendation of the mission, but they are either fake or not professionally done (Supervision Report, 2017).
[60] Communities have given land to the IGA groups for different purposes (e.g. fattening, vegetables, timber). However, the IGA groups had neither legalized property rights (e.g. land certificate) nor a promissory note (guarantee) for a defined period to ensure that the IGAs could have a long- or short-term business plan.
[61] IFAD Supervision Report (2017).

and landless households). This was further supported by evidence from the household survey (see Rural Poverty Impact section).

106. **Effectiveness of targeting**. Overall, the targeting was not differentiated in terms of categories of poverty: farmers with access to land, nearly landless farmers, and landless farmers. This reduced the effectiveness of participation. In a land-based intervention, the benefits are unavoidably proportional to the landholding size of each farmer. The income and employment generation activities proved to be ineffective due to the flaws in the design of those activities and to implementation inefficiencies. In particular, the development of value chains and their likely constraints lacked proper identification, and there was no clear approach to support youth to organize in structures that have the legal status and capacity to negotiate access to financial and other services after project completion. If support to the nearly landless and landless farmers merits equal attention, the project's allocation of resources to this activity should reflect this aspect. However, only 6.5 per cent of the total investment went to employment generation-related activities. Furthermore, the area closure and cut-and-carry system did not provide an equitable livelihood development approach for the marginalized groups, who would more likely graze their livestock in the communal land due to lack of land access.

107. **In sum,** the project effectively rehabilitated and/or protected the vegetation coverage of degraded land through various measures. To some extent, it controlled the expansion of gullies and reduced land erosion. The project focused on the issue of tenure security and helped reduce land conflicts. However, effectiveness was weakened by the fact that the main outcomes were only partially achieved, due to various factors that include an ineffective targeting approach to a marginalized group, lack of focus on on-farm soil and water conservation, absence of an integrated crop-livestock farming system, and limited coverage of climate-resilient activities. The evaluation rates the effectiveness of the project as ***moderately satisfactory*** *(4).*

Efficiency

108. **Quality of project management.** The project was declared effective on 17 March 2010 but had a long delay in starting its activities. This long start-up delay was due to the delay in opening the bank account and in setting up the Regional Project Coordination and Management Unit (RPCMU) and the Regional Steering Committee. The impact of the start-up delay was that the project has had an extension of 18 months. The RPCMU addressed most of the recommendations of the supervision missions.

109. **Cost–benefit analysis.** The assessment of efficiency attempts to examine how economically resources and inputs are converted into results. At design a traditional cost–benefit analysis was not carried out. Several streams of benefits were outlined[62] but only a few quantitative results were presented in terms of improved agricultural outputs and animal feed production (see previous section on effectiveness). However, the reliability of the estimates is questionable given the poor description of the methodology and/or calculations done to derive the figures. At completion, an unorthodox cost–benefit analysis was undertaken in the PCR to present the project's viability, but no cost–benefit analysis was carried out in the GEF TER either.[63] Based on the above, this evaluation used several proxy indicators to make an assessment of overall project efficiency.

110. **Economic and financial perspectives.** The financial analysis reported in the PCR presented a net present value of ETB 2,100 million (approx. US$71.3 million), while

[62] Including: increases in agricultural, fisheries and livestock production due to biological conservation, improved agriculture productivity from secure land tenure, carbon sequestration, and improved livelihoods from clean energy production.

[63] A CBA for the ORDA implemented activities which provided useful insights for this evaluation although it cannot be used as a proxy for the overall project's CBA.

the project's internal rate of return was not assessed. The only stream of benefits quantified to assess the net present value relates to the IGAs for cattle fattening and crop productions. The methodology used is questionable for several reasons and the results are not fully reliable. First, the representativeness of the two IGAs[64] used as proxy appears unclear and is not explained; second, net incremental benefits were not derived (the "without project" scenario is missing); third, financial prices were not corrected for inflation and for other economic distortions – hence the analysis is purely financial; and fourth, the whole cost–benefit analysis focuses exclusively on the IGAs, thus the net present value derived are those of the selected IGAs, not of the entire project (as stated in the PCR). The nature of the project activities and the lack of data on the benefits generated precluded a traditional cost-benefit analysis.

111. **Effectiveness gap and disbursement.** There was an 11-month effectiveness lag between IFAD Executive Board approval and the first disbursement of the project. This was lower than IFAD's East and Southern African Division (ESA) average of 11.5 months for ongoing projects.[65] Delays at start-up are reflected in the project's disbursement path and implementation and were the main cause of the 18-month extension. Overall, the disbursement path was slower than what had been envisaged at design throughout the entire project life, and the project experienced some liquidity challenges. This was mainly due to weak linkages between the regional and federal management units and the high turnover of staff. Despite the above, at completion overall disbursement rates were satisfactory: above 90 per cent for all financiers, ranging from 90 per cent of actual disbursement for the GEF to nearly 100 per cent for IFAD's funds (loan and grant).

112. **Efficiency in the pace of implementation.** Implementation progress was in line with the disbursement path described above. Delays at start-up were linked with the inadequate project financial management structure at project level and was reflected in the weak implementation of the AWPB. Late submission of AWPBs was being consistently reported as late as 2016, and delays in submitting audit reports and management letters were also recorded.[66] However, the inadequate budget performance reported in the first half of project life was improved in the following years. At component level, total actual AWPB expenses for each component are consistent with budgeted figures – no significant mismatch is noted. Overall, the pace of implementation suffered from delays in the procurement plan, which had not been implemented in a timely manner.[67]

113. **Project management costs.** Actual project management costs (i.e. component C) were US$6.19 million, equal to approximately 11 per cent of total actual project costs. Although this represents an increase in absolute terms, as a percentage of total project costs, this is in line with the design estimate, and is also comparable to the World Bank-financed SLMP. The increase is explained by the addition of component D and increased costs for logistics deriving from the selection of field activities of the three operational components to avoid overlapping and duplication with other projects in the country. This ratio is considered reasonable and within IFAD's average, especially when considering CBINReMP's area of interventions and complex management structure.[68]

114. **Cost per beneficiary.** The PCR does not state the cost per beneficiary, nor did the PDR. According to the evaluation, this cost works out to be US$87.53 per household when considering total project costs and expected beneficiary outreach at the design stage.[69] This is a low investment per household, even more so when this amount is spread over the almost 10-year period of the project. The unit cost of the

[64] In North Achefer and BahirDar Zuria District
[65] Source: IFAD OBI reports
[66] Source: GEF TER.
[67] Several items were regularly carried forward to the subsequent year
[68] Specifically, the RPCMU in Bahir Dar and the Federal Project Coordination and Management Unit in Addis Ababa.
[69] Given the limited reliable information on outreach collected by the project and the failure to clearly distinguish between direct and indirect beneficiaries, the cost per beneficiary is calculated based on the design stage values.

rehabilitation of degraded land, which represents the bulk of the project's work, is estimated at US$250 per ha, which is in line with the Government's Guidelines for Participatory Watershed Development. Finally, beneficiaries' actual contributions to overall projects costs are commendable. As shown by the household survey (Table 9), the project increased participation of beneficiary households in providing labour time for most of the community works.

115. **Cost-effectiveness** with appropriate design was not always considered in the selection of structural soil and water conservation measures. In the case of ORDA model watersheds, although the cluster approach of promoting multiple technologies and distributing free inputs to the communities yields significant benefits to the five watersheds, it consumed a large share of the budget and built structures (e.g. schools) that were not necessarily within the project's objectives. Some of the physical structures were also overdesigned, partially causing them to be unfinished with the given budget. Emphasis could have been given to simple and cost-effective bioengineering measures that combine trees, grasses, earth and loose stone bunds.

116. Based on these and other insufficiencies, but considering the accomplishments in terms of benefits emanating from the project and the high disbursement of funds, efficiency is assessed as ***moderately satisfactory*** *(4).*

Rural poverty impact

117. 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. Impact domains are: (i) household income and assets; (ii) food security and agricultural productivity; (iii) human and social capital and empowerment; and (iv) institutions and policies.

118. To recap the methodology section, project impact was assessed based on an ex-post comparison of livelihood indicators between beneficiary (treatment) and control group households and watershed communities. A propensity-score matching procedure was adopted to assess CBINReMP's impacts by comparing treatment and control groups' outcomes related to livelihood conditions, including household income levels, income diversification, access to land, water and productive resources, crop and livestock yields, women's empowerment, food security, and dietary diversity.

119. In the analysis of the project treatment effects (i.e. rural poverty impact), a distinction is made between "high" and "low" participation treatment groups based on the degree of project-related activity participation (for details see Annex IV). Since community participation was both a means to the outcomes and an (intermediate) objective of the project, the distinction made could confound the project's actual impacts. Based further on information shared by community members during the qualitative focus group discussions, higher participation is synonymous with the intensity of the project's effort (i.e. participation level in the treatment areas).

120. Lastly, definitions and measurement units of the outcome variables described in Tables 7, 9 and 10, presented below, can be found in Annex VI (Table A.4), while more detailed information on the means and skewness in key impact and intermediate variables can also be found in Annex VI (Tables A.5a-b and A.6a-b).

Agricultural productivity, food security, household income and assets

121. This part analyses agricultural productivity, food security, household income and assets together as they are interlinked. To understand the pathways in driving changes of household income, there is a need to examine agricultural productivity. The analysis returns to the pathways described in the ToC to review the project performance from outcomes to impact.

122. The assessment of the impact of CBINReMP on rural livelihoods considered the main targeted outcomes of improved household incomes, food security, asset holdings, agricultural productivity, and social capital. The first column of Table 7 compares the

average treatment effect between treated and control groups, assuming that there is no significant difference in extent of participation among beneficiaries within the treated watersheds. After relaxing this assumption, the second and third columns show the estimated treatment effects after comparing, respectively, the high- and low-participation treatment groups with the control group.

123. Overall, the results show that there are no detectable differences between the incomes of beneficiary and non-beneficiary groups but beneficiaries in communities with high degrees of participation in project activities enjoyed higher incomes, which may also have allowed them to have better diets. The results in Table 7 show that overall, there are no detectable differences between beneficiary and non-beneficiary groups with respect to livelihoods status, social capital, and agricultural productivity. CBINReMP had only a very limited, quantitatively verifiable impact on rural livelihoods, when beneficiary groups are taken as a whole. Only some significant effects were observed when comparing the "high participation" beneficiary group (treatment) with the non-beneficiary (control) group (column 2). Beneficiary households with high community participation have significantly higher income and greater dietary diversity than the non-beneficiary. Specifically, the incomes of high-participation group households were, on average, 17.8 per cent higher than that of the non-beneficiary group.

Table 7
Average impact of the project on lead outcome variables

Outcome variables	*Treated versus control (standard error)*	*High-participation Treated versus control (standard error)*	*Low-participation Treated versus control (standard error)*
A. Livelihood outcomes			
Total income (log_e)	0.044 (0.09)	0.178 (0.11)*	- 0.152 (0.12)
Dietary diversity	0.197 (0.16)	0.414 (0.167)**	- 0.110 (0.18)
Food security	- 0.086 (0.24)	- 0.155 (0.26)	0.013 (0.28)
Asset holding	- 0.035 (0.16)	0.062 (00.17)	- 0.173 (0.17)
B. *Agricultural productivity*			
Cereal yields			
White teff yield (log_e)	-0.075 (0.09)	- 0.039 (0.09)	- 0.131 (0.11)
Black teff yield (log_e)	0.067 (0.09)	0.125 (0.11)	- 0.038 (0.12)
Maize yield (log_e)	- 0.069 (0.10)	- 0.089 (0.12)	- 0.052 (0.12)
Livestock productivity			
Lactation period (log_e)	0.015 (0.04)	0.034 (0.04)	- 0.013 (0.04)
Milk cow productivity (log_e)	0.042 (0.20)	0.084 (0.03)**	- 0.021 (0.04)
Fattening period (log_e)	- 0.070 (0.12)	- 0.065 (0.12)	- 0.068 (0.13)
C. Social cohesion and capital			
Social cohesion index	0.068 (0.17)	0.032 (0.18)	0.128 (0.21)

Source: Based own computation of impact study, 2020.
Note: ** and * refer to 5 and 10 per cent significance level, respectively. [a] The social cohesion index is a composite of five perceptions about belongingness of individuals in the community regarding economic opportunity, opportunity in public affairs, tolerance to conflict of interest, and adequate representation in institutions.

124. Despite significant higher incomes for the high-participation group, it is unclear, however, which project activities have contributed, and how, to this positive impact. Compared with the control group, higher income was not found to be associated with better crop yields, greater income diversification, or off-farm income opportunities, and neither with enhanced women's empowerment nor reduced conflict over land. There was also no evidence of significantly higher milk productivity of cows (except for some statistically significant difference in the case of high-participation groups) and greater herd size among beneficiaries with high participation and benefits from cut-and-carry forage collection. To a limited extent, these outcomes could partially explain the impact on incomes. The lack of impact on crop productivity or income diversification suggests that the promotion of SWC practices and IGAs induced no direct economic gains to beneficiary households. Part of this outcome is explained by the fact that, except for the sub-watersheds under ORDA's supervision, SWC was mostly promoted for off-farm land, and there was no focus on improving the farming systems.

125. In high-participation groups, the dietary diversity score exceeded that of the non-beneficiary group by 0.4 units. Dietary diversity is especially important among populations with diets based on starchy staples where micronutrient deficiency is more likely, as is the case in the project area. A higher score is an indicator of increased economic access to a varied diet for household members. While this does not follow directly from the method applied by the study, it is likely that the better access to more diversified food is closely associated with the higher incomes of the high-participation treatment group.

126. Geo-spatial analysis confirmed similar findings of the survey data. The analysis of geo-spatial data showed good performance of the project. There was an improvement in vegetation coverage over the seven-year period of observation (2013–2019) and of most of the project's period of implementation. This greening of the watersheds over time could be associated with improved erosion techniques or common land rehabilitation. However, although such improvements were observed for all watersheds in the area and for component C, no statistical differences could be detected between the CBINReMP beneficiary watersheds and the control group for the main variables considered in the analysis (Table 8). The potential reasons could be that such improvements may have taken place through different means in all watersheds as well as because of exogenous factors, such as the increased rainfall experienced in the LTW area during the final years of the project's implementation.

Table 8
Geo-spatial characteristics by treatment status

Variable	*Definition of the variable – Time (2013–2019)*	*Control group (median)*	*Treated group (median)*	*Wilcoxon rank-sum test (Mann-Whitney)*
NDVI_MODIS_slope	Univariate regression slope of Modis NDVI	.0004	.0004	0.88
NDVI_LS__slope	Univariate regression slope of Landsat NDVI	.0027	.0024	0.77
NDWI_LS__slope	Univariate regression slope of Landsat NDWI	-.0013	-.0013	0.97
NDVI_MODIS__sd	Modis NDVI (standard deviation)	.1528	.1521	0.94
NDVI_LS__sd	Landsat NDVI (standard deviation)	.0541	.0534	0.60
NDWI_LS_ _sd	Landsat NDWI (standard deviation)	.0379	.0384	0.70
NDVI_MODIS_mean	Global Mean NDVI Value	.5388	.5416	0.65
NDVI_MODIS_median	Global Median NDVI Value	.5385	.5407	0.66

127. In summary, the project beneficiaries in communities with high degrees of participation in community-based natural resource management activities enjoyed

higher incomes and this may also have allowed them to have better diets. However, these positive livelihood outcomes have not come with other targeted livelihood improvements (relative to the comparison group) in terms of agricultural productivity, social cohesion or asset holdings. The higher productivity of milking cows likely underpins a modest part of the estimated income impact and, while noted, the impact was not among the central targeted outcomes of CBINReM.

Human and social capital and empowerment

128. The project did not sufficiently invest in strengthening rural organizations to build their human and social capital and in facilitating the empowerment of the rural poor. It should be recalled that achieving the intensification and extensification of river basin management in Lake Tana Watershed was premised on ANRS building on the awareness generated from the project to intensify and extensify Lake Tana river basin management. This assumes that through participation, local communities led by their Watershed Management Committees would take greater responsibility in implementing watershed management. However, the design of the project did not duly consider that human and social capital are key staples for meaningful community participation. Although the project formed various community natural resources user groups (e.g. youth group, grazing user association, common interest group), its design did not plan to include investment in supporting community user institutions as strategic in achieving its objectives. Its major focus was on working instead through local extension systems which had no capacities to provide services that such community institutions need, while relying for community participation on pre-existing mass mobilization structures.

Strengthened community participation

129. CBINReMP increased participation of beneficiary households in providing labour time for most of the community works promoted. Despite the design weakness described in the above paragraphs, the project significantly increased participation of beneficiary households in providing labour time for most of the community works promoted. The survey results in Table 9 show that the beneficiary (treatment) groups spent visibly more time on communal terrace construction, cut-off drainage and tree planting, though this is not the case for gully rehabilitation. The labour participation in these types of communal works among the high-participation beneficiary group households is broadly the same as that for the average beneficiary group. However, the confidence level for all these estimates is low, such that none of the differences between non-beneficiary and beneficiary groups were found to be statistically significant. A significant impact for labour participation would have been important in terms of the project's ToC, which saw enhanced community participation for sustainable land and water management as key to create better and more resilient livelihoods for the beneficiary population.

130. Given the lack of statistical significance, there is a question of whether the project was effective in promoting community participation in SLM works to underpin livelihood improvements. It should be recalled that the Government launched a massive community-based participatory watershed development programme in 2010/11 in four regional states, including Amhara, as part of a strategy to protect the environment while achieving food security.[70] Consequently, when CBINReMP launched its SWC activities, the target farming communities were already highly mobilized to implement physical and biological soil and water conservation measures without providing any incentive for the farmers. Therefore, the lack of statistical significance does not lead to concluding that the project was not effective in promoting community participation. Communities were already familiar and/or involved, though to varying extents, in mass mobilization SWC activities.

[70] World Bank (2019). Ethiopia Climate Action through Landscape Management Program for Results (CALM). Addis Ababa, Ethiopia.

Table 9
Labour time spent on project-related community works (hours per year)

Type of community work	*Control group (A)*	*Treatment group (B)*	*High-participation treatment group (C)*	*Adjusted Wald Test B-A*	*Adjusted Wald Test C-A*
Terrace construction	85	103	108	0.87	1.27
Cut-off drainage	37	60	62	2.01	2.23
Gully rehabilitation	42	38	39	0.07	0.04
Tree planting	33	276	293	1.09	1.08

Source: Table A.6a-b in Annex VI.

Table 10
Other key participation variables

	Control group	*Treatment group*	*High-participation treatment group*
Participation in watershed planning	77%	86%	95%
Membership in grazing land	46%	51%	61%

Source: Table A.7 in Annex VI.

131. For other participatory variables, there is little difference between beneficiary and non-beneficiary groups. For instance, 68 per cent of households of both groups participate in the watershed planning process and almost equal shares form part of grazing groups and other forms of community participation. Beneficiary communities are somewhat more likely to have a watershed plan (86 per cent) compared with the non-beneficiary group (77 per cent). However, as mentioned above, it was found that there are significant differences in degrees of participation of community members, such that it was necessary to separate the treatment group in terms of high and low participation in watershed management implementation processes.

132. However, community participation stays mostly at labour contribution, without a dimension of empowerment (e.g. community decision-making). Table 7 also confirms that there is no discernible impact on social capital. According to the United Nations Food and Agriculture Organisation's conservation guide on community participation in watershed management: participants should have decision-making capacity and responsibility (empowerment); and natural resource management cannot be successful and sustainable without the support and participation of natural resource users.

Institutions and policies

133. The project strengthened institutional coordination of ANRS agencies, which have complementary mandates relating to integrated watershed management. The project worked with the Amhara regional government structures, at regional and local administration levels, for its implementation. The project's institutional capacity development activities, particularly of component B, were designed to ensure that ANRS structures at all levels of governance would have the skills to integrate participatory watershed management in their plans and activities. Being implemented within the decentralized regional administration, it contributed to inter-service coordination between ANRS agencies (i.e. BoARD, EPLAUA, BoFED and BoEPLAU), which have complementary mandates in the various aspects of watershed management, natural resource management and rural development. There was also collaboration with other public sector institutions (e.g. ORDA, Bahir Dar University), contributing to an effective project implementation for this complex project.

