REPORT

FINAL REPORT

MCC Burkina Faso—Agriculture Development Project Interim Report

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Christopher Ksoll
Randall Blair
Seth Morgan
Caroline Lauver
Yiriyibin Bambio

Submitted to:
Millennium Challenge Corporation
875 Fifteenth St., NW
Washington, DC 20005
Project Officer: Jack Molyneaux
Contract Number: MCC-16-CON-0029 / 95332418C0214

Submitted by:
Mathematica Policy Research
1100 1st Street, NE
12th Floor
Washington, DC 20002-4221
Telephone: (202) 484-9220
Facsimile: (202) 863-1763
Project Director: Christopher Ksoll
Reference Number: 50284.01.240.032.000

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LIST OF ACRONYMS

ADP	Agriculture Development Project
AMVS	Autorité de la Mise en Valeur de la Vallée du Sourou (Authority for the Development of the Sourou Valley)
APD	Agence de Partenariat pour le Développement (post-Compact successor to MCA-BF)
ARF	Access to Rural Finance (Activity)
CATG	Centre d'Appui Technique et de Gestion
CFE	Contribution Financière en matière d'Eau
CLE	Comité local de l'eau (local water committee)
DA	Diversified Agriculture (Activity)
ERR	Economic rate of return
FAO	Food and Agriculture Organization (United Nations)
FCFA	Franc of the West African *Communauté Financière Africaine*
GDP	Gross Domestic Product
GOBF	Government of Burkina Faso
IWRM	Integrated water resource management
MCA-BF	Millennium Challenge Account-Burkina Faso
MCC	Millennium Challenge Corporation
MIS	Market Information System
Non-PAP	Person not affected by the project
O&M	Operations and Maintenance
PAP	Personne affectée par le project (person affected by the project)
RCT	Randomized control trial
RD	Regression discontinuity
SDAGE	Schéma Directeur d'Aménagement et de Gestion de l'Eau (Basin Management Plans)
TA	Technical assistance
USAID	U.S. Agency for International Development
WMI	Water Management and Irrigation (Activity)
WUA	Water-user association

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EXECUTIVE SUMMARY

A. Introduction

Burkina Faso's agriculture sector is critical to its economic health, but a variety of challenges have kept it from being as productive as it could be. In response, the Millennium Challenge Corporation (MCC) invested in the Agriculture Development Project (ADP) as part of the Burkina Faso Compact. The project's objectives were to improve agricultural productivity, increase the incomes of farmers and livestock producers, and support economic development. The ADP was implemented from 2009 to 2014 and encompassed three activities: Water Management and Irrigation (WMI), Diversified Agriculture (DA), and Access to Rural Finance (ARF). Mathematica Policy Research was engaged by MCC as an independent evaluator to evaluate the WMI and DA activities.[1,2]

The WMI Activity was designed to improve water availability and delivery, flood control, and dam safety through several initiatives. In particular, an irrigated perimeter (known as the Di perimeter) was built in the Di Department, where beneficiaries received land. As part of the activity, specialists helped water authorities build their capacity and gave them technical assistance (TA) to strengthen the operations and maintenance (O&M) of the new perimeter and existing irrigation perimeters in Sourou Valley. In Sourou, the TA and capacity building support included establishing and training water-user associations (WUAs) and providing TA to the Sourou Valley Development Authority—Autorité de Mise en Valeur de la Vallée du Sourou (AMVS)—for its action plan. In addition, the project supported the development of policies to preserve and develop water resources through an integrated water resource management (IWRM) initiative in the Mouhoun and Comoé basins. This was intended to help farmers sustain their livelihoods. The WMI Activity also supported the rehabilitation of the Léry dam, an endeavor that does not fall under the scope of this evaluation.

The DA Activity was designed to increase farmers' incomes by improving agricultural productivity and increasing the quantity and value of agricultural sales. Its components included (1) training farmers on rain-fed and irrigated production, (2) training producer associations and agribusinesses, (3) improving veterinary services and training farmers on improved livestock practices, (4) establishing a market information system (MIS) and information centers, (5) establishing and training market committees, and (6) rehabilitating rural markets. The WMI and DA activities were designed as an integrated set of activities to increase farmers' agricultural productivity and income. The WMI Activity would guarantee reliable access to irrigation, and

[1] MCC separately contracted A2F to evaluate the ARF Activity (A2F 2015).

[2] Mathematica Policy Research strives to improve public well-being by bringing the highest standards of quality, objectivity, and excellence to bear on the provision of information collection and analysis to our clients. Mathematica is an independent evaluator committed to the highest standards of objectivity and independence, and the findings in this report solely reflect Mathematica's interpretation of available information. Mathematica staff involved in analyzing the information and authoring this report did not report any conflicts of interest. The evaluation was funded exclusively by MCC.

the DA Activity would help farmers leverage this access into year-round farming, thus allowing them to diversify into higher-value crops and realize higher sales and profits.

B. Evaluation questions and methodology

Mathematica is carrying out one impact evaluation and five performance evaluations to answer research questions about the implementation, outcomes, and sustainability of the WMI and DA activities.

Three of the six evaluations focus on the Di perimeter that was constructed under the WMI Activity. The first, the Di Perimeter evaluation, studies the consequences of providing irrigated land on the perimeter to compensate people who were displaced by the project—referred to as persons affected by the project (PAPs)—and assesses the perimeter's economic value by calculating the post-compact economic rate of return (ERR) of MCC's investments in the perimeter (Table ES.1).

The second evaluation, the Di Lottery impact evaluation, has two components—an impact analysis and a methodological study. Some farming plots in the Di perimeter were distributed through a formal, province-wide lottery, which made it possible to conduct a randomized control trial (RCT) to measure the impact of winning the lottery. The methodological study compares the impacts found in the RCT with those found a second rigorous design—regression discontinuity (RD). The third Di perimeter evaluation is the Sourou O&M evaluation, which focuses on the sustainability of the irrigation infrastructure. Specifically, it assesses technical assistance for O&M on the Di perimeter as well as on additional existing perimeters also located in the Sourou Valley near Niassan. The remaining three performance evaluations investigate the effects of IWRM project activities on water management and water conflicts, the effects of the Farmer Training Sub-Activity of the DA Activity on agricultural practices and outcomes, and the degree of integration of project activities.

Table ES.1. Analytic approaches for the ADP evaluations

Evaluation	Key questions	Analytic approach
All evaluations^	Were project activities and investments implemented as planned?	Mixed-methods analysis based on administrative data and interviews and focus groups with program participants
Di Perimeter	What are agricultural outcomes on the perimeter?	Descriptive analysis of survey data
	How have PAPs' land security and well-being changed?	Mixed-methods analysis based on interviews and focus groups with program participants and descriptive analysis of survey data
	What is the ERR of the Di perimeter?	Interviews with program participants and descriptive analysis of data from interim and final surveys*
Di Lottery	What impact does winning the Di Lottery have on agricultural practices, economic outcomes, and land tenure security?	Impact evaluation using a randomized control trial (RCT)
	To what extent are the estimated impacts from the regression discontinuity similar to those from the RCT, both at the cutoff and far from the cutoff?	Methodological study using data from interim and final survey data*
O&M	To what extent are the Di perimeter and the old perimeters at Niassan effectively and sustainably operated and maintained?	Mixed-methods analysis based on interviews and focus groups with program participants and descriptive analysis of survey data

Evaluation	Key questions	Analytic approach
IWRM	Are the compact-supported IWRM institutions (basin committees, basin agency directorates, local water committees) functioning and implementing the water management plans? What are the institutions' effects on water resources management and water conflicts?	Qualitative analysis based on interviews and focus groups with program participants
Farmer training	What are project results in terms of crop diversification, average yields per hectare for ADP focus crops, and overall agricultural incomes and profits?	Pre-post analysis of survey data
Rural markets, MIS. and integration of DA activities	To what extent were the various ADP components implemented in a cohesive way? How are rural markets and the MIS functioning?	Mixed-methods analysis based on administrative data and descriptive analysis of survey data

* indicates that the evaluation question will be addressed in the final evaluation report.

ADP = Agriculture Development Project; DA = Diversified agriculture; ERR = economic rate of return; IWRM = integrated water resource management; MIS = market information system; O&M = operations and management; PAP = persons affected by the project.

^ indicates that each of the six evaluations addresses this evaluation question.