134. On the other hand, there were some gaps in inter-agency collaboration. In particular, gaps existed in the areas of forest plantation establishment and management, agroforestry, public road infrastructures as a factor in gully formation, livestock management, and related value chain development. For example, although forestry management possess a high significance in the project, the Environment, Forest and Climate Change Commission and the Bureau of Forestry were left out at both federal and regional levels, which challenges the overall effectiveness of watershed management.

135. The collaborative action between regional government and a civil society institution to implement component D led to effective, efficient and dynamic development outcomes in target watersheds. ORDA mobilized its institutional experience in rural development to make it available in the framework of component D to implement a package of integrated technologies at household level in selected watersheds. This allowed the project to overcome sectoral specialization barriers that often characterize government institutions. This collaboration also allowed value to be added by undertaking simple action research activities with target communities, thus accelerating changes in watershed management. In the political context of the country when the project was being implemented, this type of collaboration represented a change of attitude on the governmental institutions involved, as similar collaborations were not often supported to this extent.

136. In spite of its success in supporting the setting up of the community watershed committees (CWCs), the project did not work to strengthen them as sustainable community institutions. The establishment of CWCs facilitated the implementation of project activities and therefore was a key mechanism for mainstreaming watershed management activities into environmental protection and economic development at local level. The project's contribution to empowering these committees to take responsibility for watershed management was one of its key successes. However, the establishment of the CWCs was mainly used as a project implementation vehicle, building upon the mass mobilization social context. To date they have not yet developed into empowered autonomous community institutions. At *woreda* or river basin levels, the project did not support the establishment of CWC unions as forums to negotiate with watershed development actors of the public and private sectors.

137. The project did not implement key planned activities to support the process of policies and regulatory reforms. Under component B, the PDR stated that the project would create an enabling environment and institutional capacity at local *kebele*, *woredas*/district and regional levels to mainstream SLM principles into regional policies, strategies and plans for agriculture, forestry and water management, and that policies and legal framework for natural resource management and environmental conservation would be reviewed and reforms enacted. Various activities under component B intended to create an enabling environment and institutional capacity at all tiers of regional governance to mainstream SLM principles into regional policies and strategies. These included: short-term technical assistance to undertake a comprehensive review of existing policies, strategies and legislation, identify gaps and propose measures to improve their implementation; the revision of the regional conservation strategy and of the action plan for combating desertification strategic; and work on the legislation on communal grazing land and the framework for wetland management. Although the legislative and policy reform provision documents have been finalized, the reform did not take place, and no impact could be seen. There are few indications to show that these policy documents would be adopted in the near future. This was a missed opportunity to address the long-term problem of overgrazing on communal lands in LTW.

138. **In sum,** the household and community survey and geo-spatial analysis findings indicate that CBINReMP had only limited, quantitatively verifiable impact on rural livelihoods. The project contributed to higher household incomes and some greater dietary diversity, but only where there was greater community participation.

However, even for those beneficiaries, livelihood conditions had not become significantly more diversified, resilient or sustainable than those of the comparison group. Admittedly, these findings are limited to what the survey was able to test through an ex-post approach and hampered by a lack of clarity on the project's way of targeting beneficiary watersheds and households. Similarly, it is likely that there were positive income effects overall but they were too small to be captured by the sample size used by the evaluation. In terms of human and social capital and empowerment, the project could have invested more in strengthening rural organizations to build their human and social capital and facilitate the empowerment of the rural poor. At the institutional level, however, more positive results were observed in that the project strengthened institutional coordination of local agencies whose complementary mandates relating to integrated watershed management are important for the project area. Rural poverty impact is rated as ***moderately satisfactory*** *(4).*

Sustainability of benefits

139. IOE defines sustainability as "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.

140. Overall, there is reasonable prospect of sustainability for activities undertaken under the project. The key features of CBINReMP implementation that ensure the sustainability of its benefits are: (i) the built capacity of ANRS structure line offices; (ii) ANRS ownership; (iii) the community participation and the related sense of ownership (e.g. area closures, farming system improvements); (iv) the close involvement of local government throughout implementation; and (v) the training and sensitization activities about SLM practices that the project offered to the local population and public officials. In addition, the results achieved in terms of land ownership and rights to manage and use common land are considered a significant step towards sustainability of project interventions.

141. Strong government ownership enhanced the project's institutional sustainability. The ANRS structures' ownership has been strong, particularly within BoARD, EPLAUA, BoFED and BoEPLAU. This ownership started in the project design phase and strengthened during the course of implementation, with the support provided by the project to strengthen the capacity of the staff. The increased capacity at regional, *woreda* and *kebele* levels allowed an improvements in the continued interaction between ANRS structures at those levels with the community watershed committees of the target watersheds. Strong government ownership was further demonstrated by the fact that the regional government allocated the required matching funds, paid salaries for district focal persons, and provided offices for the RPCMU.

142. Community ownership had mixed results. It was strong among members who benefited from the fodder cut-and-carry system, and weaker for the others. The project supported the functioning of community watershed committees, and in some cases also the capacity-building in target watersheds. During the field visits, the evaluation observed that these committees, like the communities they serve, have strong ownership of the main results they have achieved with the project.

143. The sustainability of biophysical and vegetation structures is in question, partially due to insufficient resources available for communities. With regard to the performance of the project on pathway 2, the land rehabilitation and biophysical structures for soil and water conservation were constructed by the communities, and the community's ownership was still high in the post-project phase. While in some watersheds, capacity-building was provided to communities for the construction of SWC structures, in situations requiring heavy reparation of gully structures, the communities are unable to ensure their maintenance since no machines or tools are available for heavy civil works. In general, the sustainability of watershed

management benefits can be questioned if the implementation of improved SWC practices is limited to isolated actions that do not follow the ridge-to-valley principle, and support the improvement of farming systems. Sustainability is even worse in areas where no capacity-building or awareness raising were provided.

144. In contrast to SWC structures in ORDA model watersheds that are in good conditions, the maintenance in most of other watersheds is unsustainable due to lack of appropriate tools and equipment. Of the SWC biostructures, those that were built on-farm in ORDA model watersheds were generally in good condition. The improvements in farming system productivity in those cases increased the farmers' sense of ownership which, in turn, should contribute to the long-term sustainability of the SWC biostructures. Overall, sustainability risks for these biostructures are mitigated by the high participation of beneficiaries in their construction. However, in certain situations of difficult terrain where soils are prone to formation of deep gullies, the maintenance costs were high, and farmers were not able to cover them without the support of public administration, given the need to use appropriate tools and equipment for heavy work. Moreover, only 5 out of 22 ORDA watersheds were model ones. Most of the rest of ORDA watersheds and also the 650 Bureau of Agriculture watersheds were in an initial stage of rehabilitation. No provision was made in the PCR about regular maintenance of the infrastructure by the local institutions.

145. With reference to IGAs, sustainability risks appear higher. Overall, these activities were considered problematic due to lack of marketing analysis, no clear rights of resource usage, large group size, and limited or absence of private sector engagement. More specifically, regarding cattle-fattening, sustainability appears to be weak due to unclear user rights of resources (i.g. forage cut-and-carry in area closures) and lack of economies of scale given the size of the IGA groups. In fact, many members dropped out of the IGA groups. Similarly with beekeeping, the mission noted poor care of the infrastructure built, which poses significant risk for the medium- to long-term sustainability of the activity itself. Overall, there is concern about the neglect of private sector engagement and an exclusive focus on the public sector and communities,[71] and most of the IGAs were certainly not lucrative enough to generate realistic income for sustainability unless it would be integrated with additional IGAs.[72]

146. The weak policy environment would not sustain the project benefits as per the design. The project design intended to institutionalize the project benefits through policies and legal frameworks, and the enactment of reforms. In particular, with component B "institutional, legal and policy analysis and reform", the project had to support creating an enabling environment and institutional capacity at local (*kebele*, *woredas*/district and regional) levels to mainstream SLM principles into regional policies, strategies and plans for agriculture, forestry and water management. However, this was not materialized by the time of the evaluation. This non achievement of mainstreaming weakened the project sustainability and reduced the potential for the scaling up of the watershed management approach to other non-project areas.

147. Sustainability is also weak for technologies developed for the production of clean energy (i.e. biogas and water pumps) given the current high incidence of subsidies necessary for their functioning.

148. The qualitative assessment confirmed the above assessment. Most of the visited communities (71 per cent, equal to 17 out of 24) expressed their willingness to continue and maintain the promoted activities after project completion but declared that they lacked the knowledge, capacities and/or tools/machines to effectively do so. The two critical aspects affecting the sustainability of the agricultural benefits derived by the project are related to the lack of a market strategy at project level

[71] PCR, paragraph 161.
[72] IFAD Supervision Report (2017).

and the related poor marketing opportunities developed in the project area. As a result, migration is reported as an option by interviewed farmers, especially youth.

149. In sum, sustainability was built in the project's implementation modality, including both the ANRS ownership and its improved capacity at all tiers of regional government structures, and community ownership in maintaining some of the biophysical and infrastructure structures. However, almost all the watershed communities visited raised concerns about accessing materials and their transport and in maintaining the physical structures, while some also raised concerns about lack of capacity. It is clear that the IGAs face very high risks related to sustainability. Given these concerns, sustainability is rated as ***moderately unsatisfactory*** *(3)*.

B. Other performance criteria

Innovation

150. IOE defines innovation as the extent to which IFAD development interventions have introduced innovative approaches to rural poverty reduction.

151. Several innovative aspects were envisaged at project design, ranging from innovative approaches to address well-established issues in the project area, to innovative technologies. These included: (i) communities' involvement in the decision-making process on natural resource management, SLM, and land administration and certification through a participatory approach; (ii) demonstration of the linkages between environmental degradation, rural poverty and climate change in the project area; (iii) mainstreaming of the project's M&E at regional level; and (iv) promotion of local adaptive innovation in the SLM domain.

152. The PCR considered the community-led approach to address SLM and land degradation, and the development of integrated watershed management activities as the two main project innovations. Additionally, the PCR regarded the alternative rural energy supply (i.e. biogas technology), the wetland management, and the conservation of crop landraces as innovative. The paragraphs that follow will assess each innovation practice with the findings from the evaluation mission.

153. Firstly, the community-based participatory watershed management approach was initiated together with United Nations Development Programme, the World Bank, and the GEF following the Government's guidelines (2005).[73] Integrated watershed management centred on community participation is a change of approach compared to business-as-usual management. However, to a certain extent, this was combined with a more top-down approach for the implementation of processes that require technical skills, such as sub-watershed management planning. In this regard, the project built on the previous experience in the country by focusing on rehabilitation of degraded natural resources through community mass mobilization. It operationalized the Government's guidelines on a larger scale (650 sub-watersheds), which could be considered as innovative. In addition, component D was innovative in operationalizing the integration of CCA into farming practices. With this innovative aspect, the project proved that watershed management must be community-based, comprehensive, interdisciplinary and integrated to address the complex needs of a growing population. However, it was less innovative in addressing the contradiction between management solutions for degraded land rehabilitation and uncontrolled traditional use of communal land.

154. Secondly, the approach in blending land certification into SLM was innovative and significantly benefited smallholders in several ways. Although issuing land certification is not new in Ethiopia, in CBINReMP the project strategically blended various interventions. This approach not only ensured land security, but also enhanced household resilience to land degradation and climate change, and gender

[73] World Bank (2008): Project Appraisal Document: Sustainable Land Management Project.

equality. This contribution was unanimously recognized by the target groups (men and women) met by the evaluation team.

155. For the remaining innovative practices, though they might be innovative, various design or implementation flaws weakened their effectiveness, leaving them at piloting stage. For example, the project was claimed to be a pioneer in introducing wetland management and conserving crop landraces in the Amhara region. The PCR argued these activities to have a positive effect on natural resource management and ecosystem conservation, particularly for ensuring and maintaining both surface and groundwater tank reserves. However, as discussed before, the wetland plans were never implemented, and none of the gene bank was functioning by the time of the evaluation mission. Lastly, the PCR argued that the project implementation within the existing government administrative structure was considered innovative in terms of institutional arrangements. However, this approach has been widely used in other IFAD-financed projects, casting doubts on its innovativeness.

156. **In sum**, the project was not as innovative in terms of its participatory approach, and there were flaws in various designs and institutional arrangements. It did not implement the action research activities in order to develop its innovations; however, there were some aspects that were indeed innovative. Therefore, a rating of ***moderately satisfactor****y* (4) is given.

Scaling up

157. IFAD defines scaling up as the extent to which the results of development interventions have been (or are likely to be) scaled up by government authorities, donor organizations, the private sector and others agencies.

158. The value of the community-based participatory watershed management approach practiced by the project is its scalability and the potential for the Government to reach other communities, support them to form their community watershed committees, and build their capacity so that they can learn from those supported by the project. Such a scaling-up process did not take place, which implies an unevenness of land management within the same river basin. It also implies an unevenness in the access to project benefits between target communities and non-targeted ones within LTW.

159. The PCR reported that some project activities/approaches have already been replicated by SLMP at a wider scale.[74] However, while the project added value by blending the community-based participatory approach with other practices that enhance impact against poverty, such as land certification and CCA, the Ministry of Agriculture and Rural Development's Community Based Participatory Watershed Development Guidelines had been already published in 2005. In this sense, IFAD's and other donors' projects were designed to implement the Government's community-based approach.[75]

160. Finally, according to the design document, best practices in SLM and natural resource conservation, including agro-biodiversity, were to be collected and disseminated for replication and adaptation in other basins and watersheds of Nile basin countries. But the evaluation found no evidence of any capitalization of the experiences in a form that can be easily disseminated.

161. The scaling-up criterion is therefore rated as ***moderately satisfactory*** (4). The downgrading is mainly due to two factors: (i) the success in increasing vegetation coverage and area closure was not scaled up to other overgrazed areas; and (ii) the policy planned by the project was not adopted by the Government.

[74] For instance, the national SLMP project, financed by the World Bank, replicates the community-based approach. Other activities being scaled up include the land certification process, biogas production and participatory forest management.
[75] World Bank (2008): Project Appraisal Document: Sustainable Land Management Project.

Gender equality and women's empowerment

162. This evaluation criterion concerns the extent to which IFAD-supported 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; workload balance; and impact on women's incomes, nutrition and livelihoods.

163. At project design, the following major gender issues in the area were highlighted: insufficient participation of women in decision-making processes at the community level; heavy workload and long working hours in on-farm operations and household chores; higher rate of illiteracy than for men; limited women staff in support services within the public sector; and cultural and traditional practices. In spite of this analysis of the issues, the gender dimension was not well incorporated in the project's design in terms of specific subcomponents to address the highlighted issues, although some activities were relevant for their contribution to gender equality (e.g. land certification). In the logframe, the indicators were not gender-sensitive, making gender equality evaluability a challenge.

164. In spite of these shortcomings, some activities have contributed to gender equality through the land tenure interventions. The project made a commendable effort to provide land certificates that reduced boundary conflicts and contributed to women's empowerment, thus creating the enabling conditions to target women. Within the target area, almost all women-headed households were provided with land certificates. In addition, wherever family land was registered, co-ownership was given to both husband and wife. This guarantees equal rights and protects women's rights if their husbands divorce them or pass away. Lastly, as mentioned by the 2017 supervision reports, some landless women also benefited from delineated communal land. As confirmed by the evaluation team, women's empowerment was mostly visible in women's role in household decision-making with men on land use and the income generated by the activities at the household level.

165. The project's support to women's participation in IGAs was weakened by the less than satisfactory IGA performance in general. Women's participation in IGAs was limited. The PCR reported employment opportunities created for 10,133 landless youth and women (40 per cent of the appraisal target), but only 27 per cent of the IGA group members were women. IOE's estimation of women's participation in the IGAs is much lower based on the qualitative assessment, roughly at 10 per cent. This was partially due to the difficulty in mobilizing young girls to participate in IGAs and youth groups, which was caused by lack of awareness within communities. Although the MTR recommended identifying specific roles of women and men, young boys and girls, and their engagement in different stages of the value chain through a gender perspective (from production, to post-harvest, to market), no actions followed to carry through the recommendation.

166. Biogas, improved stoves, and water pumps may have reduced women's workload, although the magnitude, effectiveness and sustainability could not be ascertained. According to its design, the project was to conduct training for rural women on alternative energy technologies to reduce their workload since they were mostly responsible for fetching water from long distances and cooking. The PCR confirmed the introduction of these technologies. However, there were no data on the number of trainees, making it difficult to assess the magnitude of the effectiveness. IOE's assessment could only confirm that these activities remained at a piloting stage. Since all the inputs were given for free, the maintenance and sustainability remained an issue, which may also partially explain the low level of ownership of the results of the introduced technologies, as noted by the survey.

167. **Women's leadership in community decision-making bodies was more visible where the project design provided explicit guidance.** The community-based development strategy was designed to promote gender balance and women's

representation in decision-making processes. The land-use committees were specified to require women's representation, although they were never formed. As for the watershed management committee, the main community-level decision-making body, the gender composition was not specified in the project design. The 2015 MTR found an imbalance in women's representation in decision-making bodies across the different *woredas* and *kebeles*. This remained an issue throughout the project life. In fact, it was observed during IOE's field visit that women's role in various decision-making bodies was minimal. The community survey further confirmed that only 12.3 per cent of the watershed community members in the treatment groups were women, similar to the control group compositions.

168. **In summary**, by providing land certificates, the project contributed significantly to women's access to productive resources and women's decision-making at the intra-household level. The other activities, including IGAs, biogas and alternative stoves, may have made progress in reducing women's workload and creating employment opportunities. On the other hand, on one important dimension of women's empowerment – women's representation on decision-making bodies – the project could have ensured higher participation of women. Therefore, gender equity and women's empowerment is assessed as ***moderately satisfactory*** (4).

Environment and natural resource management

169. One of the key project successes, if not the major one, was using community mobilization to address the problems caused by natural resources degradation in LTW, thus establishing a connection between community development needs and protection of the environment. The achievements included in-situ SWC, enhancing groundwater recharge through biophysical SWC structures, and reducing runoff damages through area closures. However, there was little investment in enhancing soil health management. Effective watershed management is contingent on integrating SWC with adopted practices and infrastructure to address the growing complexity in managing natural resources.

170. By supporting the implementation of suitable erosion control and management measures, the project contributed to improving the environment in LTW. These measures prevent the land from being irreversibly damaged by soil erosion. SWC measures reduce surface runoff, soil loss, and thus minimize environmental damage and degradation. With area closure on degraded lands, vegetation cover improved in composition, structure and density, resulting in improved water flow regimes. However, the project did not sufficiently accompany the promotion of the area-closure practice with support to complementary strategies and regulatory measures to avoid overgrazing on communal land. In most areas visited, the evaluation team observed a juxtaposition of successful exclosures and overgrazed areas, which represents a negative impact unwittingly caused by the project. The project also did not include measures for creating riparian buffers to protect riverbanks and did not sufficiently promote agroforestry to mitigate sediment discharge into streams from adjacent agricultural croplands or livestock-grazing areas.

171. While there were overall achievements in the rehabilitation of degraded lands and the resulting in-situ environmental improvements, the net effect on Lake Tana watersheds relative to sediment accumulation in downstream reservoirs is hard to estimate without any data. Data are also lacking in how much the project contributed to reducing silting and turbidity in Lake Tana. The evaluation team had strong doubts about the significance of positive effects, given the visible signs of negative effects in terms of soil erosion and gullying resulting from increased overgrazing and tilling practices on agricultural lands on slopes, which have not improved significantly.

172. **Natural resource management.** Regarding the ten core principles set out by IFAD's Environment and Natural Resource Management policy, [76] three are

[76] IFAD (2012). Environment and natural resource management policy - Resilient livelihoods through the sustainable use of natural assets. IFAD, Rome.

particularly relevant to the project context: (i) Climate-smart approaches to rural development; (ii) Improved governance of natural assets for poor rural people by strengthening land tenure and community-led empowerment; and (iii) Livelihood diversification to reduce vulnerability and build resilience for sustainable natural resource management.

173. Regarding the first and third principles, the project provided support to hillside farmers to improve their farming systems' productivity. The various practices introduced include on- and off-farm SWC, mixed cropping for production optimization, forage production, fruit and woody trees, among others. In model watersheds supervised by ORDA, these practices increased land productivity for the major crops –wheat, barley, triticale and maize. ORDA established a system of clusters to achieve a rapid replication of adaptation practices. The introduced practices include changes in cropping pattern, forage cut-and-carry on area enclosures, and income/livelihood diversification.

174. Regarding the second principle, the project contributed to establishing an effective system of communal pasture governance through informal community by-laws. It supported land registration through a second-level landholding certificate, a system that started in 2012. Supporting certification is a way of scaling up because it: (i) protect access rights for vulnerable groups; (ii) provides tenure security, which encourages increases in productivity and investments in SWC, and tree planting; and (iii) reduces land resource conflicts. Indirectly, land certification activities reduced land degradation and decreased communal land pressure by supporting farmers' investments in their plots. Overall, land tenure-related activities proved to be an essential part of effective natural resource management.

175. Based on the above narrative, the Evaluation rates environment and natural resource management as ***moderately satisfactory*** (4).

Adaptation to climate change

176. The project successfully supported target households to adopt climate-resilient farming practices and promoted the integration of trees in the farming systems to enhance CCA and CCM. However, this was limited to micro-watersheds covered by ORDA, which are a small fraction of LTW. The project started its implementation without demonstrating special attention to the impacts of climate change on LTW populations and agroecosystems. However, it caught up with climate sensitivity during its implementation by launching component D, implemented by ORDA as described earlier, to address issues of CCA and CCM. Some model micro-watersheds visited showed how tree-planting on degraded lands and the introduction of woody species and shrubs could allow to achieve both CCA and CCM. The diversification of farming systems through fruit tree-planting contributed to climate change adaptation and mitigation. Cases observed include the introduction of fruit trees such as apple in farming systems, soil management through mixed cropping with leguminous crops, and tree-planting on degraded land to improve carbon storage and the watersheds' health and protect downstream valleys against the impact of climatic variations. In these cases, clear linkages between adaptation and mitigation, resulting from synergies between off- and on-farm activities, strengthened farming systems' resilience and ecosystem services (for adaptation, carbon sequestration, and water regulation).

177. Nevertheless, the Evaluation observed that limiting the focus on planting trees and shrubs on degraded lands to address CCA and CCM issues presented two main weaknesses. Firstly, the project did not introduce conservation agriculture practices, which could enhance soil fertility and soil carbon storage and, therefore, enhance farming systems' resilience. Secondly, there was weak integration of trees in the farming system to enhance CCA and CCM. The evaluation observed that fast-growing species (e.g. *Acacia decurrens*, *Acacia saligna*, *Eucalyptus spp*.) are planted as a substitute to crop production where farming systems have become unproductive. In

some areas where unmanaged soils have become acid, *Acacia decurrens* has become the substitute cash crop. With the risk of a tree monoculture and the threat to household food security, this expanding practice is a kind of maladaptation.[77]

178. Opportunities were missed for integrating CCA into farming practices. Until the design of component D, the project was implemented according to its original logframe. The design did not streamline climate change-related issues in its components A, B, and C. While component D could have filled this gap, it was not adequately designed to streamline CCA in all the project interventions. Important opportunities were thus missed. First, there was no attempt to introduce conservation agriculture by promoting crop residue management and the rotation of cereal crops with legumes. This could be a cost-effective approach, as many farmers cannot afford to buy mineral fertilizers. Secondly, one of the farming systems improvement strategies under component B has been promoting fruit trees such as apple. However, agroforestry, as practiced by the project, lacked a proper design. For example, no attention was given to promoting intercropping of Nitrogen-fixing trees and shrubs, which can improve crop production and produce fodder and wood and mitigate carbon dioxide. An analysis of the community survey shows little improvement of the project communities with respect to CCA outcomes compared to the control communities except for the reduction of flood risk (see Table 11). This was supported by the fact that the project communities apply similar coping mechanisms during climate shocks as the control group: among seven coping mechanisms checked, the treatment group only shows a significantly higher application of small-scale irrigation.[78] This further questioned the value addition of the project compared with government-led mass mobilization activities.

Table 11
Outcomes of climate adaptation strategy t-test results

	Treated (N = 74) [A]	Control (N = 62) [B]	Difference	Standard error	T-test [A=B]
a. Improved water storage during dry season	.297	.29	-.007	.079	0.088
b. Increased water flow during dry season	.257	.29	.034	.077	-0.435
c. Reduced flood risk	.595	.452	-.143	.086	1.668*
d. Reduced crop loss during drought	.392	.452	.059	.086	-0.699
e. Reduced potential loss of livestock	.675	.677	.002	.081	-0.0215
f. Reduced potential loss of income	.648	.597	-.052	.084	0.619

179. Overall, the project did not sufficiently support the incorporation of trees into area closures and in forage management and into the farming system as good practices for CCA and CCM. Some of these aspects were corrected in the sub-watersheds covered by component D but at a piloting scale. Based on the above narrative, the evaluation rates adaptation to climate change as ***moderately satisfactory*** (4).

C. Overall project achievement

180. The project proved that land-based watershed management could be an integral part of rural development and poverty reduction strategies that can deliver livelihood

[77] Maladaptation refers to "any changes in natural or human systems that inadvertently increase vulnerability to climatic stimuli; an adaptation that does not succeed in reducing vulnerability but increases it instead". See: GEF (2010). Evaluation of the GEF strategic priority for adaptation. https://www.thegef.org/sites/default/files/council-meeting-documents/GEFME-C39-4-SPA_Evaluation_0_4.pdf.

[78] The seven coping mechanisms are: (i) Start to use short-maturing and drought-resistant crop varieties; (ii) Start small-scale irrigation; (iii) Construct water conservation structures; (iv) Change cropping pattern/season; (v) Diversify income (become involved in off-farm and non-farm activities); (vi) Store feed; and (vii) Sell livestock.

opportunities and improve the environmental sustainability of poor rural people. This requires a genuine community-driven, bottom-up approach and a differentiated targeting allowing inclusiveness to achieve sustainable results. However, design defects weakened the intervention logic and subsequent effectiveness, including over-complexity of component A, weak internal coherence between different activities/elements, a weakly designed targeting approach, unclear pathways to sustainable livelihoods with increases in household income and greater food security, and the absence of a Lake Tana Master management plan with subplans for the four perennial rivers that contribute to the Lake's inflow.

181. With a strong government commitment, the project effectively rehabilitated and protected the vegetation cover of degraded land, promoting SLM. Land certification was a commendable practice that reduced land disputes and empowered women, and it put in place conditions that enable farmers to feel secure in investing in the improvement of their land. However, overall effectiveness was weakened by: lack of focus on on-farm soil and water conservation; absence of an integrated crop–livestock farming system support strategy; the missed opportunity to introduce conservation agriculture and CCA activities to broader watershed areas; the disappointing performance of the IGAs; lack of measures to control free grazing on communal land; and the weak institutional and policy framework.

182. **In summary**, both qualitative and quantitative assessments show that CBINReMP had only limited, verifiable impact on rural livelihoods. It contributed to higher household incomes and some greater dietary diversity, but only where the project managed greater community participation. However, even for those beneficiaries, livelihood conditions had not become significantly more productive, diversified, resilient or sustainable than those of the non-beneficiaries. The evaluation accords a rating of ***moderately satisfactory*** (4).

D. Performance of partners

Government

183. CBINReMP demonstrated strong ownership by the Regional Government from design to implementation. It was designed in collaboration with the Government and implemented through a participatory approach which actively involved concerned communities and government representatives at all levels (*woreda*, *kebele* and central). The Government's commitment to CBINReMP was reported in the project documents and shown during the evaluation mission. A strong sense of ownership by the decentralized administration structures, from regional government to *kebele* was also remarked. The direct implementation and close involvement of the structures of the Amhara regional government played an important role in developing the sense of commitment at field and regional levels. The regional bureaux (BoANR, BoEPLAU and BoFED) made significant efforts in coordinating and implementing project activities in the targeted area. At district level, coordination was ensured by a focal point within the District Office of Agriculture. At federal level, linkages were developed throughout the project's life with the SLMP and its donors through government staff, particularly within the Ministry of Agricultural and Natural Resources.

184. On the other hand, some limitations were observed. Firstly, less than optimal collaboration between the Ministry of Agriculture and other related government agencies, specifically with regards to damages caused by road construction, led the project to address the consequences but not the causes of the land management problems. Secondly, several *woreda* staff charged with the responsibility of overseeing CBINReMP activities had other competing assignments which limited their availability and overall reduced the flow of information. Thirdly, accounting challenges were reported throughout the different levels of project management, which negatively affected the flow of financial information from the federal to the regional level. Fourthly, the choice of a distant implementing partner proved to be a

challenge throughout implementation. In particular, the overall performance of the Ethiopian Biodiversity Institute, the federal-level implementing partner, presented some limitations: (i) the institute set up its regional office in the project area only towards the end of project implementation (during the last two years); and (ii) the management of contracts to finalize the gene banks was weak, which negatively affected project activities on the ground. None of the gene banks constructed were operational, as noted by the evaluation team.

185. M&E and reporting was one of the challenges of this project, which initially struggled to have a functioning M&E system up and running. Challenges were largely due to government understaffing and high staff turnover in the PMU (GEF TER). During the field visits, it was often difficult to obtain information on physical achievements and changes that took place during the project's life with regard to the Output "Community-based integrated watershed management practices adopted". This difficulty is mainly due to the fact that if the logframe is used as a basis for the M&E system, most related indicators are essentially quantitative. When describing achievements of outputs expressed in terms of area (ha), such as planted forests or rehabilitated agricultural land, it is important that indicators combine quantitative and qualitative measures; the qualitative indicator ultimately measures the effects of the project.

186. In many cases of wide thematic areas, indicators were not differentiated according to the subthemes. For example, under PFM the project was to support the increase of forest cover by at least 10 per cent, and the establishment of 18,900 ha. The targets were not differentiated as to the kind of functions met by planted trees or managed forests, which affects the evaluability of those interventions. In the context of watershed management, appropriate indicators should refer to planting objectives such as reducing deforestation (e.g. afforestation of degraded lands), supporting livelihoods and contributing to reducing poverty of the communities (e.g. agroforestry including fruit-tree agroforestry, homestead garden trees, farm woodlots, pasture tree enrichment), and establishing SWC functions (e.g. trees in biophysical anti-erosion structures, river bank buffer protection planting).

187. The PMU was generally responsive to most of the recommendations made by the supervision missions and proactive in solving implementation issues. However, it was set up late and generally reported a high staff turnover throughout the project's life. Notwithstanding the training provided to project staff, the high turnover negatively affected its overall performance and was particularly evident in the weak quality of the financial management and M&E. Financial management was also characterized by a general lack of monitoring; accounting and reporting were consistently below the required standards.[79]

188. The performance of the Government is rated as ***moderately satisfactory*** (4).

IFAD

189. IFAD's implementation support was timely and requisite. Overall, IFAD carried out seven supervision missions: one MTR and six implementation support/follow-up missions. The support provided throughout the project's life was reported to be adequate to solve implementation bottlenecks, based on a sound understanding of the project area, and proposed through a collaborative approach. Procurement and AWPBs were promptly reviewed by IFAD and no delays were reported in responding to withdrawal applications submitted by the project. IFAD supervision missions positively contributed to the project disbursement rate of 100 per cent, and several recommendations were provided to improve project financial management throughout implementation. Similar to findings from IOE's Country Programme Evaluation (2015), interviews with federal and regional stakeholders confirmed that the IFAD country office played a highly responsive role and served as "the most

[79] Source: GEF TER.

flexible donor" in adapting to changing conditions, while "not imposing unwarranted and inappropriate conditionality".

190. While these missions identified issues and relevant recommendations, critical issues from the project design remained unaddressed and affected overall effectiveness: lack of a master river basin management plan; over-complexity of component A; and a weakly designed targeting approach. Adequate adjustments were made but were not sufficient in addressing the inconsistences and weaknesses in the intervention logic. The absence of a coherent project design supported by a clear ToC and relevant indicators at different results levels made monitoring and managing for results very challenging. Moreover, IFAD could have made more efforts in addressing the delays in undertaking the baseline survey and making the M&E system work.

191. **The PCR also noted some limitations in the supervision support,** as some of the agreed actions were not specific in nature and continued to be issues in the subsequent mission. Although these issues are the responsibility of the borrower (lead agency) to act on, some of them remained unresolved for quite some time.

192. In summary, IFAD provided strong support during project implementation, and the overall design was adequate in addressing the development challenges in Lake Tana watershed. A strong country presence and the trust built with government stakeholders at different levels were also acknowledged by different partners. However, the design weakness, coupled by ineffective project implementation in various aspects (e.g. inadequate on-farm investment and training, missed opportunity in mainstreaming CCA, weak gender and youth performance, failure of IGAs) renders IFAD performance to be rated as ***moderately satisfactory*** (4).

E. Assessment of the quality of the Project Completion Report

193. **Scope.** The PCR covered all the elements set out in the PCR guidelines of 2015, including the evaluation criteria as well as informative annexes. Although it provides detailed information on activity and output targets, it does not provide sufficient information on project effectiveness with regard to its objectives. It does not sufficiently assess the performance of IFAD with regard to providing technical/scientific backstopping to the project implementation. The analysis under most performance criteria does not sufficiently highlight key issues. For relevance, for example, the issues of targeting and of pathways to increase income of target groups are not substantively analysed. Under effectiveness, the PCR does not provide a substantive analysis of the project's weak contribution to increasing target groups' income as planned. In light of this assessment, the scope of the PCR is rated as ***moderately satisfactory*** (4).

194. **Quality.** The project implementation lacked an adequate M&E system and was characterized by lack of baseline information that could allow impact to be assessed. These aspects were highlighted in this report when discussing the limitations of the impact study. Despite these shortcomings, the PCR made an effort to present available information on the performance of the project with regard to the activity and output targets. In light of this narrative, its quality is rated as ***satisfactory*** (5).

195. **Lessons.** Most of the lessons provided in the PCR are of good quality and reflect a good analysis of documents. But in some cases they do not reflect an analysis of field realities. For example, there is no assessment of the overgrazing that goes alongside the successful vegetation regeneration under the area closure system. The success of the PFM approach is exaggerated. In light of this narrative, the PCR's outline of lessons learned is rated as ***moderately satisfactory*** (4).

196. **Candour.** The PCR could have better highlighted the overall weak contribution to increasing the income of the project's target communities, lack of support to measures to control overgrazing on communal land, and weak streamlining of CCA and CCM across the area covered. Candour is rated as ***moderately satisfactory*** (4).

IV. Conclusions and recommendations

A. Conclusions

197. **The project was designed on the correct premise and attempted to integrate a livelihood approach into natural resource management** to deliver livelihood opportunities and improve environmental sustainability for the rural poor. It centred on a landscape approach to deliver rural poverty reduction, climate resilience, and sustainable development practices, which are considered adequate in achieving the project's development objectives. It clearly responded to the actual needs of the target communities and to the priorities related to the management of degraded land. However, needs related to specific groups were not completely analysed: the project's design lacked a prior study identifying the basic issues on gender equality and women's empowerment and youth development inclusiveness.

198. **The high degree of participation in the project activities demonstrates that overall the project designed the right activities; however, it could not ensure equal participation for all.** The project implemented a wide range of activities focusing on participatory watershed management, pasture and forage development, soil and water conservation, and biodiversity and ecosystem protection. Beneficiaries who participated in a relatively higher number of activities saw perceptible income increases, but participation clearly varied across watersheds. This implies two possible reasons: one, the level or quality of implementation differed across watersheds; and two, the activities were simply too numerous to ensure full participation by all beneficiaries.

199. **The limited impact on incomes of beneficiaries is also related to the nature of natural resource management projects and the low investment per beneficiary household.** Although the goal of the project was to increase incomes of beneficiaries, this was essentially a natural resource management project with its main underlying objectives being improved access of the poor to natural resources and adoption of SLM practices. Such interventions can have relatively longer gestation periods, and therefore take longer for income effects to be visible, and it is likely that at the time of this evaluation, these either had not materialized or were small so as to be not detected using the statistical power of the sample. The project did promote some IGAs but the magnitude of this activity was quite small. It is also likely that the relatively low cost per beneficiary household did not result in perceptible changes to their incomes.

200. **The project achieved considerable results in restoration of degraded natural resources through community mass mobilization, but there was no genuine community empowerment.** The project added value not only in rehabilitating ecosystem functions on degraded lands, but also by promoting watershed management planning and implementation at sub-watershed level. However, the planning process remained "top-down", with government institutions taking decisions that were subsequently communicated to the communities for implementation. Furthermore, there was insufficient focus on activities to train extension officers at *kebele* and *woreda* levels in the use of participatory methods in designing and implementing watershed management plans.

201. **There was a lack of coherence and synergies among different activities; this was partially caused by the absence of a master river basin management plan.** While micro-watershed was an appropriate level for participatory watershed management implementation, the adequate level for watershed management analysis and planning should have been the river basin level. As land uses in Lake Tana watershed include upland agriculture and lowland agriculture landscapes, tree plantations and forests, and grazing land, a master river basin management plan based on an integrated landscape management approach would have ensured a comprehensive rehabilitation of natural resources, including on-farm and off-farm lands.

202. **The success of CCA practices and technologies showed that an opportunity was missed by not introducing them for on-farm production improvement in all the 650 sub-watersheds.** Climate is a cross-cutting issue and was considered as such when the need was felt to add a component to the design of the project. The approach of implementing this component through technology clusters in five model micro-watersheds was a good choice, given that the selected technologies were already known. However, an opportunity for scaling up climate-related activities to all other project areas was missed, and the model micro-watersheds were not used as start-up areas to train the extension agents who would disseminate those technologies to the greatest possible extent in their assigned *woredas*, based on the principle of action-learning.

203. **Although the project supported the role played by the communities in implementing SWC activities, it did not seek to understand the potential of the rehabilitated resources to improve the community income.** Community members with high participation in soil and water conservation had higher incomes than the control group. It is unclear, however, which project activities contributed, and how, to this positive impact. There was higher cow milk productivity and greater herd size among beneficiaries with high participation, as well as benefits from "cut and carry" forage collection, which, to a limited extent, could partially explain the impact on incomes. However, increase in income was not associated with better crop yields, greater income diversification or off-farm income opportunities, enhanced women's empowerment, and reduced conflict over land. The lack of impact on crop productivity or income diversification suggests that the promotion of conservation practices and IGAs induced no attributable economic gains to beneficiary households. Part of this outcome might be explained by the fact that conservation was mostly promoted for off-farm, community resource protection, hence not directly having an impact on farm productivity or household-level economic opportunities.

204. **While the project improved women's access to land certificates, little evidence was found that the project significantly empowered women and youth**. Inclusion of women and the resource-poor is of paramount importance for the watershed development to become truly participatory in both implementation and impacts. However, in the project design and implementation strategy, CBINReMP lacked a gender perspective in targeting women's needs, except the support to land certification. Although women participated in the project's activities alongside men, their lack of representation in watershed committees weakened their role in community decision-making. Similarly, the project lacked impact on youth in terms of developing IGAs and entrepreneurship, or organizing them into cooperatives.

205. **CBINReMP effectively supported inter-service coordination between ANRS agencies which have complementary mandates in the various aspects of natural resource management and rural development**. Projects involving multiple agencies work best where institutional arrangements leverage the comparative advantages of each of the partners. CBINReMP's support enabled ANRS to strengthen the institutional coordination among its agencies which have complementary mandates in the various aspects of watershed management, natural resource management and rural development. Its institutional capacity development activities were designed to ensure that ANRS structures at all levels of governance would have the skills to integrate participatory watershed management in their plans and activities. However, there were some gaps in inter-agency collaboration in the areas of forest plantation establishment and management, agroforestry, public road infrastructures as factor in gully formation, livestock management, and related value chain development.