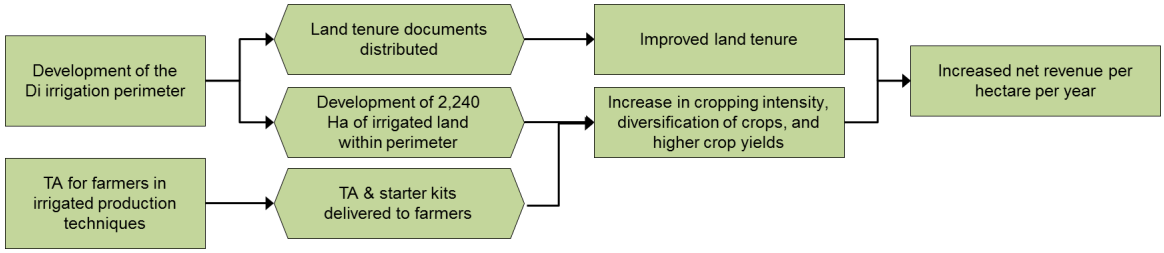
C. Key evaluation findings

In this interim report, we detail the main interim findings for each of the six evaluations. The findings are summarized below.

1. Di Perimeter evaluation

Background. MCC invested $89M in the construction of the Di perimeter, a 2,240-hectare agricultural perimeter located on the east bank of the Sourou River. The perimeter featured new irrigation and drainage canal networks, seven pumping stations, guard drains, a levee, and roads and paths throughout. PAPs displaced by the perimeter's construction received financial compensation for lost harvests, land on the perimeter with formal titles and leases, training in agricultural technologies for irrigated land, and starter kits with production inputs (during the first growing seasons). The Di Perimeter program logic envisioned that increased access to irrigated land, formalized land tenure, and enhanced technical capacity following training could increase PAPs cropping intensity and help them diversify crops, generate higher yields, and increase net agricultural income (Figure ES.1).

Figure ES.1. Di perimeter program logic



Findings. Mathematica conducted a mixed-methods evaluation of the Di Perimeter Sub-Activity that relied on qualitative interviews with implementers, interviews and focus groups with PAPs, and survey data collected through interviews with PAPs and their spouses. Our key findings are summarized in Table ES.2.

Table ES.2. Key findings: Di Perimeter evaluation

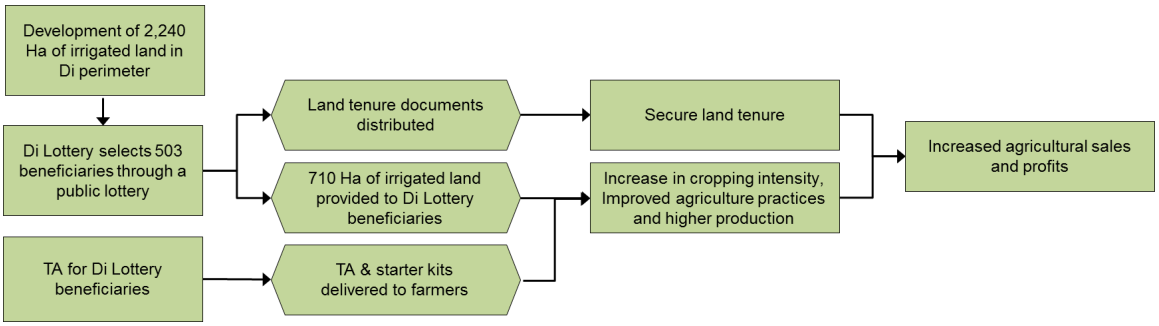
Key finding	Discussion
Implementation	**Despite substantial delays, implementers successfully constructed the 2,240-hectare Di perimeter.** Delays in planning and constructing the irrigated perimeter generated delays in allocating land and compressed the training timeline. Stakeholders considered the quality of the irrigation infrastructure to be high, despite a few minor issues with leveling of fields.
	Overall, PAPs received the program benefits they were expected to, but some farmers who started out with larger landholdings considered the land they received to be insufficient compensation. Nearly all PAPs received the complete set of program benefits consisting of financial compensation, land, ownership and leasehold documents, training, and starter kits. Large farmers did not consider the land they received to be enough compensation for the land they lost, whereas small farmers—whom the land allocation favored with overall and per-adult-member minimum land allocation amounts—did not express this dissatisfaction.
	Although about one-fifth of the PAPs were women, some women who previously cultivated land were reportedly not compensated. The project considered all individuals within the households who cultivated land as PAPs. As a result, women were also registered, and they comprised 24 percent of the PAPs. Some women, however, were reportedly not registered. In addition, because all land allocated in compensation was combined into a single plot, some female PAPs reported that their husbands kept control of the entire plot.
Outcomes	**Yields per hectare are substantially higher than they were at baseline, but they still do not meet the project targets. Importantly, these yields may not be sustainable in the long term.** PAPs now generally apply modern practices for irrigated agriculture—they use fertilizer, improved seeds, and some machinery. Although yields are substantially higher than they were before the perimeter was built, they lag behind project targets for the project-promoted focus crops. The long-term outlook on yields for both PAPs and non-PAPs is not optimistic, because soil testing indicates that soils are nutrient-poor, and only about three-fifths of farmers replenish nutrients by applying organic fertilizer.
	PAPs said they are better off now than they were before the perimeter was built—at least in terms of food security. Nearly all PAPs reported reduced food insecurity, and three-quarters of PAPs reported increased net agricultural income. Because of unfavorable trends in the prices of focus crops—perhaps linked to increased supply in the area and the lack of accessible roads to and from the perimeter—some PAPs with initially larger landholdings noted that their increased production did not translate to higher incomes.
	Most PAPs said their land tenure security on the perimeter has increased, but many of them are confused about land transfer rights. PAPs feel secure in their land rights vis-à-vis others, but the possibility that land could be withdrawn for nonpayment of WUA fees has introduced a new kind of insecurity. Fewer than half of the PAPs believe they have the right to sell land, and stakeholders disagree on whether land sales are permitted by the authorities. PAPs have a right to rent out their plots, but only half know they have this right.

2. Di Lottery RCT

Background. About 30 percent of the land in the Di perimeter was distributed to selected applicants from the Boucle du Mouhoun region via a public lottery—the Di Lottery. The ADP developed criteria for selection to the lottery that would (1) meet gender and age targeting objectives and (2) select applicants likely to make good use of the land they received. For example, by favoring applicants with experience in irrigated agriculture, the ADP program logic envisioned that Di Lottery beneficiaries, like other Di perimeter beneficiaries, could cultivate irrigated crops with higher cropping intensity, generate higher yields, and increase net

agricultural income if they had access to newly acquired irrigated land, formalized land tenure, and enhanced technical capacity as a result of training (Figure ES.2 adapts the Di perimeter program logic for Di Lottery beneficiaries).

Figure ES.2. Di Lottery program logic



Evaluation findings. Mathematica used an RCT to conduct an impact evaluation of the Di Lottery. We interviewed both lottery applicants who were chosen as beneficiaries and those who were not chosen. Our key findings are summarized in Table ES.3.

Table ES.3. Key findings for the Di Lottery evaluation

Key finding	Discussion
Implementation	**Despite substantial delays, the lottery selected beneficiaries in a transparent process that yielded more than the target number of female beneficiaries.** Delays in constructing the perimeter, allocating land to PAPs, and verifying applications delayed the lottery until February 2014. After a transparent process to verify applications, 503 Di Lottery beneficiaries were selected in a public lottery from among 1,528 participants. The proportion of female beneficiaries exceeded the project target of 20 percent slightly.
	Joint tests of significance and balance tests suggest that the lottery was properly implemented. In the baseline report, we conducted balance tests and joint tests of significance to assess whether the lottery selected Di Lottery beneficiary and control applicants and applicant households that were similar along observable characteristics (Ksoll et al. 2018). Di Lottery beneficiary and control applicants and households were balanced for 82 of 98 individual and household characteristics. Joint tests of significant indicate that the treatment is not correlated with either the set of eligibility criteria nor the larger set of indicators created from the baseline survey. Together with the transparent public lottery, this analysis confirms that the Di lottery was properly implemented to support a rigorous evaluation design.

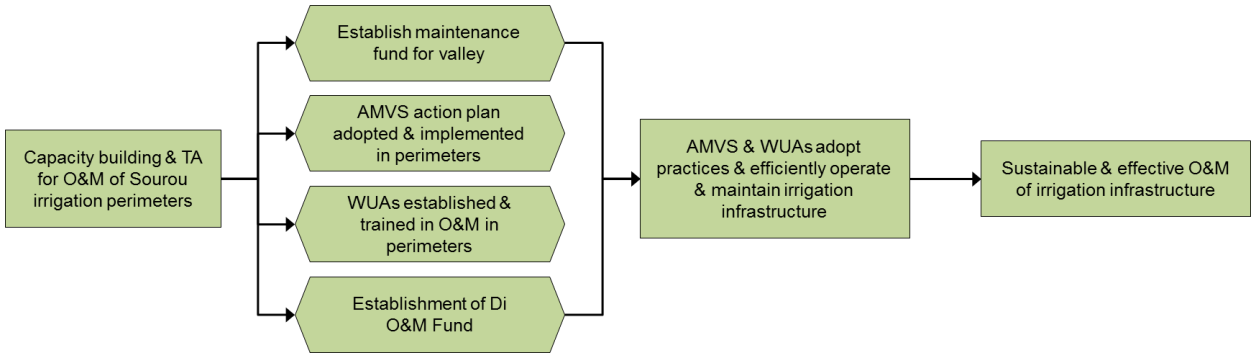
Key finding	Discussion
Outcomes	**Not all lottery beneficiaries have cultivated the plots they received: take-up was lower for winners of rice plots.** In the lottery application, applicants indicated a preference for a plot suitable for rice cultivation or a polyculture plot suitable for cultivation of a variety of crops. Most applicants indicated a preference for polyculture, but the majority agreed to accept any plot. The lottery selected a significant number of rice plot recipients who had no experience in rice cultivation. Because rice cultivation is more time-intensive and less profitable than crop production on polyculture plots, a smaller proportion of rice plot recipients currently cultivate their plots on the perimeter (compared to polyculture plot recipients).
	Di Lottery beneficiaries are significantly more likely to use improved agricultural techniques. Farmers selected to receive plots through the lottery are significantly more likely than non-lottery winners to use improved agricultural techniques—including fertilizer, pest control, and improved seeds. They are also significantly more likely to use agricultural machinery and hire labor on their fields.
	Agricultural sales, agricultural incomes, and household incomes of Di Lottery beneficiaries are significantly higher than they are among non-beneficiaries. The package of benefits has led to significantly and substantially higher sales, agricultural incomes, and household income for lottery beneficiaries relative to non-beneficiaries, as anticipated in the program logic.
	Di Lottery beneficiaries are less secure about their tenure on the perimeter than PAPs. While almost two thirds of Di Lottery beneficiaries are not worried about losing their land on the Di perimeter, a significantly higher proportion of Di Lottery beneficiaries than PAPs are very worried about losing access to their land within the next five years.

3. O&M in the Sourou Valley

Background. MCC invested $6.6M in capacity building and technical assistance for the institutions tasked with managing the irrigation infrastructure in the Di perimeter and the nearby Niassan perimeters. The project was designed to create and train WUAs on those perimeters. It also provided capacity building to AMVS—the Government of Burkina Faso (GOBF) agency in charge of maintaining primary canals in Sourou Valley and supervising the WUAs—to implement reforms contained in the AMVS action plan, including the transfer of authority for agricultural development within the Sourou Valley to the Regional Directorate for Agriculture in the Boucle du Mouhoun region.

The Sourou O&M program logic envisioned that the creation of WUAs, technical assistance to AMVS, and the establishment of two maintenance funds would lead to more sustainable and effective management of the irrigation infrastructure (Figure ES.3).

Figure ES.3. Program logic for the Sourou O&M Sub-Activity



Evaluation findings. Mathematica conducted a mixed-methods evaluation of the Sourou O&M Sub-Activity that relied on qualitative interviews with implementers, interviews and focus groups with farmers, administrative data, and survey data. Our key findings are summarized in Table ES.4.

Table ES.4. Key findings of the Sourou O&M evaluation

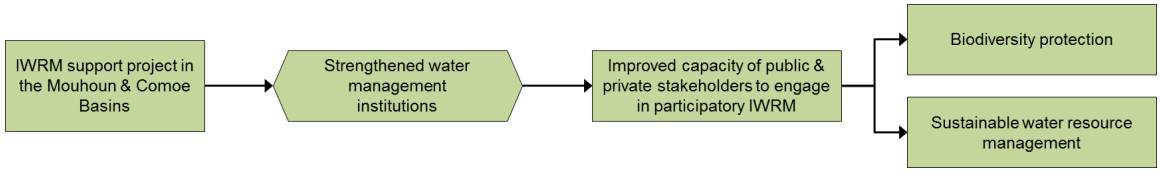
Key finding	Discussion
Implementation	**Only one WUA on the Di perimeter had received the planned support and training by the end of the compact.** Perimeter construction delays also delayed the creation of WUAs and support for them. By the end of the compact, seven WUAs on the Di perimeter and nine on the Niassan perimeters had been formally established, but most were not functional. Four WUAs on the Di perimeter had not received any training or support, two additional WUAs had received one year of training and support, and only one WUA had received all the anticipated training and support covering two years of agricultural production.
	WUAs received training in the post-compact period, some of it through a private consultancy set up to provide technical assistance post-compact. After the compact ended, the post-compact entity, Agence de Partenariat pour le Développement (APD), which was in operation between August 2014 and September 2017, funded the remaining training to WUAs that was planned under the compact. In addition, the ADP funded the creation of a private consultancy—the Centre d'Appui Technique et de Gestion (CATG)—which could provide TA to the WUAs in the long term.
Outcomes	**WUAs have the capacity to complete recurring tasks, but require continued support for some functions.** Stakeholders suggested that WUAs on the Di perimeter can conduct basic maintenance, organize themselves, and collect WUA fees. WUAs, however, do not have the capacity to address larger repairs and complete more technical tasks such as setting up maintenance plans or developing water schedules.
	Rapidly declining WUA fee collection rates in two sectors with rice plots raise questions of sustainability on these sectors. While four sectors in which over 90 percent of plots are polyculture plots are able to collect the vast majority of WUA fees, two sectors with a significant proportion of plots suitable for rice cultivation have rapidly declining payment rates. WUA fees for rice plots—which need more water but are less profitable—may not be set at a level that can be borne by farmers cultivating rice. The rapidly declining recovery rates raise questions about the financial sustainability of O&M in the two affected sectors.

Key finding	Discussion
Outcomes (continued)	**AMVS only implemented some of the key elements of the AMVS action plan in the post-compact period.** Although AMVS has electrified pumping stations and rehabilitated two perimeters as of April 2018, it has made limited progress on the other key elements of the action plan in the post-compact period: (1) WUAs are still confused about the division of responsibilities for maintenance; (2) AMVS has not transferred responsibility for production and marketing activities for the Niassan perimeters; (3) AMVS is attempting to regain responsibility for these activities on the Di perimeter; and (4) planned APD-funded activities to support AMVS' organizational and financial capacity have not been implemented.
	CATG services are valued, but WUAs cannot afford them. Various WUA board members appreciated different CATG technical support activities in terms of governance, maintenance, financial management, and fee recovery. As APD reduced its subsidy for CATG services over time, WUAs have had to assume the full cost of CATG services. In response to this pressure, WUAs on the Niassan perimeters have stopped paying for CATG services, and WUAs on the new perimeter have hired some staff directly to reduce costs.

4. IWRM

Background. With funding of $5 million, the IWRM Activity financed the creation of basin committees in Mouhoun and Comoé and training them in IWRM, the creation and training of 10 local water committees (known as CLEs), technical assistance and equipment to two Departments of Water Resources and basin-level water agencies in Mouhoun and Comoé, and the development of basin-level IWRM plans, known as Schéma Directeur d'Aménagement et de Gestion de l'Eau (SDAGEs). The IWRM Activity was designed to create, strengthen, and train water management institutions, thereby improving public and private stakeholders' capacity to engage in participatory IWRM, to protect biodiversity, and to sustain management of water resources (Figure ES.4).

Figure ES.4. Program logic for the IWRM Sub-Activity



Evaluation findings. Mathematica conducted a mixed-methods evaluation of the IWRM Sub-Activity that relied on qualitative interviews with implementers, interviews and focus groups with water users, and administrative reports. Our key findings are summarized in Table ES.5.

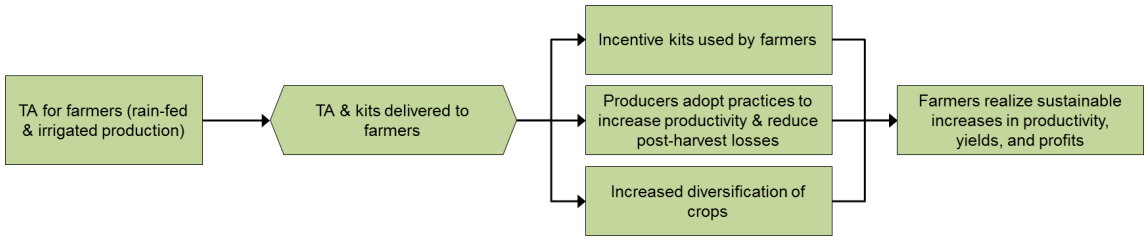
Table ES.5. Key findings for the IWRM evaluation

Key finding	Discussion
Implementation	**Despite substantial delays, all project targets were met.** Stakeholders successfully created the two basin committees and 10 local water committees (CLEs) that were planned, and developed the first two basin management plans (SDAGEs) in Burkina Faso. Although initial training and support for IWRM institutions were somewhat limited, basin committees successfully developed and validated the SDAGEs for the Comoé and Mouhoun basins. The 10 planned CLEs were put in place by the end of the compact period.
Outcomes	**Post-compact, IWRM institutions are engaged in fulfilling their core functions at the basin and local levels.** At the basin level, basin committees and water agencies have begun putting SDAGEs into practice through multi-year plans, and leveraging rehabilitated water analysis labs to promote healthy outcomes. At the local level, CLEs successfully conduct outreach, monitoring, riverbank rehabilitation, and dispute resolution. **IWRM institutions have influenced planning at the basin level.** IWRM institutions have influenced both strategic plans by placing limits on the development of additional perimeters and the annual agricultural plans. **Water users and other stakeholders appreciate CLEs for their role in resolving water conflicts.** The CLEs are charged with bringing together the water users who are in conflict with each other, gathering evidence and documentation, and making sure all users are being taken into account when resolving a water dispute. Large and small water users, basin agency staff, and Ministry of Water staff all highlighted the important role that CLEs play in reducing conflict and mediating water disputes. **Due to funding and capacity constraints, IWRM institutions are not fully meeting their objectives of managing water resources.** Water user fees, which were meant to provide dedicated funding for basin institutions, are difficult to collect because they are largely voluntary. As a result, IWRM institutions cannot afford to scale activities to fully meet their objectives of managing water resources.