206. **The nature and design of the project posed complications in the conduct of the impact evaluation.** The CBINReMP had a wide reach (650 watersheds) and a relatively large number of activities. This required a substantial amount of data collection on the part of the project M&E system to track and report on, which was a

daunting task. As a result, the system was found wanting in some respects – it provided incomplete information about targeted watershed communities and lack of clear distinction lines between the project's interventions and support provided to communities through other mechanisms. This, and the selection biases because of non-random placement (targeting) of the project, self-selection of beneficiaries, possible spatial spillover effects of project benefits to non-treatment communities, and the project's phased rollout, posed obstacles in conducting the impact evaluation.

B. Recommendations

207. Key recommendations are provided below for consideration by IFAD and the Government of Ethiopia.

208. **Recommendation 1. Adopt a master plan for integrated participatory watershed management as an effective rural development approach to enable the involvement of all stakeholder groups in the management planning and implementation processes.** The holistic nature of an ecosystem requires holistic management since one sector's activity can affect another. A master plan could serve as a framework for the design of an integrated approach to maximize the coordination, complementarities and synergies of implementation efforts from different parties. A livelihood vulnerability assessment should inform the process for its elaboration to understand the stresses on the farming systems and natural resources in the watershed and the capacities of the rural households to cope with those stresses on their assets. It is also recommended that watersheds be developed in clusters defined by the demarcation of the drainage areas within the wider watershed. The key criterion to be used for selecting the micro-watersheds is that the intervention should be essentially a community organization process.

209. **Recommendation 2. Watershed management projects should prioritize the inclusion of women, youth and vulnerable groups in the design and implementation of the management plan of their watersheds.** Watershed development projects tend to be biased in favour of those who own and have access to land and other productive resources. Without attention to the poor and landless, inevitably the greatest benefits will flow to those who are relatively better off. Hence, it is important to develop farm typologies based on adequate poverty and livelihoods analyses, including gender analysis to identify context-specific women's needs and to determine the most effective pathways for change. To promote increased equity between landless, nearly landless, and farmers with land, a differentiated targeting approach to the vulnerable groups should be used. Linking livelihoods to natural resource development objectives is key, and opportunities should be sought/provided to those marginal groups, balancing technical objectives with consideration of social inclusion and equality.

210. **Recommendation 3. For projects that have their principal focus on natural resource management, align the length of the project's duration with the time frame of the watershed management plan in order to fully see the effects on beneficiaries' incomes.** Results from natural resource management interventions can take longer to fructify than other interventions, and the resulting expected effect on income may not always be visible even immediately after the project's completion. This does not allow time for any necessary course-correction to be made, and also limits learning from the project. Allowing for sufficient implementation time for such projects can be one way to see a fuller effect on incomes before a project's completion, and this can be achieved by ensuring that the duration of the project is at least as long as the time frame required for the implementation of a major part of the master plan.

211. **Recommendation 4. When adding new cross-cutting components to a project after its implementation has already started, ensure that they are holistically integrated into the project rather than appearing as a separate**

project implemented in a fragmented manner. For components and activities added to a project that is already under implementation with the aim of addressing a cross-cutting theme, avoid adding them through a separate and geographically targeted component, but rather ensure their full integration in all project components where relevant. In order to integrate the added intervention in the existing project strategies, a review and possible revision of the ToC is of the utmost importance. In the case of an added cross-cutting component such as for CCA, the revision of the design should set clear foundations for its integration, including clarifying how impact pathways take into consideration both the new and the existing components. It would also require appropriate implementation assumptions, not only with regard to the participatory involvement of target communities, in the case of watershed development, but also the contribution to the enabling policy framework.

212. **Recommendation 5. The design of watershed management projects should embed M&E elements that can better facilitate impact studies.** It is important to better track where projects will and will not be implemented, and the reasons for those decisions. In this manner, when conducting impact evaluations one can control for those differences between target and non-target watersheds in analysis, and the unobservable component of potential project placement bias becomes minimized. Another element that can help ex post impact evaluation of projects like CBINReMP that have a wide reach and relatively high number of activities is to track which type of interventions take place in which project areas (in this case, in which watersheds). Finally, in order to conduct a good-quality geo-spatial analysis, it is crucial to have an accurate depiction and delineation of project boundaries, in this case, watersheds, through digitization of existing physical watershed boundary maps to filter out non-agricultural land from imagery at a localized level.

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.	X	Yes
	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.		No
	• 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.		No
	• 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.		No
	• 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.		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, etc.) 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; workload 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 resource 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 resource 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	4	-1
Project performance			
Relevance	5	4	-1
Effectiveness	5	4	-1
Efficiency	4	4	0
Sustainability of benefits	5	3	-2
Project performance[b]	**4.75**	**3.5**	**-1.25**
Other performance criteria			
Gender equality and women's empowerment	5		-1
Innovation	5	4	-1
Scaling up	5	4	-1
Environment and natural resource management	5	4	-1
Adaptation to climate change	5	4	-1
Overall project achievement[c]	**n.a.**	**4**	**n.a.**
Performance of partners[d]			
IFAD	5	4	-1
Government	4	4	0
Average net disconnect			**-0.92** (-11/12)

[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 resource 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.	4	n.a.
Quality (methods, data, participatory process)	n.a.	5	n.a.
Lessons	n.a.	4	n.a.
Candour	n.a.	4	n.a.
Overall rating of the Project Completion Report	n.a.	4.25	n.a.

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

Reconstructed theory of change

1. A theory of change (ToC) allows the understanding of how a programme or project is expected by its designers to lead to expected results by showing its sequencing and causal pathways, i.e. the links from outputs and outcomes to impact. Patricia Rogers[1] (2008) provides the following description and definition of the ToC: "Every programme is packed with beliefs, assumptions and hypotheses about how change happens – about the way humans work, or organizations, or political systems, or ecosystems. Theory of change is about articulating these many underlying assumptions about how change will happen in a programme."

2. As no explicit ToC was formulated during the design process of CBINReMP, since it was not required at the time, the evaluation reconstructed it to make explicit the underlying ToC. The evaluation used the model developed by John Mayne[2] (2015), which puts behaviour change at the ToC's centre. The model argues that appropriate outputs must be delivered and put in use by stakeholders to change behaviour. Then behaviour change leads to intermediate outcomes (i.e. change in practices), outcomes (i.e. direct benefits) and impact (i.e. improved well-being). The justification for using Mayne's model is that many CBINReMP interventions focus on capacity-building or socio-organizational change, or aim to bring about a change in practices (land management).

3. Based on the reading of the project document, the evaluation team reconstructed CBINReMP's ToC in order to examine the key aspects in the outputs to outcomes to impacts pathways that are intermediate states, impact drivers and assumptions. Based on definitions provided by the GEF[3] (2009), the "**intermediate states**" are the transitional conditions between the project's immediate outcomes and its desired impacts, and are necessary changes for achieving these impacts. The analysis also identified "**impact drivers"**, which are significant factors that, if present, are expected to contribute to the realization of the desired impacts and are within the control or influence of the project. The **"assumptions"** are the significant factors that, if present, are expected to contribute to the ultimate realization of project impacts but that are largely beyond the power of the project to influence or address. The **impact pathways** are the means–ends relationships between project outcomes and the intended impacts that describe the specific conditions or factors that are required in order to achieve impacts. From a theoretical standpoint, the premise is that if the project outcomes are assessed as having been achieved and the key ToC conditions between outcomes and impacts are in place, then it can be concluded that there is a likelihood that the desired impacts will be achieved.

4. The reconstructed ToC is presented in Figure 1 below. From the left, it begins with the identification of the direct partners that implement the project. This is followed by the identification of key problems to be addressed, which are: (1) Insufficient landholding for about one third of the number of householders; (2) Land degradation due to loss of vegetation cover and soil erosion; (3) Most households experiencing a prolonged food gap during pre-harvest period; and (4) Decline of agricultural productivity due to increased population density and environmental degradation. Then follow three immediate outcomes that derive from the components as identified in the project document.

5. The project's goal and purpose being also well defined in the project document, the task of the reconstruction of ToC centred mainly on identifying the elements that were not explicitly described in the project document, which are the impact drivers,

[1] Rogers, P.J. (2008) "Using Programme Theory for Complicated and Complex Programmes", *Evaluation*, vol. 14, no. 1, pp.29–48. https://journals.sagepub.com/doi/pdf/10.1177/1356389007084674
[2] Mayne, J. (2015). Useful Theory of Change Models. Canadian Journal of Program Evaluation/La Revue Canadienne d'Évaluation de programme 30.2 (Fall/Automne), 119–142
[3] GEF (2009). The ROtI Handbook: Towards Enhancing the Impacts of Environmental Projects. Methodological Paper #2. https://www.gefieo.org/sites/default/files/ieo/ieo-documents/ops4-m02-roti.pdf.

the assumptions, and the intermediate states. After completing the identification of the explicit and the implicit elements and their sequence, the evaluation team proceeded to the final stage: the analysis of the impact pathways.

6. Three impact pathways were identified: (1) Participatory action research allows behaviour change and adoption of climate-smart agriculture practices; (2) Improved institutional capacity and community organization; and (3) Social equity, and women's and youth's empowerment. Two assumptions were also identified: (1) Amhara Government is committed to support transformative processes aimed at mainstreaming Lake Tana Watershed Management into sustainable development strategies; (2) Local communities led by their Watershed Management Committees take greater responsibility implementing watershed management. As for the Intermediate States (IS), four were identified as follows (the first figure of the sub-index indicates the number of the Impact driver to which the IS relates):

   $IS_{1.1}$: Adoption of climate-smart agriculture practices leads to increased resilience of watershed resource users;
   $IS_{2.1}$: Reinforced watershed management extension approaches and contents allow major land degradation factors to be addressed;
   $IS_{2.2}$: Building on awareness generated from the project, the Amhara Government intensifies and extensifies Lake Tana River basin management;
   $IS_{2.3}$: Watershed management activities result in the creation of new and sustainable livelihoods for the landless and poor smallholders.

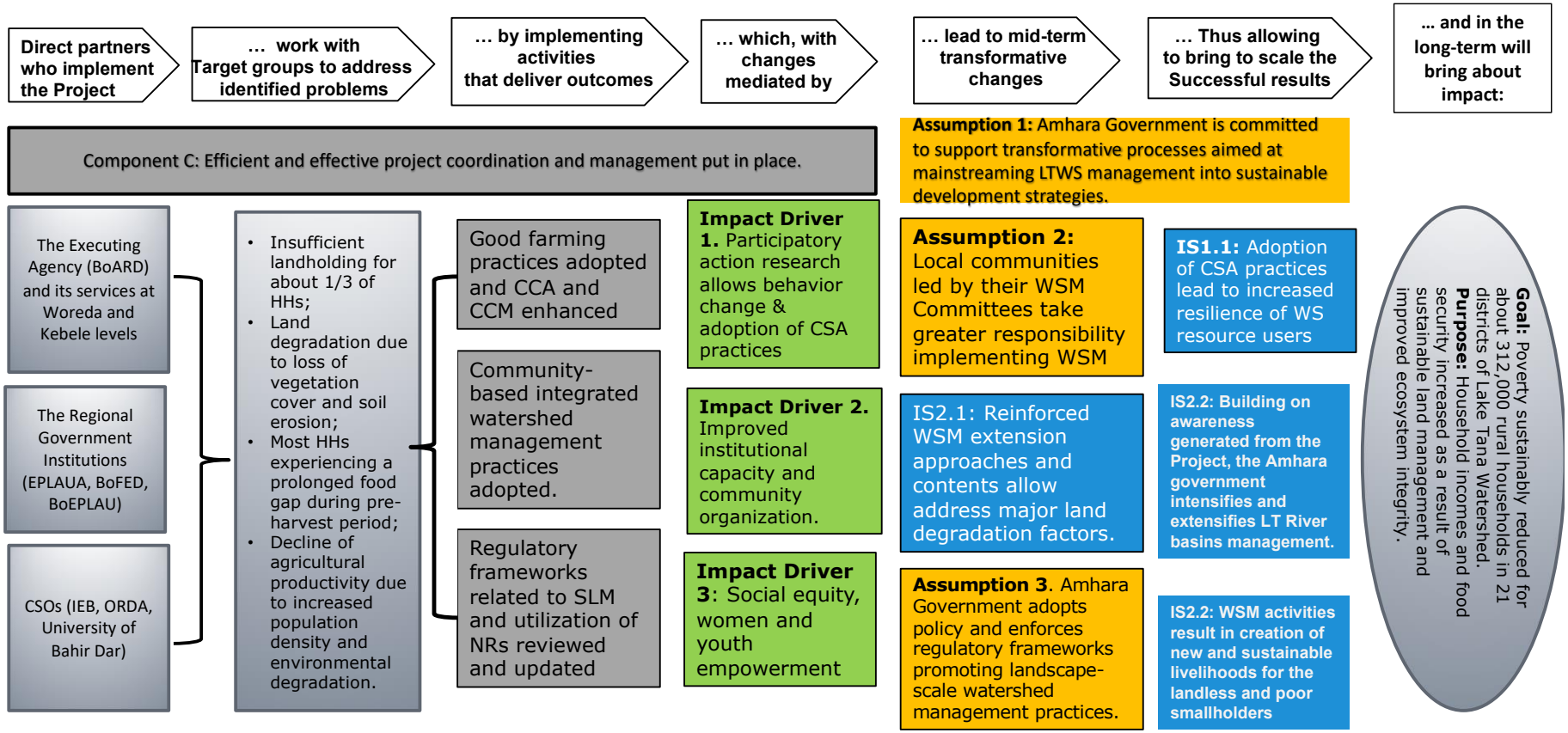
7. After this, the crucial stage was the analysis to identify the impact pathways. Three pathways were identified:

   Pathway 1: "Farming practices". This pathway rests on the second objective of the project: "to improve agricultural production technologies, mainly through the adoption of sustainable land management practices". It is premised on farmers' adoption of good agricultural practices, including on-farm soil and water conservation, and climate-smart agriculture practices to increase the resilience of watershed resource users ($IS_{1.1}$). The changes required to achieve impact are mediated by participatory action research allowing behaviour change and adoption of climate-smart agriculture practices (Impact Driver 1).

   Pathway 2: "Watershed management". This pathway is premised first on ANRS reinforcing watershed management extension approaches and contents that allow major land degradation factors to be addressed ($IS_{2.1}$). It is also premised on ANRS building on the awareness generated from the project to intensify and extensify Lake Tana river basin management ($IS_{2.2}$). Achieving this assumes that local communities led by their Watershed Management Committees take greater responsibility in implementing watershed management (Assumption 2), and is mediated by improved institutional capacity and community organization (Impact Driver 2).

   Pathway 3: "Improved livelihoods". This pathway is premised on the contributions from all of the project outcomes as well as the impact drivers, and on $IS_{1.1}$ and $IS_{2.3}$. To achieve this, it requires a livelihood approach that integrates natural resource management into people's utilization of natural resources to make a living. It further requires a socially inclusive approach that allows women, youth and vulnerable groups (e.g. nearly landless and landless households) to benefit from the project's interventions, through improved land tenure and the creation of off-farm employment.

Reconstructed Theory of change



Methodology, key hypotheses, and survey design of the quantitative analysis

Methods

1. The principal aim of this evaluation is to assess the impact of the project on project beneficiaries. Impacts are assessed for four outcomes considered key to rural poverty reduction: (i) increases in household income and assets; (ii) improved human and social capital and empowerment; (iii) improved food security and agricultural productivity; and (iv) strengthened community institutions and participation.

2. The overall impact evaluation of the CBINReMP conducted by IFAD's Independent Office of Evaluation and IFPRI employed a mixed-method approach. Both quantitative and qualitative data were collected, with the latter being collected prior to quantitative data collection to help inform the design of the quantitative survey. The qualitative data were used to inform interpretation of the quantitative results. Additionally, geo-spatial data were analysed to assess the biophysical indicators as outlined in the theory of change. Here the quantitative approach is outlined and the geo-spatial data are used.

3. This is an ex-post impact evaluation conducted after completion of the project activities. Lacking proper baseline survey data of beneficiary communities and households,[1] a quasi-experimental design method was used to estimate average treatment effects through comparison of beneficiaries and a "control" group.

4. To evaluate the impact of the project on household income, agricultural productivity, and other social and economic indicators, the impact evaluation must attempt to account for potential observable sources of selection bias, with the idea that by accounting for those observables, unobservables are also somehow balanced between the treatment and control groups.

5. In doing so, the impact assessment had to face the challenges identified in the previous section:

   - selection bias because of non-random placement (targeting) of the project;
   - self-selection of beneficiaries into receiving the project;
   - possible spatial spillover effects of project benefits to non-treatment communities; and
   - a phased rollout approach.

6. To account for the non-random placement of the project, the evaluation controls for observable community-level characteristics and geographical attributes that are exogenous to the project – i.e. most of which refer to the period before the project intervention and might be correlated with the project's targeting strategy. However, it is acknowledged that the evaluation cannot account for all possible unobservable confounders. In the context of this study, all households living within the targeted watersheds are considered as beneficiaries, so the results can be considered as "intent to treat" effects. Hence, self-selection of the beneficiaries to take part in the community watershed activities is not an initial challenge.

7. As planning of the project intervention was done at the *kebele* level, the interventions could have benefited both targeted and non-targeted watersheds within a treated *kebele*. To check for potential spatial "spillover" effect due to the *kebele*-level planning of the project, the evaluation first identified whether the control watersheds

[1] A baseline survey was not undertaken until after several years of the start of the project. The late undertaking of the baseline survey implies that the state of conditions that existed in the project areas prior to CBINReMP interventions cannot be precisely established. Also, as noted in the MTR (IFAD, 2014), the baseline survey that eventually was conducted in 2013 was not considered to be sufficiently comprehensive in design and information coverage to facilitate proper monitoring and evaluation of the project's achievements.

belonged to a *kebele* which included a treated watershed or not. It then re-estimated the treatment effects, comparing separately the targeted watersheds with control watersheds located either within or outside the *kebeles* with treated watersheds. The results of this exercise (reported in Annex 2, Table A.1) do not show any consistent pattern that would support the argument of detectable "spillover" effects due to the design of the project.

8. Lastly, it was not possible to account for any influence of the phased roll-out of the project interventions, since there was only after-project information of beneficiary household and community characteristics and the overall benefits they received, not how or when the interventions were phased in.

9. An additional challenge was to identify a proper control group in light of the way beneficiary watersheds were selected. As stated above, the initial selection of watersheds gave priority to those with higher perceived resource degradation. As explained further below, the evaluation randomly selected the control group watersheds from a list of non-project watersheds. Since the non-project watersheds would thus likely face less resource degradation, this could influence the assessed outcomes, given the possible difference in key initial conditions. To account for this potential "mismatch" in conditions between treatment and control group, the household and community survey questionnaires included questions regarding the (perceived) state of natural resource degradation at the start of the project (10 years ago), and this information was used in the matching procedure, minimizing such differences.

Survey design

10. The quantitative data were collected at both the household and community levels. CBINReMP was implemented in three watersheds covering four zones (West Gojjam, Central Gondar, South Gondar, Awi) around Lake Tana. Specifically, the project covered 24 intervention *woredas* or districts. In two of these *woredas*, Quarit and Yilmana Densa, only one micro-watershed was targeted and, consequently, had to be dropped from the sample selection. Furthermore, in South Gondar only one component of the project (land certification) was implemented in all five *woredas* and no information was available for the list of watersheds covered by the project in the *kebeles* belonging to these *woredas*. Likewise, three *woredas* (Wogera, Gondar Ketema, Dangla Ketema) with only either treatment or control *kebeles*/watersheds were also excluded. Thus, the quantitative impact assessment had to be limited to the 14 *woredas* for which watershed level information on implementation activities was available. Within these 14 *woredas*, the project reportedly reached about 153 *kebeles* and 517 community or micro-watersheds. These *kebeles* and micro-watersheds constituted the sampling frame for treated or beneficiary watersheds.