5. Farmer training

Background. The farmer training component of the Technical Assistance Sub-Activity of the DA Activity was designed to train nearly 10,000 farmers, about half of them women, from 30 villages in the Sourou Valley and Comoé Basin. Conducted by AECOM, training and technical assistance focused on techniques applicable to both rain-fed and irrigated crops, including compost production and use, pesticide and chemical fertilizer use, use of improved seeds, improved planting and harvesting techniques, and crop rotation. Training sessions also focused on the production of maize, cassava, and vegetables in the Sourou Valley and on the production of maize, rice, and onions in the Comoé Basin. To facilitate the adoption of crops and techniques featured in training, AECOM distributed incentive kits containing agricultural inputs to farmers who participated in training. The sub-activity envisioned that providing farmers with training, technical assistance, and production inputs would enable them to develop modern agricultural practices and diversify their production, thus leading to sustainable increases in productivity, yields, and profits.

Figure ES.5. Program logic for the Farmer Training Sub-Activity



Evaluation findings. Mathematica conducted a mixed-methods evaluation of the Farmer Training Sub-Activity that relied on qualitative interviews with implementers, interviews and focus groups with participants, and survey data collected by interviewing participants. Our key findings are summarized in Table ES.6.

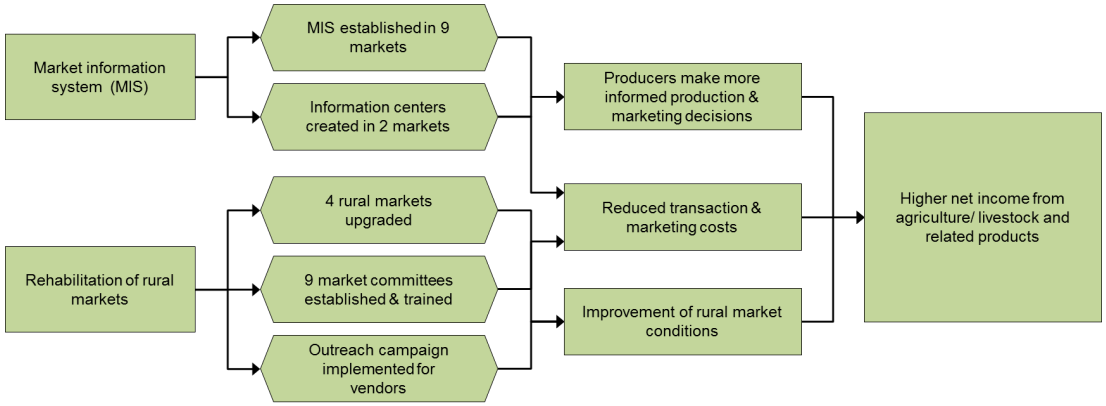
Table ES.6. Key findings for the Farmer Training evaluation

Key finding	Discussion
Implementation	**The sub-activity exceeded the training targets, and the proportion of trained households in target communities was high.** The implementer exceeded targets for the number of farmers trained as part of the sub-activity. The implementer also reached a high proportion of households in target communities, with at least half of randomly sampled households in the 30 targeted villages receiving training and kits.
	Trainings were generally well received by the farmers, although they reported low teacher-to-trainee ratios and logistical complications. Stakeholders and participants highlighted the pedagogical approach—which included teaching with visual aids, model farms, and individual practice with provided materials—as conducive to learning and adopting techniques. However, logistical issues like a poor choice of training venues and a relatively large number of participants per extension agent—as high as 40 to 1 in some cases—negatively affected trainees' perceptions of the training.
Outcomes	**Trainees generally adopted the new practices, and many continue to apply them.** Citing the new practices' usefulness, time savings, and positive effects on yields, trained farmers continue to apply the techniques they learned, particularly soil management, double-ridging, composting, and cultivating onions on a high platform.
	Trained farmers have substantially changed their cropping patterns, shifting cultivation to project-promoted focus crops. Trained farmers in Sourou are now more likely to grow maize and onions during the dry season, whereas trained farmers in the Comoé Basin have transitioned toward cowpea production.
	Profits in Comoé and the Sourou region decreased, primarily due to lower yields on most crops in 2016–2017. Yields of primarily rain-fed crops were substantially lower in the time period covered by the interim survey than they were at baseline, most likely because of the below-average rainfall that affected the country. Overall profits were also lower in both project regions in the agricultural campaign of 2016–2017 than they were in 2011–2012.

6. Rural markets, MIS, and integration of DA activities

Background. In addition to farmer training, the DA Activity included various market-related complementary components designed to reduce trained farmers' costs for transactions and marketing, thus increasing their agricultural incomes (Figure ES.6). The Rural Markets Sub-Activity—which was designed to improve market conditions—funded (1) the establishment and training of nine market committees, (2) the rehabilitation of four of these markets, and (3) an outreach campaign to give vendors information on hygiene, parking, safety, and taxes. Three of the markets that MCC selected for rehabilitation—Di, Gassan, and Gouran—were in the Sourou Valley; the fourth—Soubakaniedougou—was in the Comoé Basin. The DA Activity also funded the creation of an MIS, which was designed to enable trained farmers and other beneficiaries to make more informed marketing and production decisions by giving them timely information on prices.

Figure ES.6. Program logic for the Rural Markets and MIS sub-activities



Evaluation findings. In addition to evaluating MCC's investments in rural markets and MIS, this evaluation investigates the cohesiveness of the project by analyzing how many participants in the Farmer Training Sub-activity received various additional project benefits. Mathematica used a mixed-methods approach that relied on site visits, interviews with implementers, implementer reports, MIS data, and survey data collected through interviews with trainees. Our key findings are summarized in Table ES.7.

Table ES.7. Key findings for the evaluation of rural markets, MIS, and integration of DA activities

Key finding	Discussion
Implementation	**The project successfully established the MIS and rehabilitated four rural markets.** The MIS was rolled out in 2012, and continues post-compact after being transferred to a private company. Di, Gassan, Gouran, and Soubakaniedougou markets have new or rehabilitated buildings, toilets, and parking.
	The project achieved good overlap in benefits for farmer training participants. Although not all households received every benefit, many households in the farmer training sample report receiving a variety of benefits through the ADP, including being put in touch with input providers and participating in training modules on post-harvest agricultural processing.
Outcomes	**Three of the four rehabilitated markets are functioning as intended, but few trained farmers in Sourou sell their cash crops at the markets.** New markets are in good condition, well equipped, and well lit. The rural markets at Di, Gassan, and Gouran are largely functioning as intended, whereas the Soubakaniedougou market is only partially used because of a lack of electricity, non-functional hand-washing stations, and farmers' reluctance to use the market because it was not inaugurated with a traditional ceremony when it first opened. Farmers in Sourou largely continue to sell cash crops like onions and tomatoes directly from their plots.
	The MIS is only partially functional, and it is rarely being used in project areas. As of May 2018, MIS requests for prices were largely unfulfilled in the two project areas, and it only had pricing information on a portion of MCC-supported markets. Further, the MIS is not widely known or used by farmers in the two regions.

D. Implications and next steps

1. Summary

The compact's objective was to support farmers so they could earn higher incomes from increased productivity and access to irrigation. The implementation of all activities was delayed but was generally completed by the end of the compact. Where activities were incomplete, the ADP coordinated the support to beneficiaries through the post-compact entity. Outputs—ranging from farmer training and land tenure assistance to training and TA for WUAs and basin water committees—were generally considered of good quality.

Our evaluation reveals that PAPs and people who received the farmer training adopted the practices featured in the training and transitioned to focus crops during the 2017 agricultural year. PAPs' yields for focus crops are higher than they were before the compact. Results for yields per hectare for farmers trained as part of the DA reveal mixed results, with yields for tomatoes and onions lower in 2017, whereas yields for rice are higher. Agricultural profits for farmers are lower. We cannot say that the project itself caused the results for PAPs and farmers because we could not construct a comparison group. As a result of the lack of comparison group, the below-average rainfall that affected Burkina Faso during the 2017 growing seasons cannot be disentangled from the effects of the project.

Di Lottery winners—the only group we *can* make causal statements about because we could use a design that allows it—were able to leverage new access to irrigated land, training, and inputs to generate higher yields, agricultural profits, and household income than similar eligible

applicants who did not win the lottery could. Because the outcomes of both lottery beneficiaries and the control group would have been equally affected by the below-average rainfall in Burkina Faso, we can say that our estimated effects are truly the result of the compact's investments.

We also investigated the sustainability of MCC's investments in the Di perimeter, primarily by assessing investments in soil nutrients and O&M for the perimeter infrastructure. Only about half of Di perimeter beneficiaries use organic fertilizer; this threatens the quality and quantity of their future production and potentially prevents them from realizing the planned long-term dividends of the perimeter. Also, although four of the Di perimeter WUAs have very high recovery rates for WUA fees and generally manage to complete planned maintenance activities, three WUAs on the Di perimeter are already having serious trouble collecting WUA fees and do not have the resources to finance O&M activities.

With respect to the outcomes of MCC's investments in IWRM institutions, those created through compact funding were largely fulfilling their core functions in 2018, around four years after the close of the compact. This is a particularly noteworthy achievement. With respect to the longer-term sustainability of these investments, however, not enough is being collected in water fees as of now to cover the full implementation of IWRM activities expected under the compact.

2. Next steps

The interim findings have some implications for the evaluations' next steps. In Table ES.8, we describe those next steps.

Table ES.8. Next steps in the ADP evaluations

Evaluation	Next steps
Di perimeter	Collect final data, using measurement squares to capture yields more accurately. Conduct quantitative analysis of price changes due to perimeter construction. Update economic rate of return (ERR) based on interim and final data collection (including sensitivity estimates with different life span estimates for the perimeter).
Di Lottery	Collect final data by georeferencing of plots. Conduct impact analysis for land tenure (perception, transfer rights, land documentation, conflict, and investment). Conduct RD analysis and within-study comparison.
O&M	Conduct engineering assessment of perimeter lifespan; this will inform the ERR update.
IWRM	*The interim report completes the IWRM evaluation.*
Farmer Training	Submit baseline and interim data for farmer training sample. *The interim report completes the farmer training evaluation.*
Rural markets, MIS, and Integration of DA Activities	*The interim report completes the assessment of rural markets, MIS, and integration of DA activities.*

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I. INTRODUCTION AND OVERVIEW

A. Background on the Agriculture Development Project

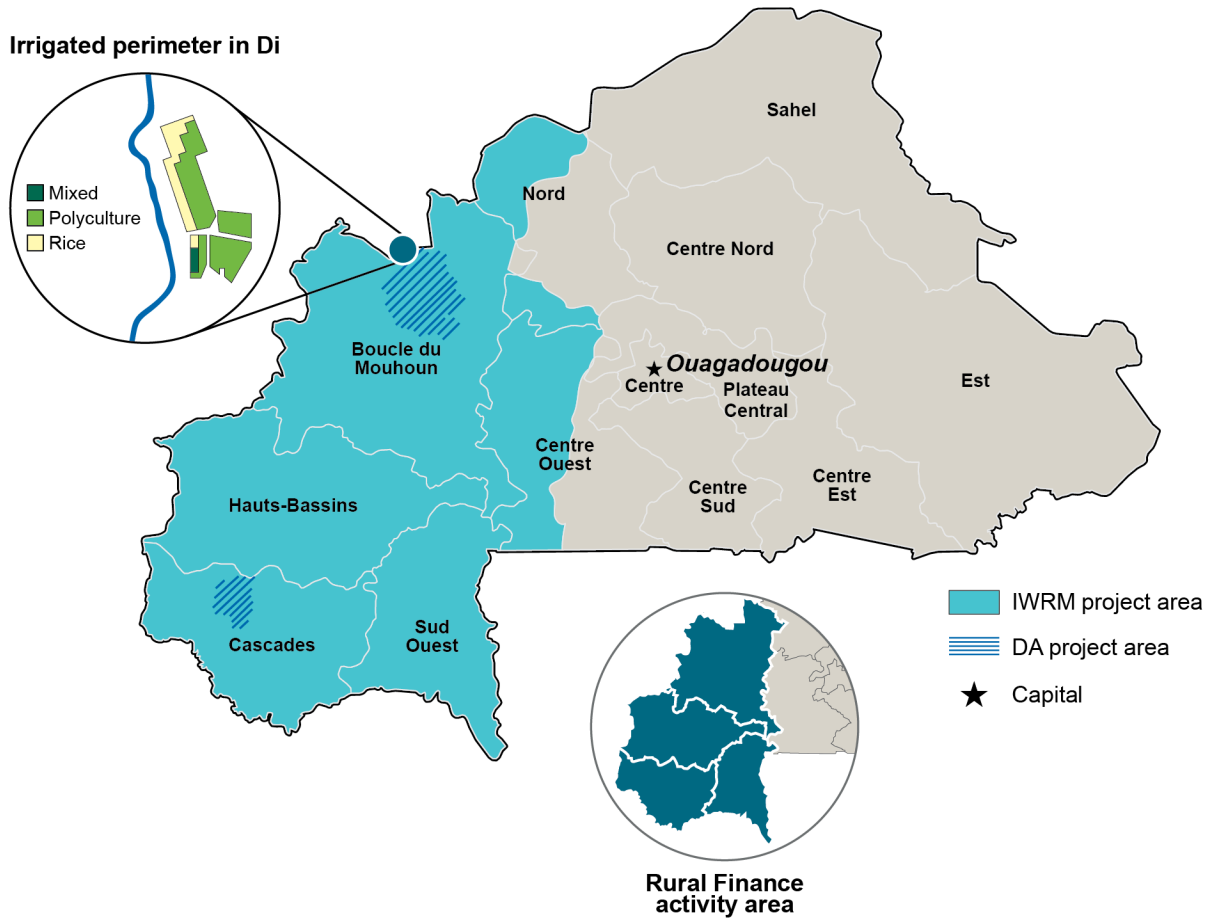
In Burkina Faso, as in much of Africa, the agriculture sector is a critical component of the economy. A large share of the country's population depends on farming and other agriculture-related activities for their livelihood and their own consumption. As of 2011, agriculture contributed nearly one-third of the country's annual gross domestic product (GDP), with total production estimated at just under $3 billion annually (FAPDA 2014). The sector also employs 80 percent of Burkina Faso's workforce, primarily on small subsistence farms of five hectares or less (USAID Burkina Faso 2015; FAPDA 2014). Despite its prominent role in the country's economy, the agriculture sector is characterized by low crop and livestock productivity (USAID Burkina Faso 2015). Burkina Faso also is a net food importer (Chauvin et al. 2012). Low agricultural productivity contributes to extreme poverty in Burkina Faso, which is one of the poorest countries in the world with a GDP per capita of $634 (FAPDA 2014).

Agricultural improvements are needed for economic growth and poverty reduction in Burkina Faso. However, the sector faces several challenges—in particular, the level of rainfall is low and variable (USAID Burkina Faso 2015). Annual rainfall in Burkina Faso averages around 750 millimeters, with the northern Sahelian area typically receiving less than 600 millimeters while the southern Sudanian region receives up to 1,200 millimeters. The rainy season in Burkina Faso normally lasts from April or May to September or October. However, rainfall has been gradually decreasing since the severe droughts of the 1970s (Sally et al. 2011). Inadequate rainfall necessitates irrigation for successful agriculture, yet infrastructure is poor, and farmers' access to irrigated water is low (FAPDA 2014). Less than 1 percent of cultivated land in Burkina Faso is equipped for irrigation (FAO 2016). Other challenges facing the country's agriculture sector include limited knowledge and capacity among farmers, land tenure insecurity, poor roads and other transportation infrastructure, and limited access to credit. Burkina Faso's economy is also susceptible to regional trade shocks and volatile food and fuel prices (FAPDA 2014; USAID Burkina Faso 2015).

In response to the challenges facing the country's agriculture sector, the Millennium Challenge Corporation (MCC) invested in the Agriculture Development Project (ADP) as part of the Burkina Faso Compact implemented by the Millennium Challenge Account–Burkina Faso (MCA-BF). The project's objectives were to improve agricultural productivity, increase incomes among farmers and livestock producers, and support economic development primarily in the Sourou Valley and the Comoé Basin. The ADP was a five-year effort, implemented from 2009 to 2014, and it comprised three activities: (1) Water Management and Irrigation (WMI), (2) Diversified Agriculture (DA), and (3) Access to Rural Finance (ARF).[3] The intervention areas of the three activities are shown in Figure I.1. The WMI Activity was a $103.9 million investment, representing nearly three-quarters of the ADP, while the DA Activity was a $29.7 million investment.