11. A three-stage sampling strategy was followed. In the first stage, three *kebeles* each from the nine *woredas* having 10 or more treated *kebeles*, and two *kebeles* each from the remaining five *woredas*, with less than 10 treated *kebeles*, were selected using simple random sampling. Thus, a total of 37 treated *kebeles* were considered. In the second stage, two treatment watersheds were selected from each sample *kebele* selected in the first stage using simple random sampling. The sample of watersheds was drawn from the list of watersheds initially targeted by the project. In the third stage, based on the list of community members provided by the watershed management committee, 12 farm households were selected from each community watershed, using systematic random sampling.

12. Once the sample treatment *kebeles* were identified, it was decided to select control group community watersheds and households from a list of non-intervention kebele*s* neighbouring the selected treatment *kebeles*. This decision was made on grounds of similarities in agro-ecological conditions and presumably also socio-economic conditions. While this could not be fully verified during the sampling process, it was further assumed that the control group *kebeles* and watershed communities not only

had no part in CBINReMP but also not from any other watershed development project by development partners[2] (other than the periodic natural resource conservation implemented by the Government through mass mobilization).[3] The attempt here was to avoid any problem of contamination of intervention benefits between treatment and control group, while having a proper control group would allow for proper estimation of treatment effects. Following the establishment of the sample frame for control group communities, the same three-stage sample selection procedure was followed for the control group sample selection.

13. The sample size thus obtained consisted of 74 treatment watershed communities and 887 treatment households, and 62 control group watershed communities and 768 control households (Tables 1 and 2).

Table 1
Survey sample design and distribution between treatment and control groups

Description	*Treatment group*	*Control group*	*Total sample*
Number of *woredas*	14	14	28
Number of *kebeles*	37	31	68
Number of watersheds	74	64	138
Number of households	887	768	1 665

Table 2
Geographic distribution of the sample by treatment and control group

Zone	*Woreda*	Number of watersheds		Number of households	
		Control	*Treated*	*Control*	*Treated*
West Gojjam	Bahirdar Zuria	6	6	72	72
West Gojjam	Bahirdar Ketema	4	4	48	48
West Gojjam	North Mecha	4	4	48	47
West Gojjam	South Mecha	4	4	48	48
West Gojjam	Sekela	4	6	48	72
West Gojjam	North Achefer	6	6	72	72
West Gojjam	South Achefer	4	6	48	72
Awi	Fagitalekoma	6	6	72	72
Awi	Dangla Zuria	6	6	72	72
Awi	Banja	4	4	50	48
Central Gondar	Gondar Zuria	4	6	48	72
Central Gondar	West Dembia	4	4	48	48
Central Gondar	East Dembia	4	6	48	72
Central Gondar	Lay Armacheho	2	6	46	72

[2] However, some interventions had overlaps with the sample: World Bank Tana & Beles Integrated Water Resources Development – overlap sub-watershed Gumera. For People and Nature: Establishment of a UNESCO Biosphere Reserve at Lake Tana in Ethiopia, USAID; Amhara Micro-enterprise development, Agricultural Research, Extension, and Watershed (AMAREW) project – overlap *woredas*; Farta, Lay Gayint, Zuria, Sekela.
[3] *Kebeles* and watersheds receiving benefits from interventions by other projects with similar objectives to those of the CBNReMP were excluded from the sampling frame, regardless of their treatment status.

Questionnaires and survey implementation

14. Household and community questionnaires were developed, pre-tested in the field, and modified accordingly before the actual survey data collection, which took place during March 2020. Of the 1,674 households identified from the sampling frame for interviews, 1,665 of them were available and willing to complete the household survey, implying a response rate of 98.9 per cent. Likewise, community-level data were collected from 136 sample micro-watersheds. One key informant (typically head of household) was interviewed for collecting the household-level data, while several respondents were sought to provide the information relating to the community survey questionnaire (typically two members of the community watershed committee, one or two elders from the community, and women and youth representatives).

15. The questionnaire of the community survey included questions regarding: community organization; community's access to infrastructure, institutions, services and markets; and community-led natural resource conservation and climate adaptation practices. The household survey included modules on household composition, land use, land certification, crop and livestock production and utilization, natural resource conservation, extension services and credits, off-farm income, food security, adaptation strategies, and participation in community planning and works. Annex 1 includes both questionnaires. Interviews were conducted in Amharic, the local language of the study area.

Geo-spatial data

16. This impact assessment makes use of agro-climatic and geo-spatial data to assess the biophysical indicators as outlined in the theory of change. According to the project design report, interventions for all targeted 650 watersheds were designed using geo-spatial information. However, none of the area shapefiles needed to geographically identify micro-watersheds could be provided by the project managers or local authorities.

17. Due to the unavailability of the shapefiles, new watershed area data were created. The total sampled watershed area was "re-created" from information provided by respondents to the community questionnaire; specifically, using the responses to the questions regarding how much time it took, in minutes, to walk from the north to the south edge, as well as from the east to the west edge. This walking time was converted to distance and then projected into an estimated rectangle area of the watershed. The GIS-derived centroid was then applied to centre of the rectangle. On this basis, it was estimated that the mean of the sampled watershed area was 7.7 km^2 with a median of 5.2 km^2. Given the application of a uniform walking time, imposed boundary form and typical variations in respondent estimation, these estimates should be taken with a fair degree of possible error. For instance, although watersheds should be discrete objects, many watersheds had overlapping boundaries or centroids that did not seem to conform to topography. This has implications for treatment and control groups since they were subsequently modelled, in some instances, as overlapping. Regardless of these limitations, remote-sensed data were derived from these rectangles and consist of four major variables.

18. To capture changes in the landscapes due to interventions, the evaluation utilized satellite remote-sensing images from MODIS, LandSat and a derived dataset called Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS). Spatial datasets were derived from three primary sources, all of which were available near the year of the start of project interventions. MOD13Q1 and MYD13Q1 MODIS products were used to construct an interpolated 8-day equivalent Normalized Difference Vegetation Index (NDVI) time series with a 250m resolution.[4] Landsat 8

[4] https://lpdaac.usgs.gov/products/mod13q1v006/.

collection tier 1 was used to generate annual cloud-free median NDVI. The NDVI is generated from the Near-IR and Red bands of each scene as (NIR - Red) / (NIR + Red), and ranges in value from -1.0 to 1.0. NDVI is sensitive to the presence of chlorophyll and is regularly used as a proxy for plant health and productivity. From the same source, the evaluation also calculated annual Normalized Difference Water Index (NDWI), which is sensitive to changes in water content of vegetation, with values ranging from -1 to 1.[5] Both LandSat products are annual but have a significantly higher spatial resolution than MODIS products (30m versus 250m, respectively) The time-series properties of rainfall are measured by the CHIRPS dataset. CHIRPS incorporates 0.05° resolution satellite imagery with in-situ station data to create gridded rainfall time series for trend analysis and seasonal drought monitoring. In this case, the rain data were resampled to 75m spatial resolution to ensure that each enumeration area had an observation associated with it. Precipitation is collected by dekad (Funk et al., 2014). There are three dekads in a month, the first two being 10 days long, and the third being the remaining days in the month.

19. All data are summarized over time to help differentiate changes within treatment and control watersheds. For instance, the evaluation might look at whether NDVI or "greenness" is higher in intervention areas than in the control group. The challenge then is to create a set of indicators that meaningfully describes differences between the watersheds for the seven years for which data are available.

20. A large number of potentially important time-series features were derived from the remote-sensed imagery. For the sake of brevity, only those features that were used in the final analysis are described. Note that most time-series indicators will be more robust for the MODIS and CHIRPS because of their significantly higher temporal frequency. Table 3 provides a description of the set of metrics extracted and a brief description of each. Each time-series metric described below is then summarized by its mean value for all land within each of the treatment and control watersheds.

Table 3
Description of remote-sensed variables (2013–2019)

Name	*Description*	*Interpretation*
NDVI/NDWI Slope	Univariate time-series regression estimate	Time trend (positive increasing—negative decreasing)
NDVI/NDWI Standard Deviation	Distribution of observations from mean	Are variations of cropping patterns (water retention) larger/smaller?
Mean	Global mean value	Average observed greenness / rainfall (annual)
Median	Global median value	Average observed greenness
Precipitations sum (annual)	Total annual rainfall during the *meher* crop season	Relative rainfall variation

21. As the data capture the entire watershed and do not allow for spatial heterogeneity within the watershed (i.e. individual plots), our statistical analysis is restricted to statistical differences contrasting treatment and control watersheds. Owing to these limitations, the geo-spatial data were used to provide complementary, contextual information to interpret the results of the quantitative impact assessment based on the household survey data but could not be directly used for the estimation of the treatment effects.

[5] https://www.sciencedirect.com/science/article/abs/pii/S0034425796000673.

Matching procedure

22. The propensity-score matching procedure controlled first for initial heterogeneity between watersheds and households, based on the probability of a watershed and household participating in CBINReMP conditional on the watershed's observable co-variates. Subsequently, to estimate the treatment effects, a *doubly robust estimation method* was applied, which combines propensity-score estimation and regression-based methods (PSM Weighted Regression) (Wooldridge, 2007). The doubly robust estimation method allowed the evaluation to better account for the observable community characteristics that are correlated with project participation and the outcomes, while assuming that unobservables are also balanced between the participants and control group on average.

23. The first step consisted of matching treatment and control groups at the watershed/community level. Since each *kebele* was assumed to include a pool of qualified micro-watersheds and households possessing similar characteristics as those of project communities and households, the community-level propensity score was adopted to find counterfactual communities outside the project area but either within the same *kebele* or a control watershed from a neighbouring *kebele*. A restriction was applied to the communities within the same district to assure geographical similarity and spatial proximity between project watersheds and potential control watersheds. Matching parameters were derived from the community-level data.

24. Selection of the matching variables was done with due caution, because if the project's objectives were met, some of the variables might have changed because of the project. For example, even the household demographics may not be valid matching parameters, like marriage or migration. Since CBINReMP was a nine-year project, the project might have affected virtually any variable one could think of at the household level, including variables that are often used in matching models such as household demographic characteristics, asset holdings or production variables. Therefore, it was decided instead to use variables measured in the community survey that largely reflected pre-treatment variables that could be measured. Since the community or watershed level was the targeted unit of intervention, it made the most sense to also develop propensity scores at that level. Ideally, those variables should reflect the type of characteristics used for the selection of beneficiary watersheds for CBINReMP in the first place. After controlling these variables, the remaining variation in characteristics of watersheds should be considered to be approximately random, rather than due to unobservable differences between selected and control watersheds.

25. The variables for the matching of treatment and control group cases were subsequently selected using the LASSO regression model. The LASSO model is a method for selecting variables to be included in a regression in a way that maximizes predictive value. Intuitively, it is not very different from a standard regression, but with the main difference being that it includes a penalty function for inclusion of variables that do not help explain the outcome. For measuring propensity scores, the LASSO regression is combined with a logit model, in which a cross-validation algorithm is used to choose variables to include in propensity-score estimation. The list of potential variables included community variables that were arguably exogenous, as well as interactions between variables that were continuous or discrete and continuous. The LASSO is increasingly used in studies requiring estimation of propensity scores, particularly in epidemiology. In that literature, Franklin et al. (2015) find that the LASSO outperforms other estimators.

26. The second step was to use the propensity scores to estimate the predicted probability of inclusion for each watershed. For each individual in a watershed, the propensity score indicates the predicted probability that the household belongs to a treated watershed community rather than to a comparison group of non-treated

watersheds. The propensity scores *p* are then used as weights for the comparison observations; that is, while each treatment observation receives a weight of one, the control-group observations receive a weight of $\frac{P(X)}{1-P(X)}$. The intuition is as follows. Watersheds that have observable characteristics indicating that they are not likely to be chosen as participants receive very low weights in the regression, whereas observations with observable characteristics suggesting that they should be good comparisons to treatment observations receive a great deal of weight. By placing higher weights on non-recipient observations that have characteristics more like participants, and lower weights on non-participants that have characteristics less like participants, observable characteristics are balanced between participants and non-participants, even if they were unbalanced before weighting. Using the weights, a balance test among observable characteristics – both those included in the propensity score estimation and those that were not – will be conducted to ensure that observable characteristics are balanced after applying the weights based on propensity scores. Details on the variables included in propensity scores and a balance table for observables prior to treatment are included in Annex VI (Table A.2).

Testing for treatment or degree of participation

27. The project implemented wide range of activities focusing on participatory watershed management, pasture and forage development, soil and water conservation, and biodiversity and ecosystem protection. However, evidence from the qualitative assessment shows that the degree of participation in the various project activities varied considerably across targeted watershed communities. A descriptive analysis of the participation variables of the household and community surveys also confirmed that this was clearly the case. This leads us to make a distinction between "high" and "low" community project participation and assess potential impact heterogeneities. The distinction was made based on close examination of responses to 18 survey questions related to household and community participation in the planned activities of the project (Annex VI Table A.3). A "participation score" (ranging from 0 to 18) was created to rank communities from low to high level of participation. To ensure a comparable counterfactual, two of the control-group watershed communities with a participation score of more than 12 were dropped from the sample. The high project participation score in these cases could reflect that, despite being identified as non-treatment, these were nonetheless direct or indirect beneficiaries and hence could not be considered part of the control group.

28. In the analysis of the treatment effects, this distinction between "high participation" and "low participation" treatment groups is based on the degree of project-related activity participation. Since community participation was both a means to the outcomes and an (intermediate) objective of the project, the distinction made could confound the actual impacts of the project. Based further on the information provided by communities during the qualitative focus group discussions, higher participation is interpreted as synonymous with the intensity of the project's effort (i.e. participation level in the treatment) and that more treatment would more likely help generate the targeted outcomes.

Estimation procedure

29. The quantitative impact assessment was based on an estimation of the average treatment effect on the treated (ATT) for the project's targeted outcomes. The ATT is estimated as the difference between the outcome variable for the households among which the treatment was administered, and among households that were not offered the treatment. The average treatment effect of CBINReMP was estimated using a doubly robust method, as indicated above when discussing the LASSO method for the matching procedure. That is, while the outcome variable is regressed over the treatment status, higher weights were given to non-beneficiary observations with characteristics more like beneficiaries and lower weights otherwise.

30. Formally, the specification of the regression model used to estimate the ATT can be formulated as follows:

$$Y_{ji} = \alpha_{1j} + \beta_1 Treat_{ij} + \beta_k Z_{ij} + \varepsilon_{ij}$$

where Y is (lead and intermediate) output variable; Treat refers to the treatment status, which is a measure of treatment effect; Z_1 refers to different community-level co-variates selected by the LASSO model; α_1, β_1 and β_k are parameters to be estimated; subscript i denotes households, j indexes watersheds, and k denotes the co-variates; and ε is a mean–zero error term. Here, the primary null hypothesis to be tested is whether β_1 (ATT) is equal to zero.

Descriptive data

Household and community socio-economic characteristics

1. By the nature of the project, treated and control groups were not allocated randomly. Hence, to evaluate the extent to which the two groups will be comparable, a series of balancing tests were executed on household- and community-level characteristics. Accordingly, Table 1 describes the household characteristics of the treated and control groups. The results show that, with the exception of distance to cooperatives, the two groups show neither detectable nor statistically significant differences in their demographic characteristics, asset holdings, and access to training and market centres.

Table 1
Household-level characteristics by treatment status

Variable	*Definition and measurement of the variable*	*Treated group*	*Control group*	*Adjusted Wald test*
Age	Age of the household head	49.08	49.08	0.01
Education	Education level of the household head	1.65	1.54	0.41
Household size	Number of active labour force in the family	5.72	5.69	0.06
Land holding	Total land owned (ha)	1.29	1.25	0.21
Livestock	Total livestock of the household measured in Tropical livestock unit (TLU)	5.33	5.40	0.09
Distance to farmer training centre	Distance from home to the farmer training centre using usual means of transport (travel time in minutes)	32.35	35.13	0.78
Distance to *woreda* centre	Distance from home to the *woreda* centre using usual means of transport (travel time in minutes)	108.4	112.7	0.28
Distance to the cooperative	Distance from home to the cooperative using usual means of transport (travel time in minutes)	42.57	52.97	4.10**

Source: Own computation, 2020.
Note: ** refers to 5 per cent significance level.

2. The balancing tests on community-level characteristics of the treated and control watersheds are presented in Table 5. The two groups face similar agroecological conditions and degrees of access to basic infrastructure and services, such as telecommunication, electricity and health services. The two groups are also comparable in their total population and area coverage. While, on average, the treated watersheds are located closer to both markets and cooperatives, the treatment and control group communities do not show detectable differences in access to roads and training centres. Overall, though, it is concluded that the two groups are comparable for all community-level co-variates presented in Table 2.

Table 2
Community-level characteristics by treatment status

Variable	*Definition and measurement of the variable*	*Treated group*	*Control group*	*Adjusted Wald test*
Distance from *woreda*	Distance of the watershed from *woreda* centre (km)	18.75	19.19	0.01
Road access	Distance from the nearest gravel road (km)	2.68	3.04	0.39
	Distance from the nearest asphalt road (km)	17.82	18.06	0.01
Distance to market	Distance from the centre of the watershed to the nearest market (km)	5.58	8.99	4.90**
Distance to cooperatives	Distance from the centre of the watershed to the nearest cooperatives (km)	4.48	7.30	3.39*
Distance to farmer training centre	Distance from the centre of the watershed to the nearest farmer training centre (km)	2.38	2.69	0.47
Agro ecology	Percentage of lowland agroecology	4.42	9.59	1.75
	Percentage of midland agroecology	86.40	79.33	1.37
	Percentage of highland agroecology	9.17	11.07	0.14
Access to telecommunications	= 1 if there is access to telecommunications (% with access)	86.47	83.62	0.21
Access to electricity	= 1 if there is access to electricity (% with access)	21.64	11.59	2.51
Access to health centre	= 1 if there is access to health center (% with access)	44.64	37.79	0.64
Population	Total number of households in the watershed	256.0	300.0	2.43
Area	Total area of the community watershed (ha)	433.3	452.4	0.24

Source: Own computation, 2020.
Note: * and ** refer to 10 and 5 per cent significance level, respectively.

Geo-spatial characteristics

3. Four spatially derived variables were used to assess whether control or treated watersheds exhibited important differences regarding vegetation cover changes or soil water retention mapping (irrigation or other water management strategies), or were impacted by relative annual rainfall differences. Given that the data were not normally distributed, median tests were performed. Table 3 indicates that none of the variables were found to be statistically different, suggesting that geo-spatial conditions were roughly similar on average for the watershed areas where the control and treatment groups were located. However, it should be remembered that the lack of clearly delineated, mutually exclusive, boundaries implies that this conclusion needs to be taken with great caution.

4. Given this caveat, NDVI and NDWI trend lines were drawn through the data to determine if there were changes in vegetation coverage over the seven-year period of observation (2013–2019). A positive slope would imply increased greening of the watershed over time, while a negative slope would indicate a deterioration of vegetation cover. While both the MODIS- and Landsat-harvested variables revealed a statistically significant positive slope for the median of the sampled watersheds, there were no statistical differences between the treatment and control groups. The potential reasons for the overall positive slope could be attributed to improved erosion techniques or common land rehabilitation undertaken in all watersheds, but it may also be due to exogenous factors such as increased rainfall experienced during the final years of the project's implementation. The median water index was slightly negative with no statistical differences between the two groups (it should be noted that the overall mean was slightly positive because of a few large positive values).

Table 3
Geo-spatial characteristics by treatment status

Variable	*Definition of the variable – Time (2013–2019)*	*Control group (median)*	*Treated group (median)*	*Wilcoxon rank-sum test (Mann-Whitney)[a]*
NDVI_MODIS_slope	Univariate regression slope of Modis NDVI	.0004	.0004	0.88
NDVI_LS__slope	Univariate regression slope of Landsat NDVI	.0027	.0024	0.77
NDWI_LS__slope	Univariate regression slope of Landsat NDWI	-.0013	-.0013	0.97
NDVI_MODIS__sd	Modis NDVI (standard deviation)	.1528	.1521	0.94
NDVI_LS__sd	Landsat NDVI (standard deviation)	.0541	.0534	0.60
NDWI_LS_ _sd	Landsat NDWI (standard deviation)	.0379	.0384	0.70
NDVI_MODIS_mean	Global Mean NDVI Value	.5388	.5416	0.65
NDVI_MODIS_median	Global Median NDVI Value	.5385	.5407	0.66
PPT_sum_2013	Precipitation during 2013 meher crop season (cm)	1,365	1,424	0.66
PPT_sum_2014	Precipitation during 2014 meher crop season (cm)	1,335	1,317	0.68
PPT_sum_2015	Precipitation during 2015 meher crop season (cm)	1,260	1,260	0.78
PPT_sum_2016	Precipitation during 2016 meher crop season (cm)	1,252	1,248	0.77
PPT_sum_2017	Precipitation during 2017 meher crop season (cm)	1,518	1,500	0.67
PPT_sum_2018	Precipitation during 2018 meher crop season (cm)	1,324	1,305	0.67
PPT_sum_2019	Precipitation during 2019 meher crop season (cm)	1,391	1,390	0.60

Source: Own computation, 2020.
Note: No statistically significant differences were found. [a] The Wilcoxon rank sum test is a non-parametric test that may be used to assess whether two distributions of observations obtained between two separate groups on a dependent variable are systematically different from one another.

5. We subsequently looked at changes in geo-spatial conditions over the 2013–2019 period by testing standard deviations for the key indicators. Again, the evaluation did not find statistically significant differences between control and treatment groups. Given that the MODIS product was collected at a higher frequency (every eight days versus an annual aggregation for Landsat), further tests on the means and medians were performed, but also in this case no statistically significant differences could be identified. Annual variations in rainfall could suggest important variations in NDVI and NDWI indexes; however, while there were some annual differences in area rainfall, co-variation suggests relatively similar impacts on both treated and control watersheds.

Supplementary results tables from the impact evaluation

Table A.1

Average treatment effect by control subgroups: "spillover" effect

Outcome Variable	*Treated (N = 887) [A]*	*Control_T[a] (N = 240) [B]*	*Control_C (N = 493) [C]*	*Wald test (F value) [A=B]*	*Wald test (F value) [A=C]*
Lead outcome variables					
Food security	7.62	7.08	7.59	**11.96*** **	0.03
Dietary diversity	2.14	2.03	2.31	0.10	0.33
Total income (log)	9.31	9.41	9.23	0.55	0.44
Asset holding	2.89	3.44	2.68	**6.59** **	1.66
Social cohesion	0.01	-0.27	0.11	1.51	0.32
Participation in WS plan	0.68	0.68	0.69	0.01	0.08
Membership in grazing land	0.51	0.46	0.49	0.67	0.20
White teff yield	1.52	1.52	1.62	0.00	1.01
Black teff yield	1.67	1.60	1.59	0.17	0.37
Maize yield	3.07	3.17	3.03	0.45	0.12
Lactation period	2.03	1.94	2.05	**3.46***	0.22
Cow productivity	0.11	0.05	0.09	1.85	0.58
Fattening period	1.22	1.29	1.30	0.33	0.37
Intermediate outcome variables					
Income diversification	1.59	1.65	1.57	1.34	0.18
Free grazing	2.74	3.19	2.85	2.43	0.10
Female WS committee	12.26	12.73	11.63	0.03	0.05
Resilience to climate change	0.77	0.83	0.65	0.36	1.35

Agri. productivity (10 years)	0.51	0.49	0.42	0.03	0.76
Off-farm income availability	0.83	0.93	0.61	1.34	**5.11****
SWC communal land (10 years)	0.49	0.46	0.44	0.24	0.88
Labour time for terracing	102.73	83.06	81.82	0.58	0.86
Labour time for cut off drainage	59.8	26.32	39.37	4.11**	1.35
Labour time for gully rehabilitation	38.24	21.95	50.15	3.70*	0.67
Labour time for tree planting	275.5	24.52	30.25	1.12	1.07
SWC own land (10 years)	0.51	0.45	0.47	1.62	0.61
Cereal yield (10 years)	0.52	0.49	0.45	0.34	1.96
Herd size (10 years)	0.41	0.40	0.31	0.03	**8.72*****
Cut and carry	0.77	0.77	0.74	0.02	1.13
Resource conflict	0.24	0.19	0.25	1.41	0.11

Note: [a] Control_T and Control_C refer to control groups located within and outside of the treated *kebeles*, respectively.

Table A.2
Balancing test of community level co-variates using propensity score weights [N = 134]

No.	*Variable code*	*Measurement and definition*	*Treated*	*Control*	*Wald test (prob > F)*
1	si_i18c	Severity of conflicts before 10 years (Number of conflicts/year)	12.02	15.63	0.31
2	sc_c32b	Per centage of HH who adopt energy efficient tech. before 10 years	6.20	7.20	0.79
3	kolla_agro	=1 if kola covers >25per cent and 0 otherwise	0.09	0.08	0.74
4	woyandega_agro	=1 if midland covers >25 per cent and 0 otherwise	0.90	0.87	0.58
5	dega_agro	=1 if lowland covers >25 per cent and 0 otherwise	0.09	0.08	0.71
6	ws_distance	Distance from community watershed to the center of the *kebele* (km)	2.80	2.68	0.78
7	vehicle_access	=1 if there is vehicle access and 0 otherwise	0.16	0.15	0.83
8	truck_access	=1 if there is truck access and 0 otherwise	0.02	0.06	0.31
9	wscomm_09	=1 if watershed committee is formed before 2009 and 0 otherwise	0.95	0.93	0.43
10	sc_c26c1	Area of forest rehabilitated before 10 years (ha)	8.56	8.88	0.92
11	sc_c5a2	Area of land allocated for crop production before 10years (ha)	299.1	280.4	0.54
12	sc_c5b2	Area of land allocated for pasture/grazing before 10years (ha)	60.09	66.71	0.48
13	sc_c5c2	Area of land allocated for forest before 10years (ha)	52.5	63.66	0.33
14	sc_c5d2	Area of land covered by degraded land before 10years (ha)	8.59	10.30	0.41
15	sd_d6a1	Local cow productivity in 2009 (liters of milk/cow/day)	1.97	1.85	0.56
16	sd_d6b1	Local chicken productivity in 2009 (egg/hen/year)	98.25	109.58	0.34
17	sd_d6c1	Honey productivity from traditional beehive in 2009 (kg/hive/year)	11.50	12.17	0.52
18	sd_d6d1	Fattening period of cattle in 2009 (months)	4.93	3.83	0.51

Note: The results on the wald test column are p values

Table A.3
Participation variables used to redefine treatment status

No.	*Activities (planned to be) implemented by the project*	*Variable definition and measurement*
A	*Participatory watershed management*	
1		= 1 if the HH participate in the community level watershed plan
2		= 1 if there is community level watershed management plan
3	○ Participation in watershed management plan	= 1 if the community watershed management plan was participatory
4		= 1 if there is *kebele* level watershed management plan
5		= 1 if the *kebele* watershed management plan was participatory
B	*Pasture and forage development*	
6	○ Community bylaws	= 1 if there is written by law to administer watershed
7		= 1 if the HH is a member of grazing land association
8	○ Free grazing and grazing land associations	= 1 if the HH practices cut and carry or controlled grazing
9		= 1 if the HH practices free grazing
C	*Soil and water conservation*	
10		= 1 if SWC practices are implemented [plot level data]
11		= 1 if the HH participate on terrace construction
12		= 1 if the HH participate on cutoff drain
13	○ Participation in community level SWC practices	= 1 if the HH participate on gully rehabilitation
14		= 1 if the HH participate on tree planting
15		= 1 if the HH participate on area closure
16		= 1 if the HH participate on forage development
17	○ Training on SWC	= 1 if the HH got training on soil and water conservation
D	*Biodiversity and ecosystem*	
18	○ Meeting/training on biodiversity	= 1 if there was consultative meeting/training on biodiversity

Note: HH and C in the remark column refer to household and community questionnaires, respectively.

Table A.4
Definition and measurement of outcome variables

Outcome Variables	*Definition and measurement*
Lead outcome variables	
Dietary diversity	HH dietary diversity score estimated using the 12 standard food groups listed on section L of household questionnaire (the score ranges from zero to 12)
Food security	Experience based food security index: generated from recall of the typical week consumption of the household (refer M1 of HH questionnaire for details)
Total income	Log: Total income from crop, livestock, on/off-farm sources in Ethiopian birr
Asset holding	Constructed wealth category ranging from 1st to 5th quantiles where 1st refers to the poorest and 5th is the richest.
Social cohesion	Social cohesion index: computed interitem correlation of the questions on H2 of the community questionnaire
White teff yield	Household level average productivity of white teff [quintal/hectare ; in log]
Black teff yield	Household level average productivity of black teff [quintal/hectare; in log]
Maize yield	Household level average productivity of maize [quintal/hectare; in log]
Lactation period	Household level average lactation period of local cow [months; in log]
Cow milk productivity	Household level average productivity of local cow [milk/cow/day; in log]
Fattening period	Household level average fattening period of sheep/goat [months; in log]
Intermediate outcome variables	
Cut and carry	= 1if the household practice cut and carry system and 0 otherwise
Free grazing	Area of land allocated for free grazing [ha; in log]
Resource conflict	= 1 if the household involved in land related disputes and 0 otherwise
Labour for community works	Total labor time allocated for community works (i.e. - terrace, cut off, tree planting, and gully rehabilitation) [labour time in hours/year]
Resilience to climate change	= 1 if community coping capacity has improved compared to 10 years ago
Income diversification	Number of income sources of the household
Off farm income	= 1if availability of off/on farm income increased compared to 10 years ago
Female WS committee	Female watershed committee members [per cent]
Agri. productivity (10 yr)	= 1if productivity of cereal or livestock increased compared to 10 years ago
Cereal yield (10 yr)	= 1if productivity of cereal increased compared to 10 years ago

Herd size (10 years)	= 1if herd size increased compared to 10 years ago
SWC on own land (10 yr)	= 1if participation in own land SWC increased compared to 10 years ago
SWC on common land (10 yr)	= 1if participation in communal land SWC increased compared to 10 years ago
Participation in WS plan	= 1if the household participate in community level watershed plan, 0 otherwise
Membership in grazing land	= 1if the household a member of grazing land association, 0 otherwise

Table A.5a
Descriptive statistics: Lead outcome variables

Outcome Variable	*Definition and measurement of variables*	*Control HH/watershed*				*Treated household/watershed*				*All households/watersheds*				*Remark*
		N	*Mean*	*SD*	*Skewness*	*N*	*Mean*	*SD*	*Skewness*	*N*	*Mean*	*SD*	*Skewness*	
A. Socioeconomic outcomes														
Food security	HH dietary diversity score	733	7.39	1.53	0.10	887	7.63	1.63	0.17	1655	7.53	1.60	0.15	HH
	Experience based food security index	733	2.25	2.36	0.85	887	2.14	2.04	0.87	1655	2.17	2.32	0.87	HH
Total income and assets	Total income from crop, livestock, off-farm, and on-farm activities (log)	655	9.35	1.36	-0.06	800	9.31	1.41	0.04	1487	9.39	1.38	-0.01	HH
	Income diversification = Number of income sources	733	1.58	0.82	-0.14	887	1.59	0.78	-0.14	1655	1.59	0.79	-0.15	HH
	Asset holding (constructed wealth category)	733	2.91	1.41	0.05	887	2.89	1.42	0.07	1655	2.89	1.41	0.06	HH
Social cohesion	An index generated from five questions (i.e. measuring interitem correlations)	733	0.01	0.90	0.58	887	0.01	0.74	-0.32	1655	0.000	0.82	0.25	HH
B. Adaptation to climate change														
Adaptation to climate change	= 1 if the HH take adaptation measures	733	0.07	0.25	3.34	887	0.07	0.26	3.27	1655	0.07	0.25	3.34	HH
	= 1 if coping capacity of the HH has improved compared to 10 years ago	733	0.32	0.46	0.78	887	0.33	0.47	0.71	1655	0.32	0.47	0.73	HH
	= 1 if coping capacity of the community has improved compared to 10 years ago	733	0.72	0.45	-0.98	887	0.77	0.42	-1.28	1655	0.74	0.43	-1.13	HH

Outcome Variable	*Definition and measurement of variables*	*Control HH/watershed*				*Treated household/watershed*				*All households/watersheds*				*Remark*
		N	*Mean*	*SD*	*Skewness*	*N*	*Mean*	*SD*	*Skewness*	*N*	*Mean*	*SD*	*Skewness*	
C. Agricultural productivity														
Crop productivity	White teff yield [qt/ha] (log)	216	1.58	0.80	-0.65	287	1.52	0.79	-0.15	519	1.54	0.80	-0.38	HH
	Black teff yield [qt/ha] (log)	151	1.54	0.68	-0.39	152	1.67	0.69	-0.10	308	1.61	0.68	-0.23	HH
	Maize yield [qt/ha] (log)	244	3.07	0.92	-0.54	263	3.07	0.79	-0.44	520	3.07	0.85	-0.49	HH
Livestock productivity	Local cow lactation period (month) (log)	578	2.00	0.40	-0.46	713	2.03	0.40	-0.40	1320	2.02	0.40	-0.44	HH
	Local cow productivity (milk/cow/day) (log)	570	0.08	0.45	0.48	704	0.11	0.49	1.97	1303	0.09	0.47	1.37	HH
	Fattening period of local sheep/goat (month) (log)	377	1.25	0.69	2.77	463	1.22	0.67	3.19	858	1.24	0.68	2.99	HH

Table A.5b
Descriptive statistics: Lead outcome variables by participation level

Outcome Variable	*Definition and measurement of variables*	*Control HH/watershed*				*High-participation Treated household/watershed*				*Low-participation Treated household/watershed*				*Remark*
		N	*Mean*	*SD*	*Skewness*	*N*	*Mean*	*SD*	*Skewness*	*N*	*Mean*	*SD*	*Skewness*	
A. Socioeconomic outcomes														
Food security	HH dietary diversity score	733	7.39	1.53	0.10	524	7.81	1.59	0.16	363	7.36	1.66	0.25	HH
	Experience based food security index	733	2.25	2.36	0.85	524	2.18	2.34	0.88	363	2.08	2.25	0.83	HH
Total income and assets	Total income from crop, livestock, off-farm, and on-farm activities (log)	655	9.35	1.36	-0.06	478	9.43	1.40	0.30	322	9.14	1.42	-0.31	HH
	Income diversification = Number of income sources	733	1.58	0.82	-0.14	524	1.67	0.78	-0.12	363	1.48	0.75	-0.23	HH
	Asset holding (constructed wealth category)	733	2.91	1.41	0.05	524	3.01	1.42	-0.03	363	2.72	1.40	0.21	HH
Social cohesion	An index generated from five questions (i.e. measuring interitem correlations)	733	0.01	0.90	0.58	524	-0.04	0.76	-0.14	363	0.09	0.72	-0.59	HH
B. Adaptation to climate change														
Adaptation to climate change	= 1 if the HH take adaptation measures	733	0.07	0.25	3.34	524	0.10	0.29	2.68	363	0.04	0.18	4.99	HH
	= 1 if coping capacity of the HH has improved compared to 10 years ago	733	0.32	0.46	0.78	524	0.38	0.48	0.47	363	0.25	0.43	1.13	HH
	= 1 if coping capacity of the community has improved compared to 10 years ago	733	0.72	0.45	-0.98	524	0.81	0.39	-1.61	363	0.71	0.45	-0.91	HH
C. Agricultural productivity														
Crop productivity	White teff yield [qt/ha] (log)	216	1.58	0.80	-0.65	177	1.57	0.82	0.03	110	1.45	0.76	-0.58	HH

Outcome Variable	*Definition and measurement of variables*	*Control HH/watershed*				*High-participation Treated household/watershed*				*Low-participation Treated household/watershed*				*Remark*
		N	*Mean*	*SD*	*Skewness*	*N*	*Mean*	*SD*	*Skewness*	*N*	*Mean*	*SD*	*Skewness*	
	Black teff yield [qt/ha] (log)	151	1.54	0.68	-0.39	101	1.70	0.72	-0.27	51	1.61	0.63	0.32	HH
	Maize yield [qt/ha] (log)	244	3.07	0.92	-0.54	122	3.04	0.83	-0.40	141	3.11	0.76	-0.47	HH
Livestock productivity	Local cow lactation period (month) (log)	578	2.00	0.40	-0.46	435	2.03	0.40	-0.29	278	2.02	0.41	-0.56	HH
	Local cow productivity (milk/cow/day) (log)	570	0.08	0.45	0.48	430	0.15	0.46	0.31	274	0.05	0.53	3.84	HH
	Fattening period of local sheep/goat (month) (log)	377	1.25	0.69	2.77	295	1.22	0.69	3.11	168	1.23	0.64	3.35	HH

Table A.6a
Descriptive statistics: Intermediate outcome variables

Outcome Variable	*Definition and measurement of variables*	*Control HH/watershed*				*Treated household/watershed*				*All households/watersheds*				*Remark*
		N	*Mean*	*SD*	*Skewness*	*N*	*Mean*	*SD*	*Skewness*	*N*	*Mean*	*SD*	*Skewness*	
A. Land certification: resource allocation, credit access and woman empowerment														
Resource allocation and decision making	= 1 if a woman is holder of land certificate	733	0.06	0.24	3.51	887	0.07	0.25	3.37	1655	0.06	0.25	3.48	HH
	= 1 if land certificate improves position of a woman	733	0.94	0.23	-3.75	887	0.95	0.22	-4.04	1655	0.95	0.22	-3.95	HH
	= 1 if the wife is responsible to sell the crop	726	0.60	0.49	-0.41	874	0.65	0.47	-0.64	1635	0.63	0.48	-0.54	HH
	Female watershed committee members [Per cent]	709	15.09	14.8	0.62	887	12.23	13.39	0.80	1631	13.72	14.2	0.69	Comm.
Land investment	= 1 if the HH undertakes long-term SWC practices	733	0.62	0.48	-0.48	887	0.65	0.47	-0.66	1655	0.64	0.47	-0.60	HH
Credit access	= 1 if HH believes land certificate improves access to credit	681	0.94	0.22	-3.39	807	0.96	0.18	-5.08	1521	0.95	0.20	-4.52	HH
Resource conflict	= 1 if the HH encounter land related disputes	733	0.23	0.42	1.27	887	0.24	0.43	1.18	1655	0.24	0.42	1.22	HH
	= 1 if the HH encounter water or forest related disputes	733	0.09	0.29	2.75	887	0.13	0.33	2.26	1655	0.11	0.31	2.46	HH
B. Natural resource management														
Soil and water conservation	Stone/soil bund/stone faced soil bund (meter)	565	12921	18787	1.49	816	20686.6	47956.5	3.89	1416	17130	38538	4.60	Comm.
	Cut off drain (meter)	505	2302.6	5266	3.86	575	4494.7	15243.8	5.40	1103	3416.1	11620	6.73	Comm.
	Gully rehabilitation (meter)	398	5854	16128.9	3.88	682	825.9	1677.8	3.54	1092	2707.3	10115	6.60	Comm.
	Tree planting (number)	505	28.12	54.12	3.13	743	52.64	252.5	7.53	1283	191.2	1549	9.96	Comm.