[3] The ARF activity does not fall under the scope of this evaluation. MCC separately contracted the evaluation of the ARF activity; A2F completed this evaluation in 2015 (A2F 2015).

Figure I.1. Map of ADP intervention areas in Burkina Faso



Source: MCA (2014d).

1. Project activities

The WMI Activity was designed to improve water availability and delivery, flood control, and dam safety through several initiatives, particularly by constructing an irrigated perimeter near the town of Di in the Sourou Valley (known as the Di perimeter) on which several groups of beneficiaries received land. Also under the activity, specialists provided water authorities with capacity building and technical assistance (TA) to strengthen the operations and maintenance (O&M) of the new Di perimeter and existing irrigation perimeters—called the Niassan perimeters—in the Sourou Valley. The TA and support for capacity building provided in Sourou included (1) establishing and training water-user associations (WUAs) and (2) providing TA to the Sourou Valley Development Authority (Autorité de Mise en Valeur de la Vallée du Sourou, or AMVS) on the development and implementation of its action plan. In addition, the WMI Activity aimed to improve the long-term sustainability of agricultural livelihoods by strengthening institutions devoted to integrated water resource management (IWRM) in the Mouhoun Basin of the Sourou Valley and the Comoé Basin. Finally, the WMI Activity also

supported the rehabilitation of the Léry dam, an activity that does not fall under the scope of this evaluation.

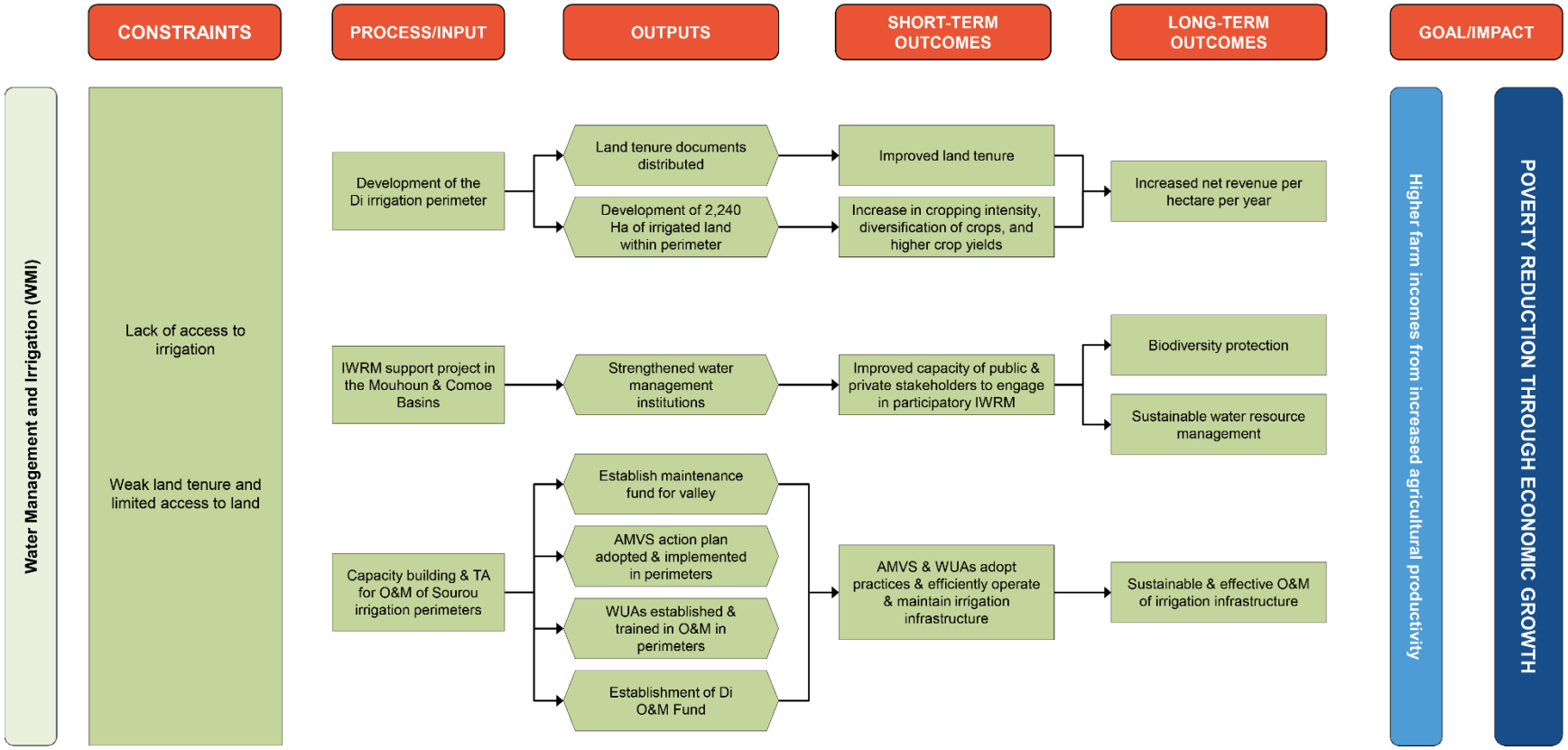
The DA Activity was designed to increase farmers' incomes by improving agricultural productivity and increasing the quantity and value of agricultural sales in the Sourou Valley and the Comoé Basin. Its components included (1) training farmers on rain-fed and irrigated production, (2) providing training to producer associations and agribusinesses, (3) improving veterinary services and providing livestock training, (4) establishing an MIS and information centers, (5) establishing and training market committees, and (6) rehabilitating rural markets.

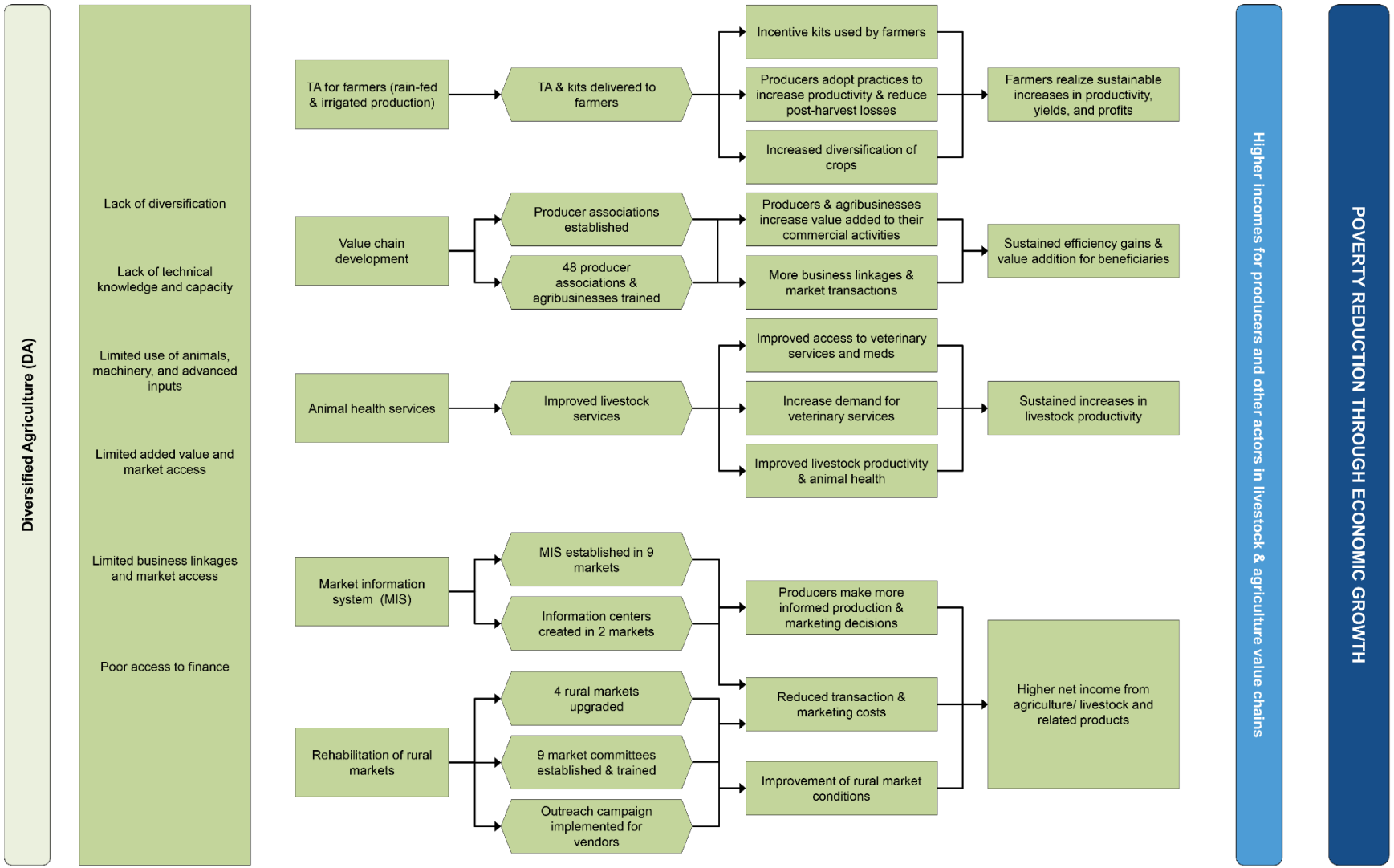
2. Program logic

As noted, the ADP was designed to enhance agricultural production in the Sourou Valley and the Comoé Basin. These two areas, near the country's borders with Mali and Côte d'Ivoire, respectively, are both predominantly rural and agriculture is the principal activity for most of the population. Farmers in the Comoé Basin and in the Sourou Valley generally grow cereals, as well as tomatoes and onions where possible. However, some farmers are also involved in livestock, aquaculture, and forestry. Agriculture in the area has traditionally been rain-fed, but government programs and nongovernmental organizations (NGOs) began introducing irrigation infrastructure in the late 1990s (MCC 2008a).