Outcome Variable	*Definition and measurement of variables*	*Control HH/watershed*				*Treated household/watershed*				*All households/watersheds*				*Remark*
		N	*Mean*	*SD*	*Skewness*	*N*	*Mean*	*SD*	*Skewness*	*N*	*Mean*	*SD*	*Skewness*	
Labor spent on community level conservation practices	Labor hour spend on terrace construction [labor hour/yr]	444	84.47	168.28	6.34	549	102.73	339.93	9.50	1016	93.58	273.6	10.53	HH
	Labor hour spend on cut off drain [labor hour/yr]	148	36.70	101.39	8.45	190	59.98	197.47	8.34	351	48.52	159.8	9.52	HH
	Labor hour spend on gully rehabilitation [labor hour/yr]	155	42.08	117.59	6.92	209	38.24	91.43	10.17	378	39.23	101.4	8.53	HH
	Labor hour spend on tree planting [labor hour/yr]	155	32.91	96.75	8.77	208	275.51	3465.15	14.31	373	167.53	2588	19.21	HH
Flooding	= 1 if the HH experienced high flooding	214	0.48	0.50	0.05	290	0.55	0.49	-0.19	520	0.52	0.49	-0.09	HH
	= 1 if flooding is more severe compared to 10 years ago	733	0.27	0.44	1.00	887	0.28	0.45	0.93	1655	0.28	0.45	0.94	HH
Free grazing	Area of land allocated for free grazing [Hectare]	733	36.24	60.04	3.15	887	21.67	28.45	2.52	1655	28.36	45.64	3.81	Comm.
Nursery access	Distance to the nearest nursery site from home [minutes]	733	21.54	102.3	7.10	887	21.81	69.8	-0.24	1655	22.47	86.27	5.16	Comm.
	Distance to the nearest nursery site from the center of the community [minutes]	733	45.04	50.0	0.86	887	78.98	346.9	8.09	1655	62.71	256.7	10.87	Comm.
Water flow	= 1 if the flow of river and springs has reduced	733	0.43	0.49	0.27	887	0.45	0.49	0.19	1655	0.44	0.49	0.23	HH
C. Water harvesting and energy efficient technologies														
Water harvesting	= 1 if the HH adopted water harvesting technology	733	0.05	0.22	4.10	887	0.45	0.49	0.19	1655	0.05	0.22	4.12	HH
Access to energy efficient technologies	=1 if the HH adopted the technology and 0 otherwise	733	0.09	0.29	2.77	887	0.12	0.32	2.38	1655	0.11	0.31	2.57	HH
	Households in the community who adopt energy efficient technology [per cent]	326	23.89	28.53	1.21	516	35.32	35.04	0.49	842	30.89	33.13	0.74	Comm.

Note: HH and Comm. refer to household and community level data, respectively.

Table A.6b
Descriptive statistics: Intermediate outcome variables by participation level

Outcome Variable	*Definition and measurement of variables*	*Control HH/watershed*				*High-participation Treated household/watershed*				*Low-participation Treated household/watershed*				*Remark*
		N	Mean	SD	Skewness	N	Mean	SD	Skewness	N	Mean	SD	Skewness	
A. Land certification: resource allocation, credit access and woman empowerment														
Resource allocation and decision making	= 1 if a woman is holder of land certificate	733	0.06	0.24	3.51	524	0.06	0.24	3.59	363	0.08	0.27	3.09	HH
	= 1 if land certificate improves position of a woman	733	0.94	0.23	-3.75	524	0.94	0.23	-3.89	363	0.95	0.21	-4.29	HH
	= 1 if the wife is responsible to sell the crop	726	0.60	0.49	-0.41	517	0.66	0.47	-0.68	357	0.64	0.48	-0.59	HH
	Female watershed committee members [Per cent]	709	15.09	14.8	0.62	524	12.57	13.22	0.76	363	11.71	13.63	0.87	Comm.
Land investment	= 1 if the HH undertakes long-term SWC practices	733	0.62	0.48	-0.48	524	0.76	0.42	-1.25	363	0.50	0.50	-0.01	HH
Credit access	= 1 if HH believes land certificate improves access to credit	681	0.94	0.22	-3.39	485	0.96	0.19	-4.75	322	0.97	0.16	-5.73	HH
Resource conflict	= 1 if the HH encounter land related disputes	733	0.23	0.42	1.27	524	0.25	0.43	1.14	363	0.23	0.42	1.25	HH
	= 1 if the HH encounter water or forest related disputes	733	0.09	0.29	2.75	524	0.13	0.33	2.20	363	0.11	0.32	2.36	HH
B. Natural resource management														
Soil and water conservation	Stone/soil bund/stone faced soil bund (meter)	565	12921	18787	1.49	475	19884	46683	4.23	341	21803	49722	3.48	Comm.
	Cut off drain (meter)	505	2302.6	5266	3.86	337	4627	15138	5.44	238	4306	15421	5.35	Comm.
	Gully rehabilitation (meter)	398	5854	16128.9	3.88	428	942.74	1807.2	3.19	254	629	1415	4.40	Comm.
	Tree planting (number)	505	28.12	54.12	3.13	442	73.42	324.8	5.76	301	22.12	31.73	2.00	Comm.

	Labor hour spend on terrace construction [labor hour/yr]	444	84.47	168.28	6.34	429	108.32	342.9	9.32	120	82.76	329	10.27	HH
Labor spent on community level conservation practices	Labor hour spend on cut off drain [labor hour/yr]	148	36.70	101.39	8.45	190	62.48	202.54	8.12	10	15.05	16.4	2.31	HH
	Labor hour spend on gully rehabilitation [labor hour/yr]	155	42.08	117.59	6.92	192	39.06	95.12	9.81	17	29.05	23.94	1.11	HH
	Labor hour spend on tree planting [labor hour/yr]	155	32.91	96.75	8.77	194	293.4	3587.9	13.81	14	26.85	33.96	1.25	HH
Flooding	= 1 if the HH experienced high flooding	214	0.48	0.50	0.05	185	0.55	0.49	-0.23	105	0.53	0.50	-0.13	HH
	= 1 if flooding is more severe compared to 10 years ago	733	0.27	0.44	1.00	524	0.27	0.45	1.01	363	0.31	0.46	0.84	HH
Free grazing	Area of land allocated for free grazing [Hectare]	733	36.24	60.04	3.15	524	21.71	29.23	2.46	363	21.50	27.3	2.62	Comm.
Nursery access	Distance to the nearest nursery site from home [minutes]	733	21.54	102.3	7.10	524	31.18	65.01	-0.17	363	8.27	74.17	-0.18	Comm.
	Distance to the nearest nursery site from the center of the community [minutes]	733	45.04	50.0	0.86	524	28.94	38.29	2.56	363	151.2	532.5	5.07	Comm.
Water flow	= 1 if the flow of river and springs has reduced	733	0.43	0.49	0.27	524	0.42	0.49	0.34	363	0.50	0.50	-0.02	HH
C. Water harvesting and energy efficient technologies														
Water harvesting	= 1 if the HH adopted water harvesting technology	733	0.05	0.22	4.10	524	0.07	0.25	3.47	363	0.02	0.13	6.99	HH
Access to energy efficient technologies	=1 if the HH adopted energy efficient technology and 0 otherwise	733	0.09	0.29	2.77	524	0.15	0.35	1.97	363	0.07	0.26	3.32	HH
	Households in the community who adopt energy efficient technology [per cent]	326	23.89	28.53	1.21	340	38.97	34.76	0.29	176	28.26	34.58	0.93	Comm.

Table A.7
Descriptive statistics: Project participation variables

No.	Activities of the project	Variable definition and measurement	Control HH/watershed				Treated household/watershed				All households/watersheds				Remark
			N	Mean	SD	Skewness	N	Mean	SD	Skewness	N	Mean	SD	Skewness	
A	*Participatory watershed management*														
1	Participation in watershed management plan	= 1 if the HH participate in the community WS plan	733	0.68	0.46	-0.77	887	0.68	0.46	-0.80	1655	0.68	0.46	-0.80	HH
2		= 1 if there is community level WS management plan	733	0.77	0.42	-1.29	887	0.86	0.34	-2.14	1655	0.82	0.37	-1.72	Comm.
3		= 1 if the community WS management plan was participatory	733	0.90	0.29	-2.69	887	0.93	0.25	-3.44	1655	0.92	0.27	-3.10	Comm.
4		= 1 if there is *kebele* level WS management plan	733	0.93	0.24	-3.51	887	0.94	0.22	-3.94	1655	0.94	0.23	-3.78	Comm.
5		= 1 if *kebele* WS management plan was participatory	733	0.90	0.29	-2.69	887	0.93	0.25	-3.44	1655	0.92	0.27	-3.10	Comm.
B	*Pasture and forage development*														
6	Community bylaws, free grazing and grazing land associations	= 1 if there are written by-laws to administer watershed	773	0.87	0.3	-2.19	887	0.89	0.31	-2.52	1655	0.88	0.32	-2.39	Comm.
7		= 1 if the HH is a member of grazing land association	733	0.46	0.49	0.12	887	0.51	0.50	-0.05	1655	0.49	0.50	0.02	HH
8		= 1 if the HH practices cut and carry or controlled grazing	733	0.75	0.42	-01.19	887	0.78	0.41	-1.34	1655	0.77	0.42	-1.28	HH
9		= 1 if the HH practices free grazing	733	0.67	0.47	-0.72	887	0.65	0.47	-0.64	1655	0.66	0.47	-0.67	HH

No.	Activities of the project	Variable definition and measurement	Control HH/watershed				Treated household/watershed				All households/watersheds				Remark
			N	Mean	SD	Skewness	N	Mean	SD	Skewness	N	Mean	SD	Skewness	
C	*Soil and water conservation*														
10	Participation in community level SWC practices	= 1 if HH implemented SWC practices at one or more plot	733	0.82	0.37	-1.74	887	0.82	0.37	-1.75	1655	0.83	0.37	-1.77	HH
11		= 1 if the HH participate on terrace construction	733	0.68	0.46	-0.77	887	0.69	0.45	-0.86	1655	0.69	0.46	-0.83	HH
12		= 1 if the HH participate on cutoff drain	733	0.23	0.42	1.24	887	0.23	0.42	1.22	1655	0.24	0.42	1.21	HH
13		= 1 if the HH participate on gully rehabilitation	733	0.23	0.42	1.24	887	0.25	0.43	1.11	1655	0.25	0.43	1.14	HH
14		= 1 if the HH participate on tree planting	733	0.24	0.42	1.19	887	0.27	0.44	1.03	1655	0.26	0.43	1.08	HH
15		= 1 if the HH participate on area closure	733	0.12	0.32	2.32	887	0.13	0.33	2.17	1655	0.13	0.33	2.19	HH
16		= 1 if the HH participate on forage development	733	0.07	0.25	3.42	887	0.06	0.24	3.63	1655	0.06	0.24	3.84	HH
17	Training on SWC	= 1 if the HH got training on soil and water conservation	733	0.26	0.43	1.09	887	0.28	0.45	0.93	1655	0.27	0.44	0.99	HH
D	*Biodiversity and ecosystem*														
18	Meeting/training on biodiversity	= 1 if there was consultative meeting on biodiversity	733	0.32	0.47	0.72	887	0.50	0.50	-0.002	1655	0.43	0.49	0.26	Comm.

Note: The final column marks whether the variables relate to the household (HH) or community (Comm) questionnaires.

Direct observations methodology and findings

Table 1
Scale used to rate integrated watershed management outcomes based on field observations

Ratings	*Operational criteria for assessment based on field observations and on-site discussions with target farmers and extension agents*
Highly satisfactory (HS)	i) Productivity potential of rehabilitated degraded (on- and off-farm) lands sustainably improved, from WS ridge to valley; (ii) Farming systems (FSs) improve biomass through climate smart agriculture practices (conservation agriculture, agro-horticulture, agroforestry, forage production, silvo-pastoral systems); (iii) support to asset-less (ex. youth), smallholder and vulnerable HHs through IGAs; (iv) Formation of well-informed community-based organizations resulting in overall building of social-political capital; (v) extensification process initiated.
Satisfactory (S)	(i) WS management in continuum from ridge to valley on communal land as well as individual farms; (ii) land-based resources sustainably managed and improving living conditions of target groups; (iii) Concrete multiple economic, social and ecological benefits are derived from rehabilitated degraded lands and improved FSs; (iv) Management of target HHs farming systems improved
Moderately satisfactory (MS)	Improved productivity potential of rehabilitated communal degraded lands through biophysical interventions but focus on improving farming systems of individual HHs is lacking.
Highly unsatisfactory (HU)	Failure of biophysical soil and water conservation structure and return to baseline conditions and/or further land degradation and marginalization of the poor/asset-less households further aggravated.
Moderately unsatisfactory (MU) and Unsatisfactory (U)	Based on appreciation between HU and MS

Table 2
Ratings of the visited watersheds sample

Watersheds	*Operational criteria for assessment based on field observations and on-site discussions with target farmers and extension agents*	*Rating*
Aba Gewudi (Werkemla Achadir)	Biophysical structures successful but only lower areas of WS and secondary gullies treated. Soil erosion is not addressed at the source and there is a considerable sheet and rill erosion on farms.	MU
Argameher	Farming systems and landscape transformation lead to improved farmers livelihoods and healthier sub-watersheds. Biophysical structures according to the ridge-to-valley principle.	S
Chena	Good biophysical structures from ridge to downstream of WS; farming systems improved.	S
Bekeloseber	Good biophysical infrastructures on- and off-farm; successful area closure (pasture regeneration and Acacia plantation. Farming systems improving.	S
Mebela	Hillside terracing increased terrain instability; crop production not appropriate; focus on a section of the sub-watershed and not in continuum.	MU
Zimba-3	Area closure and youth integration through user groups; dam construction but no activity targeting farming system or further water management (e.g. aquaculture); free grazing is intense.	MS
Tsebelu	Biophysical structures degrading under pressure of free overgrazing towards WS ridge and mid-hill; no valley gully-repair; not built on good farming practices of individual HHs; deep gullies not repaired; good integration of youth through cut and carry activities and cow fattening; 3 water pumps.	MU
Lansan	Degradation of farming systems unaddressed leading to their replacement by dense Acacia plantations; major gullies not treated; 2 ha area closure but intense free overgrazing.	U
Fagita Lekoma	Physical treatments only at sub-watershed ridge; good pasture management; waterways contributing to gully erosion.	MS
Keteb	Physical treatments only at sub-watershed ridge; waterways contributing to gully erosion.	U
Fuafure	Return to baseline condition of land degradation; further ecological marginalization of the poor and the landless.	HU
Negade Ber	Satisfactory area closure, but biophysical structures have little value added versus traditional practices.	MU

CBINReMP qualitative assessment focus group discussion summary

I. Introduction

1. Due to the community participatory nature of CBINReMP, the interventions at the community level were complex and with high heterogeneity. To better understand and gauge the project theory of change and implementation, the IOE-IFPRI team conducted a qualitative assessment mission before the quantitative assessment. The findings would then inform the quantitative sample design, the identification of control groups and potential confounding factors, and the development of the survey instrument. Equally important, the qualitative assessment findings could enrich the interpretation of the survey analysis results.

2. **Process**. The qualitative data analysed in this report were collected from 21 September to 15 October 2019 among 24 micro-watersheds in the Amhara region with 416 respondents (360 men, 56 women), using a semi-structured questionnaire. Among the 24 focus group discussions, 12 were conducted by the IOE-IFPRI team, together with a national consultant, and the other 12 were conducted by the national consultant alone using the same survey instruments. In addition, 5 out of the 24 watersheds were implemented by Organization for Rehabilitation and Development in Amhara (ORDA) under component D – adaptation to climate change. Table 1 below lists all the watersheds visited.

3. The sampling of qualitative assessment used a stratified sample (i.e. *woreda* and types of intervention) to select the micro-watersheds, which caused oversampling of interventions that were only implemented in a smaller area. During the field visits, the sample was slightly revised based on the connectivity and the security situation. Since the sample was not representative of the population and only a small sample was drawn, the evaluation did not draw any definite conclusion on the effectiveness and impact of the project using the qualitative assessment. Nevertheless, the results from the qualitative assessment provided the evaluation team with significant information related to the selection process of CBINReMP micro-watersheds, relevance, project targeting, implementation, gender and social inclusion, participatory approach in watershed planning and management, institutions and policies, social empowerment, and potential impacts on agricultural production, food security, household incomes, and women/youth empowerment.

4. Analysis of the qualitative data entailed a manual synthesis of questionnaire notes using thematic, content and narrative analyses to provide a robust picture of different aspects, as mentioned above. Table 1 presents the list of micro-watersheds visited where the data were collected. The table is followed by a discussion of the main findings.

Table 1
Sample and watershed sites visited

No.	*Date*	*Woreda*	*Kebele*	*Watershed*	*ORDA*
1	21/09/2019	Aba Gewudi	werkemla Achadir	Bahir Dar	No
2	23/09/2019	Farta	Meher Arga Dedim	Arga Meher	Yes
3	23/09/2019	Chena	Lewaye	Estie	Yes
4	24/09/2019	Lay Gayint	Titira	Mebela	Yes
5	24/09/2019	Lay Gayint	Titira	Bekiloseber	Yes
6	24/09/2019	Lay Gayint	Shidoguza	Albokie	Yes
7	25/09/2019	Bahir Dar Zuria	Chenta	Dilshit	No
8	25/09/2019	Bahir Dar Zuria	Yigode	Zimba No. 3	No
9	26/09/2019	Sekela	Surba	Lunsan	No
10	26/09/2019	Sekela	Surba	Tsebelu	No
11	27/09/2019	Fagita Lekoma	S/d/bambil	Fagtit	No
12	10/03/2019	Dangila	Manguda	Ajurie	No
13	10/04/2019	Dangila	Avadera	Gumera	No
14	10/04/2019	South Achefer	Dikulie1	Andaytetash	No
15	10/05/2019	South Achefer	Chaba	Upper Achukie	No
16	10/05/2019	South Achefer	Chaba	Lower Achukie	No
17	10/06/2019	North Achefer	Liben	Kngere Mewucha	No
18	10/06/2019	South Achefer	Ahurie3	Langatay	No
19	10/07/2019	North Mecha	Edeget Bihbert	Mage	No
20	10/07/2019	North Mecha	Addis Amba	Abay2	No
21	10/08/2019	North Mecha	Agamena	Dengay Wonber	No
23	10/08/2019	N Mecha	Mekenie	ChareDegorena	No
24	10/13/2019	Dangila	Wofeta datie	Keltie	No

II. Main findings

5. Not all the communities visited were aware of the project. This could be partially because the project was implemented using an existing regional government structure (e.g. *woreda*, *kebele*) which led farmers to perceive it as a government project. Alternatively, and more likely, this could be due to the similarity compared with the past mass mobilization.

Table 2
Community awareness of the project

Categories	*Count*
a. Never heard of the project, and farmers can't describe relevant project activities	10
b. Never heard of the project, but farmers can describe relevant project activities	8
c. Aware of the project	6
Total	24

Key issues to be addressed (project relevance)

6. Soil erosion, land degradation and water shortages for both drinking and irrigation purposes were the four top issues reported by targeted beneficiaries during the focus groups and interviews. Deforestation, overgrazing and gully formation were also described by some beneficiaries (respectively, 50 per cent, 38 per cent and 29 per cent of watersheds) as important issues. Only 13 per cent (equal to 3 watersheds out of 24) indicated youth unemployment as the main problem in the community before the project. Presumably, this answer was biased by the composition of the watersheds' members interviewed, although there is no clear evidence given that the data collected was disaggregated by gender or age.

7. In terms of interventions put in place by the project to address the above, interviewed communities distinguished between project interventions on communal land and individual farmland. The main interventions reported at the community level were: soil bund and gully restoration; dam construction and development of irrigation canals; and communal land area closure and plantation along with the physical soil conservation structures as well as on degraded land. At the individual level, the following interventions were more often indicated by farmers: stone bunds; water conservation; canals and cut-off drains; and plantation along the soil bund.

8. Overall, the main findings from the focus group discussions confirmed the relevance of the project's design to address local needs.

Participation in watershed management planning and implementation[1]

9. Overall, interviewed communities pointed out their limited involvement in the watershed management planning process; only one watershed was involved throughout the whole WSM process. Communities' perception is that watershed management planning took place at *kebele* level with some 46 to 50 per cent involvement from their side to influence the plan. These communities described the watershed management planning approach as "top-down" with government institutions, particularly *kebele* agricultural offices, making decisions that were subsequently communicated to the communities for implementation. Women's and youth's participation were reported on a limited scale and not always on a spontaneous basis. Similarly, from interviews with beneficiaries, it appears that watershed committees, although they were set up at the beginning of the project's activities, were not involved in watershed management planning. In all these cases, the lack of sense of ownership in the WSM development process and practices emerged in the interviews.

10. Regarding WSM implementation, very high community involvement was reported in the focus group discussions, as well as for watershed maintenance activities. The high participation was built upon the existing mass mobilization approach (see next paragraph). However, in some cases, initial resistance from the communities to the project was reported, which was mainly due to a perception of disadvantages deriving from project's activities at the individual level. Such resistance was addressed by the project through the sensitization campaign and other mechanisms. Consultations were held with the entire community mostly at the village level, usually at the church, and were judged as being informative by most people interviewed. In some cases, the consultation was mainly to discuss the action plan for watershed rehabilitation. In addition, meetings held with the concerned officials (agriculture

[1] The categorization of community participation follows a comprehensive study on community-driven development (CDD) and community-based development (CBD) of the World Bank (Mansuri and Rao, 2004). It defines CDD as a form of CBD where communities are in control of a community development fund. The synthesis makes a further distinction and proposes a third approach related to CDD: "Participatory Local Governance (PLG)". PLG projects include natural resource management and agricultural development projects that empower communities to engage with local government to shape their own development, but usually funds remain under the control of the government. The fourth type identified in the synthesis is participatory community development, which covers the vast majority of IFAD projects, where communities participated in certain stages of the project, usually in the planning and implementation.

office experts, *kebele* administration and watershed committees) were considered useful by participants.

11. It is noted that mass mobilization (an annual initiative led by the Ministry of Agriculture to organize voluntary community labour during the low agricultural season) is a common approach for land rehabilitation. Mass mobilization almost always happens at the *kebele* level, not just the watershed. The community consulted during the field visits confirmed that participation in mass mobilization was not on a voluntary basis completely, though exceptions were given to seniors and people with an illness. This questions whether the project has empowered local communities through participation in decision-making and innovative social mechanisms in managing project resources. Additionally, this raises the question regarding the project's value addition compared with the regular mass mobilization work. According to the qualitative assessment, nearly 80 per cent of interviewed communities do not see significant changes brought in by the project compared to the past mass mobilization practice. According to the majority of communities (68 per cent, or 13 out of 19), it was basically the same, but there is some quality improvement on the soil and water conservation practice due to training provided. In some cases (4 out of 24), the community highlighted that the training and awareness-raising provided by the project motivated them to participate in the mass mobilization. The household survey would further investigate this issue by collecting the data of labour days worked before and after the project.

Table 3
How the project was different than previous watershed development projects*

Categories	*Count*
a. The same	6
b. Different (e.g. due to awareness-raising and capacity-building)	4
c. Basically the same but quality and quantity of soil and water conservation practice b/s government more focus on watershed management practices	13
Total	23

* Total is 23 because watershed =S/t/Bambil *Kebele* – Fagita Lekoma watershed did not give a response for this variable.

12. Finally, it is worth noting that not all visited communities acknowledged the existence of the community WSM plan. This is mainly due to the top-down approach reported above.

Table 4
Level of participation in WFM among community members

Categories	*Count*
a. Community participated in the WSM plan development and consultation	1
b. Community participation was mainly involved in WSM implementation, with some influence in the plan	11
c. Community participation was mainly involved in WSM implementation, with little influence in plan development	12
Total	24

Effectiveness of project implementation

13. Among all of the project's interventions, the ones that communities reported to be most effective were: watershed physical and biophysical constructions to protect degraded lands; area closure; and land/soil restoration-related activities (e.g. communal and household plantations, seed supply, capacity-building for communities regarding land conservation, seedling management). However, only 8 per cent (equal to 2 watersheds out of 24) believed that the main problems existing

before the projects were solved. For more than half of the watersheds (58 per cent, equal to 14 watersheds), some problems remain.

14. Among the project's interventions, the following ones were generally acknowledged by communities as being effective to address their needs: gully restoration; building of dams and related irrigation systems; and restoration of degraded soil mainly through plantation of cash crops and trees (including apple trees and vegetables) as well as terracing of land (in some cases, this was already reported as a practice promoted by ORDA before the start of project, which then continued with CBINReMP); and inputs supply.

15. The following top five remaining challenges reported were: persistence of soil erosion (58 per cent, 14 out of 24); lack of water for irrigation purposes (38 per cent, equal to 9 watersheds); land degradation (33 per cent, 8 out of 24); lack of drinking water (29 per cent, 7 out of 24); and overgrazing (29 per cent, 7 out of 24).

16. According to the participants, the main reasons of the persistence of the above challenges were: community's limited capacity to implement watershed management practices (54 per cent, 13 out of 24); inadequate maintenance of WSM practices and poor training received (46 per cent, or 11 watersheds for both answers); as well as lack of awareness about benefits of watershed management (50 per cent, 12 out of 24). These responses seem to indicate the limited effectiveness of the capacity- building/ training/awareness-raising activities put in place by the project. Regarding maintenance, despite the existence of watershed management committees overlooking the conservation structures, the lack of measures to control those community members who may cause damages, which was mentioned as an issue at all levels of interventions (i.e., private and communal lands and area closure on communal lands).

Table 5
Were the problems solved after the project?

Categories	*Count*
a. Most of the problems resolved	2
b. Some remaining problems	14
c. Most of the problems remaining (i.e. little impact)	8

17. **Area closure.** Among the 24 micro-watersheds where the data was collected, 16 had area closure interventions.

Table 6
Were the area closure activities effective and sustained?

Categories	*Count*
Area closure was **effective and sustained** after project completion (e.g. zero-grazing, with effective by-laws, and cut-and-carry system, and grazing land user associations)	N/A
Area closure **was effective, but not sustained** after project completion (e.g. zero-grazing, with effective by-laws, and cut-and-carry system, and grazing land user associations)	N/A
Area closure was **ineffective** (e.g. lacks management (rotational grazing/cut-and-carry practices, or enrichment with forages and trees)	N/A

18. **Income-generating activities.** Among the 24 micro-watersheds where the data was collected, 13 were supported with IGAs (54 per cent). Overall feeling about the IGAs is that participation was confined to a few households, specifically youth groups. Poor participation of young women was mentioned during the discussions with the communities.

19. In terms of IGA's impact, the general sense is that the activities were effective in promoting income generation among members only for a limited time, mainly at start-up and the following year, but faded over the years. Similarly, during the start-up and implementation, the youth group/IGAs reduced pressure on land use and contributed to increase land sustainability. However, these effects were mainly visible at the beginning of the project activities and faded over time (posing questions on the maintenance of the interventions as well as their sustainability). Among others, the main issues constraining IGAs' effectiveness and impact include lack of business plan feasibility studies (i.e. none of the IGAs had business plans or marketing analysis); lack of secure land access. Communities have given land to the IGA groups for different purposes (e.g. fattening, vegetables, timber). However, the IGA groups had neither legalized property rights (e.g. land certificate) nor a promissory note (guarantee) for a defined period to ensure that IGAs can have a long- or short-term business plan; and housing infrastructure constructed for the IGAs lack quality or are not completed at all (e.g. the bee keeping group in Bekiloseber watershed).

20. According to the interviewed beneficiaries, the sustainability of the IGAs after project completion is low mainly for the following reasons: the general poor interest shown by the youth to continue the IGAs without the project's support; limited marketing opportunities; and unsuitable group size (deemed too large).

Rural poverty impact

21. Overall, 96 per cent of watersheds (23 out of 24) reported improvements in their livelihoods. Diversification appears to be the main driver of livelihood improvement. This involves diversification in livestock activities and animal sources (milk and fattening) as well as diversification in agricultural practices (food and cash crops). Positive results were mainly reported from improved livestock practices (grazing) as well as plantation of forage and vegetables as a source of feed, food and income.

22. In terms of food security, despite the lack of data, all watersheds reported improvements both in terms of food quantity (absence of food shortages) and greater diversity of food available and consumed. There are some difficulties in attributing the food security improvement to the project intervention alone due to other factors that took place during the project life span (e.g. farm inputs provided from other sources). In addition, communities' housing improved, including demarcated arrangements for people and animals, improved sleeping conditions (i.e. beds) and availability of electricity through solar energy.

Table 7
Change in food security status among the 24 watersheds

Categories	*Count*
Improved	24
No change	0
Worsened	0

23. Yield increases (about 25 to 40 per cent) were generally reported by interviewed farmers during the project's life for main crops grown in the area (maize, finger millet and barley). Farmers' impression is that crop yields increased due to the cumulative effect of the following: better and increased utilization of inputs; use of technology packages; and soil and water conservation practices. However, some crop diseases were reported to affect the agricultural campaign of certain communities, especially for potatoes.

24. Income increases and improvements in food security derived from the above were pointed out by community members, particularly for landowners. More precisely, all watersheds interviewed acknowledged improvements in their level of food security.

In the wet season, increases in dairy products were also reported. As an example (source: Chare Degorna watershed), milk production increased in the local breed cow from 0.25 litre/cow/day to 1.5-2 litres/cow/day). In Keltie (gurdala) watershed, milk production reported to double from the ex-ante situation.

25. Yield increases during the dry season were also reported. Here below an example from North Achefer *Woreda*, Kilage *Kebele*, Negade Ber watershed.

Table 8
Crop yields before and after the project

Crop type	*Yield /hectare before project*	*Yield/ hectare after project*
Finger millet	20	32
Maize	32	60
Niger seed	4	12
Barley	12	20

Table 9
Perception on change in crop yields

Categories	*Count*
Increased	23
No change	1
Decreased	0

Table 10
Perception on reasons related to improved crop production

Categories	*Count*
Soil and land conservation practices (project-related)	2
Inputs provided (e.g. seedlings, fertilizer) (not project-related)	1
Improved farming skills (project-related)	2
Improved farming skills (not project-related)	5
Soil and conservation practices introduced by the project plus improved farming skills (the latter not project related)	14

Land certificates

26. Land certificates, including first-level certification, were acknowledged by communities as an important tool in reducing conflicts, although disputes still exist. In some cases where second-level certifications were issued, disputes were reported to have stopped. Encroachment reduction and greater land security were reported as the main effects. Linked to the above, some farmers reported investments in land improvements as well as new plantations.

27. With reference to access to credit, only 12 per cent of watersheds reported the use of land certificates for obtaining loans from a local credit institution (i.e. Amhara Credit institution) but not from banks. Some of the farmers living closer to urban areas and/or electrical grid connection reported being able to get a connection to the existing electrical grid upon showing the land certificate.

28. Overall, the land security among community members improved in 92 per cent of the visited watersheds (22 out of 24). In addition, 75 per cent (18 out of 24 watersheds) of landholders who received formal land certification reported to be less likely to experience land disputes. Yet in some cases, it was reported the general

sense of trust between communities and national governmental bodies worsened. An indicative example is the Zimba no. 3 watershed, where farmers believe land certificates are a tool which will be used to assess compensation measures when they are expropriated of their land. This example shows a lack of awareness-raising from the Bureau of Land Administration when certificates were issued and poses problems for the sustainability of project interventions. It would appear that an information campaign to explain the potential benefits of having land certificates at community level was not undertaken thoroughly, although meetings were held at the villages and local churches.

29. Finally, whether the land certification has led to a greater sense of women's empowerment, the prevailing feeling in 92 per cent of the watersheds (22 out of 24) is that women's conditions improved. Land certificates gave them the opportunity to make decisions about land use and therefore empowered them at household and community levels. Women are aware of their property rights through the land certificates and, in case of divorce, it was acknowledged that the land would be equally distributed between wife and husband. Nearly all interviewed communities acknowledged that the land certificate ensures equal property rights to women and men. Interestingly, in 15 watersheds out of 24 (63 per cent), landholders who have received formal land certification declared they did not change their investment and land use decisions.

Table 11
Do people feel more secure about their land situation than before having first- or second-level certification?

Categories	*Count*
Improved	22
No change	2
Worsened	0
Total	24

Table 12
Land disputes

Categories	*Count*
Improved	18
No change	4
Worsened	1
Total	23

Table 13
Access to credit

Categories	*Count*
Improved	3
No change	20
Did not respond	1
Total	24

Table 14
Investment and land use decisions

Categories	*Count*
Improved	9
No change	15
Total	24

Table 15
Perception of sense of empowerment for women

Categories	*Count*
Improved	22
No change	2
Worsened	0
Total	24

Sustainability

30. Most interviewed communities seem aware of the benefits brought by CBINReMP. Most of the visited communities (71 per cent, or 17 out of 24) expressed their

willingness to continue and maintain the promoted activities after project completion but declared that they lacked knowledge, capacities and/or tools/machines at their disposal to effectively do so. Less than a third (i.e. 7 communities) declared their lack of interest or materials to continue with the project's activities.

31. Finally, the two critical aspects affecting the sustainability of the agricultural benefits derived by the projects are related to the lack of a market strategy at project level and the related poor marketing opportunities developed in the project area. As a result, migration is reported as an option by interviewed farmers, especially youth. Sustainability is therefore an issue.

Table 16
Is there interest in and willingness to continue with the promoted activities after project completion?

Categories	*Count*
Communities have willingness, but lack of knowledge/capacity to continue/maintain and materials/machines	14
Communities have willingness and knowledge/capacity to continue/maintain, but lack materials/machines	3
Communities do not have willingness, knowledge/capacity or materials/machines to continue/maintain	7

Gender equality and empowerment of women and youth

32. In addition to the impact of gender equality and empowerment mentioned in previously, another relevant activity benefiting women was the development of alternative sources of energy, which reduced women's workload (including time used to fetch wood). However, the totality of the watershed interviewed on the gender aspect reported that there was no specific activity targeting women. This could be further investigated by the next mission.

33. Overall, the project's impact on youth was described as poor in terms of income increases, which occurred among only a limited number of youth and not lasting over time (youth benefiting from IGAs declined throughout the project life). As a result, migration among youth was still taking place, although figures are not available from the interviews.

Table 17
Is there any activity that targeted women in the community?

Categories	*Count*
Yes	Not answered the direct question
No	16

List of key persons met

Government

H.E. Kebede Yimam, State Minister, Environment, Forest and climate change Commission

Habtamu Hailu, Federal Sustainable Land Management Program Coordinator, Ministry of Agriculture

Markos Wondie, Project Coordinator and Deputy Head of Bureau of Agriculture

Yismaw Wuletaw, Soil and water conservation expert, Bureau of Agriculture

Woreta Asrese, Project Coordinator, Organization for Rehabilitation and Development in Amhara

Tamirat Demisse, CBINReMP Focal Person on Land Administration Director, Bureau of Land Administration and Use

Kindalem Getu, Land use expert, Bureau of Land Administration and Use

IFAD and project staff

Ulac Demirag, Country Director

Seyoum Tesfa, Country Programme Officer

Sofian Mohamed, CBINReMP Coordinator, Bahir Dar Zuria Woreda

Addis Melak, Sekella Woreda CBINReMP Coordinator, Sekella Woreda Office of Agriculture

Fekadu Wondemagegn, West Gojam Zone coordinator

Getahun Abe, CBINReMP Focal Person, North Achefer Woreda Office of Agriculture

Habtamu Endeshaw, Foresry expert, North Achefer Woreda Office of Agriculture

Amare Mamo, CBINReMP Focal Person, Banja Woreda Office of Agriculture

International organizations

Paul Martin, Team task leader, Sector Leader, Africa Region, World Bank

Bekele Shiferaw, Lead Evaluation Specialist, World Bank-IEG

Ebru Karamete, Evaluation Specialist, World Bank-IEG

Research institutes

Feleke Woldeyes Gamo, Deputy Director General, Ethiopian Biodiversity Institute

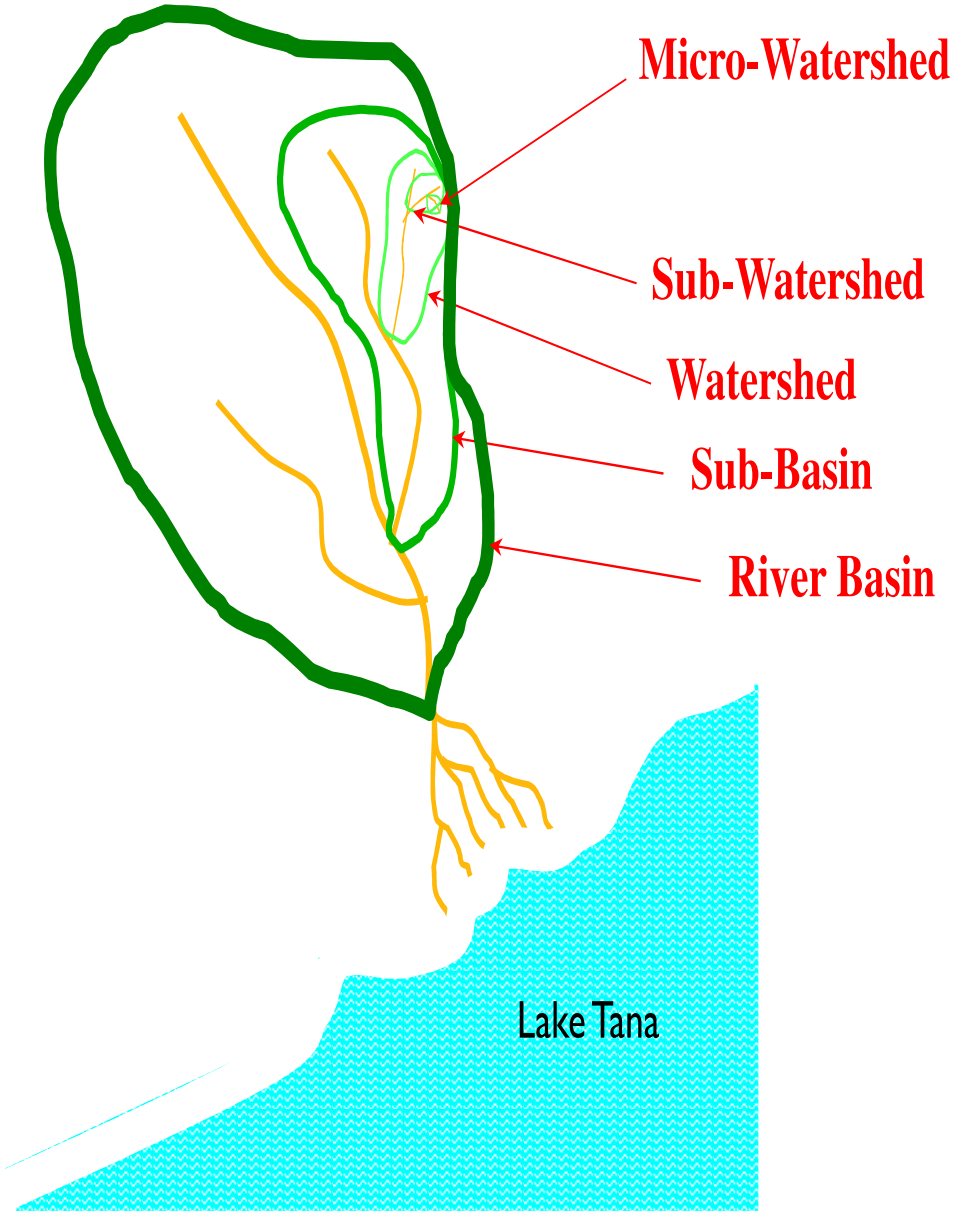
Masresha, Focal Person, Ethiopian Biodiversity Institute

Ayalew Wondie, Focal Person, Bahir Dar University

Edeget Merawi, Director, Bahir Dar Biodiversity Center

Graphic illustrating the hydrological system of a river basin in the Lake Tana watershed

(Adapted from Abebe, B. 2014)



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