The program logic for the WMI and DA Activities is in Figure I.2. The WMI and DA Activities were designed to work in an integrated way to increase agricultural productivity and income for beneficiaries. At the activity level, the WMI Activity would guarantee reliable access to irrigation, and the DA Activity would help farmers leverage this irrigation access into year-round farming, thus diversifying into higher-value crops and obtaining higher sales and profits. Within the DA Activity, the beneficiaries in the primary project areas in the Sourou Valley and the Comoé Basin were meant to profit from multiple interlocking activities that worked together to address a variety of material, human capital, and informational constraints along the agricultural value chain. These included land tenure assistance; training on animal health, irrigation-based farming and livestock techniques; and up-to-date crop price information and market opportunities.

Figure I.2. Program logic of the DA and WMI activities




Diversified Agriculture (DA)
Lack of diversification
Lack of technical knowledge and capacity
Limited use of animals, machinery, and advanced inputs
Limited added value and market access
Limited business linkages and market access
Poor access to finance
TA for farmers (rain-fed & irrigated production)
TA & kits delivered to farmers
Incentive kits used by farmers
Producers adopt practices to increase productivity & reduce post-harvest losses
Increased diversification of crops
Farmers realize sustainable increases in productivity, yields, and profits
Value chain development
Producer associations established
48 producer associations & agribusinesses trained
Producers & agribusinesses increase value added to their commercial activities
More business linkages & market transactions
Sustained efficiency gains & value addition for beneficiaries
Animal health services
Improved livestock services
Improved access to veterinary services and meds
Increase demand for veterinary services
Improved livestock productivity & animal health
Sustained increases in livestock productivity
Market information system (MIS)
MIS established in 9 markets
Information centers created in 2 markets
Rehabilitation of rural markets
4 rural markets upgraded
9 market committees established & trained
Outreach campaign implemented for vendors
Producers make more informed production & marketing decisions
Reduced transaction & marketing costs
Improvement of rural market conditions
Higher net income from agriculture/ livestock and related products
Higher incomes for producers and other actors in livestock & agriculture value chains
POVERTY REDUCTION THROUGH ECONOMIC GROWTH

B. Evidence review

For countries like Burkina Faso whose population largely consists of subsistence farmers, growth in the agriculture sector is likely to be the most effective way to reduce poverty because poor farmers stand to gain more from growth in agriculture than in other sectors (Christiaensen et al. 2011; De Janvry and Sadoulet 2010). Over the past several decades, agricultural yields in Burkina Faso have been growing slowly but remain low and vulnerable to severe weather and drought (Chauvin et al. 2012). Evidence from developing regions suggests that the ADP's large investments in irrigation could increase agricultural productivity—provided that irrigation infrastructure is properly maintained—and that land provision can also boost farmer productivity and alleviate poverty. However, there is mixed evidence on linkages between farmer training and improved agricultural outcomes in countries with agricultural and economic conditions that are similar to Burkina Faso.

The evaluation of the ADP will contribute to limited literatures of the impacts of irrigation practice, O&M, IWRM, and land titling and provision (both population-wide and by gender) in West Africa and Burkina Faso, in particular. It will also provide new evidence of whether farmers implement training practices as intended or adapt them to suit local contexts. Because of the use of a randomized lottery, the evaluation will also be among the first studies to provide rigorous estimates of the impact of large-scale provision of irrigated farm land. Below we provide a brief summary of the existing evidence on (1) irrigation, (2) IWRM, (3) farmer training, and (4) land distribution and titling, and highlight the key gaps in the evidence that this evaluation hopes to fill. (See Ksoll et al. [2017] for a detailed review of the relevant literature).

1. Effects of irrigation

Access to irrigation. The existing literature suggests that irrigation can increase agricultural productivity (Hussain and Hanjra 2004; Kuwornu and Owusu 2012; Janaiah et al. 2004; Matsumoto-Izadifar 2009) and income (Tucker and Yirgu 2010; Datar and Del Carpio 2009; Dillon 2011), thus encouraging growth in the sector as well as poverty reduction. For example, Kuwornu and Owusu (2012), found that access to irrigation increased cropping intensity in Ghana by almost three-quarters for rice and about one-third for pepper and okra, and also improved how much these crops yielded per harvest. Much of the existing literature of large-scale irrigation schemes primarily draws on the evaluation of projects implemented in Asia (See, for example, Lipton [2007] for an Asia-focused review) and is lacking in particular for West Africa. This evaluation will contribute to the literature by calculating the economic rate of return for a large-scale irrigation project in West Africa. However, the contribution of our evaluation is limited by the absence of reliable baseline information on outcomes and the absence of a control group.

Irrigation infrastructure maintenance. Maintenance of large-scale irrigation infrastructure is often not undertaken, which leads to deterioration of the irrigation infrastructure (Dillon 2011; Turiansky 2017). Turiansky (2017) finds evidence that farmers on an irrigated perimeter in Haiti invest less in canal cleaning if they expect their neighbors to make a similarly small investment. While there is a large literature base on the problem of under-investments in irritation infrastructure maintenance, the literature on O&M schemes and mechanisms to ensure sustainability of such schemes is rare and often not rigorous. The evaluation of O&M in Sourou

will help fill these gaps, but relies on a performance evaluation design that cannot assess causality between investments and O&M outcomes.

2. Effects of IWRM

The small set of existing studies argues that IWRM interventions have been largely ineffective in promoting growth in the agriculture sector. In a case study conducted in Burkina Faso, Sally et al. (2011) argued that the previous water reforms introduced in the late 1990s have had little effect on improving water management, and thus agricultural growth. They concluded that, as of 2011, the local water committees (Comité local de l'eau, or CLEs) created under the IWRM law that were still operational had limited capacity and were institutionally weak. Rey et al. (2008) came to a similar conclusion in their audit of global IWRM implementation: water management institutions may appear operational, but are often too weak to realize IWRM objectives. There is little literature on the implementation of IWRM in Africa. As of 2012, the African Ministers' Council on Water noted that very few sub-Saharan countries had put IWRM plans into practice (AMCOW 2012). This evaluation of the IWRM Activity will provide a case study of the successes and challenges of implementing IWRM plans in a West African country.

3. Effects of farmer training

Existing rigorous evaluations of agricultural trainings that have been conducted in developing countries have reported mixed results. Just over half of the agricultural extension service interventions reviewed by the Independent Evaluation Group (IEG) of the World Bank in 2011 reported positive impacts on at least one key indicator. However, some of these studies did not find impacts on all indicators, or the impacts were not evenly distributed across beneficiaries. Other studies outside of IEG's systematic review exhibited mixed results as well. For example, Larsen and Lilleør (2014) find positive effects of farmer field schools on food security in Tanzania, but not on poverty. The evaluations of MCC's first five farmer training activities in Armenia, El Salvador, Ghana, Honduras, and Nicaragua also found mixed evidence of impacts on practice adoption rates and farm income (MCC 2012).

Existing literature that estimates the impacts of farmer training programs is somewhat limited. Waddington et al. (2010) noted in their systematic review that most studies were unable to take advantage of experimental or quasi-experimental designs, or they suffered from inadequate data or selection bias. In another study in 2014, Waddington et al. pointed out that farmer training is often offered as one component of a larger agricultural intervention, such as a large-scale irrigation intervention. As a result, it can be difficult to separate the impact of the agricultural extension component from the impacts of the often broader intervention. In addition, the literature lacks evidence on whether adopted practices are being implemented as intended or adapted to local contexts. Our study will contribute to the existing research on the effects of training on practice adoption and the sustainability of this adoption for the specific innovations introduced by the compact. We will also use qualitative methods to assess whether adopted practices are being implemented as intended. However, because of the lack of a control group, our evaluation will not be able to contribute rigorous estimates of the impact of the farmer training program.

4. Effects of land distribution and titling

Land provision. Ghatak and Roy (2007) and Bardhan and Mookherjee (2007) reviewed the literature on land provision in India, generally finding positive effects of land provision on agricultural productivity and poverty reduction. There are relatively few rigorous impact evaluations on this subject because land provision is rare, and instances where it does occur typically do not allow for rigorous evaluation (for example, provision is not randomized). In addition, few studies document the interactions between the provision of new land and informal needs-based land rights in Africa. The randomized controlled trial (RCT) study of the Di Lottery provides a unique opportunity to provide rigorous evidence on the causal impact of receiving access to irrigated land on agricultural production, agricultural incomes, and household incomes. To our knowledge, it is the only RCT in which a subset of applicants received irrigated land.

Land titling. Research indicates that land titling programs can prevent the negative outcomes of land insecurity. Several reviews of the literature have shown that land titling programs can have positive impacts on tenure security and land investments, but these impacts can vary substantially depending on the features of the program and the local context (Deininger and Feder 2009; Payne et al. 2009; Besley and Ghatak 2010).There is mixed evidence of the underlying cost of land insecurity in Burkina Faso. For example, Linkow (2016) found a potential for costly land conflicts related to migration as part of MCC's independent evaluation of the Burkina Faso Compact's Rural Land Governance Project. However, Brasselle et al. (2002) found that the traditional village order in Burkina Faso provides the basic land rights required to stimulate small-scale investment. Early interim results from the compact's Rural Land Governance Project (RLGP) suggest a positive impact of the RLGP on perceptions of land tenure security (MCC 2016). Our study will provide evidence of perceptions of changes in land security due to land titling for persons affected by the project (PAPs). However, because of the lack of a control group, our evaluation will not be able to contribute rigorous estimates of the impact of land titling on outcomes.

Land provision and titling, by gender. The literature highlights substantial differences in (1) land tenure security by gender and (2) the impact of land certification and land provision by gender. A number of researchers have investigated land rights by gender in West Africa and found that these rights vary by gender and status as head of household, with important consequences for agricultural inputs, land investments, and outcomes. A few studies have found that land regularization and titling improves female agency and access to land and increases female participation in intra-household decision making, including studies in Ghana (Ali et al. 2014) and Ethiopia (The Cloudburst Group 2016). Even when titles to land are available, women are typically at a disadvantage in having their land rights recorded, though research shows that achieving more equitable outcomes in land tenure is possible in some contexts, including urban Tanzania (Ayalew et al. 2014). Few studies have been able to estimate accurate impacts of providing land by gender or of recording land rights by gender in West Africa. Our study will provide rigorous estimates of the effects of providing land for females versus males because gender was explicitly incorporated into the land lottery.

C. Overview of evaluation approaches and methodology

1. Overview of the ADP evaluations

Mathematica is implementing one impact evaluation and five performance evaluations to address research questions on project implementation, outcomes, and sustainability for the WMI and DA activities.

Three of the evaluations center on the Di perimeter that was constructed under the WMI Activity. The first, the Di Perimeter evaluation, studies the consequences of providing irrigated land on the perimeter to compensate people displaced by the project—known as PAPs—and assesses the economic value of the perimeter by calculating the post-compact economic rate of return (ERR) of MCC's investments in the perimeter. The second evaluation, the Di Lottery impact evaluation, has two components—an impact analysis and a methodological study. Some plots in the Di perimeter were distributed in a formal lottery process to applicants province-wide, which made it possible to conduct a RCT to measure the impact of winning the lottery. The methodological study compares the impacts found in the RCT with those found from a second rigorous design—regression discontinuity (RD). The third Di Perimeter evaluation is the Sourou O&M evaluation, which focuses on the sustainability of the irrigation infrastructure. Specifically, it assesses TA for O&M on the Di perimeter and on existing perimeters also located in the Sourou Valley near Niassan. The remaining three performance evaluations investigate the effects of IWRM project activities on water management and water conflicts; the effects of the Farmer Training Sub-Activity of the DA Activity on agricultural practices and outcomes; and the degree of integration of project activities.

Table I.1 provides an overview of the key research questions we will answer in this interim report and our analytic approach to them, organized by evaluation.[4]

[4] Our final evaluation report will assess additional research questions, including the economic rate of return of the Di perimeter as well as whether estimated impacts from an RD design are similar to those from the RCT at the cutoff and far from the cutoff study.

Table I.1. Analytic approaches for the ADP evaluations

Evaluation	Key questions	Analytic approach	Data sources
All evaluations^	Were project activities and investments implemented as planned?	Mixed-methods analysis featuring thematic framing and triangulation of qualitative and quantitative data	Administrative data and interviews and focus groups with program implementers, authorities, and participants.
Di perimeter	What are agricultural outcomes on the perimeter?	Descriptive quantitative analyses	Interim surveys of PAPs
	How have PAPs' land security and well-being changed?	Mixed-methods analysis featuring thematic framing of qualitative data	Interviews, focus groups, and interim surveys of PAPs
Di Lottery	What impact does winning the Di Lottery have on agricultural practices, economic outcomes, and land tenure security?	Impact evaluation using a randomized control trial	Interim surveys of PAPs
Sourou O&M	To what extent are the Di perimeter and the perimeters at Niassan effectively and sustainably operated and maintained?	Mixed-methods analysis featuring thematic framing of qualitative data	Interviews and focus groups with program implementers, authorities, and WUA administrators
IWRM	Are the compact supported IWRM institutions functioning and implementing the water management plans? What are these institutions' effects on water resources management and water conflicts?	Qualitative analysis based on interviews and focus groups with program participants	Interviews and focus groups with program implementers, authorities, and WUA administrators
Farmer training	What are project results in terms of crop diversification, average yields per hectare for ADP focus crops; and overall agricultural incomes and profits?	Pre-post analysis	Interim surveys of ADP-trained farmers
Rural markets, MIS, and integration of DA activities	To what extent were the various ADP components implemented in a cohesive way? How are rural markets and the MIS functioning?	Mixed-methods analysis featuring thematic framing of qualitative data	Interviews and focus groups with program implementers, authorities, and ADP participants

ADP = Agriculture Development Project; DA = diversified agriculture; MIS = market information system; PAPs = persons affected by the project.

^ indicates that each of the six evaluations addresses this evaluation question.

2. Quantitative data collection

Our Di Perimeter, Di Lottery, and Farmer Training evaluations required us to collect survey data directly from households on the ADP activities' key outcomes. Mathematica procured a local data collection firm—the Centre de Recherche sur le Développement Appliqué (CRDA)—to collect survey data. To leverage efficiencies across the three evaluations, we used a common ADP survey with separate modules focusing on the Di perimeter, the Di Lottery, and farmer training. To maximize efficiencies in travel and interviewer training, we collected primary data at the same time in all evaluations for each agricultural season. The round of data collection for this evaluation report covered the 2016/2017 agricultural season and took place from January through April 2018. The interim data collection and report focus on medium-term outcomes. In addition, we obtained MIS data to inform the evaluation of rural markets, MIS, and integration of

DA activities.[5] Table I.2 provides an overview of the sample and survey modules relevant to this interim evaluation.

Table I.2. Primary quantitative data collection overview

Sample	Sample size	Modules
ADP survey		
Di perimeter beneficiaries (incl. Di Lottery beneficiaries);	1,182	• Agricultural practices (crop choice, area planted, input use, agricultural techniques [including particular focus on improved techniques learned under the DA Activity) • Agricultural outcomes (production, sales, total agricultural income)
Di Lottery applicants	2,078	• Agricultural practices (crop choice, area planted, input use, agricultural techniques [including particular focus on improved techniques learned under the DA Activity) • Agricultural outcomes (production, sales, total agricultural income)
Farmer training participants	612	• Agricultural practices (crop choice, area planted, input use, agricultural techniques [including particular focus on improved techniques learned under the DA Activity) • Agricultural outcomes (production, sales, total agricultural income)
MIS data		
Agridata/Ecodata	105,370	• Prices for Di and markets surrounding the perimeter. Prices for markets further away from Di

3. Qualitative data collection

Working with STAT DEV, a local data collection firm procured by Mathematica, we collected qualitative data to support the six evaluations. For each evaluation, we drew on a variety of data sources, including implementers and program participants whose knowledge and perspectives differ and complement each other. This variety of sources gave us a comprehensive picture of the interventions and helped us triangulate information during data collection and analysis. The qualitative data helped us understand the implementation of the various projects, the decisions made, and the successes and challenges of different aspects of the interventions. As shown in Table I.3, we spoke to a wide range of stakeholders, including program implementers—such as former and current staff from MCA and the Agence de Partenariat pour le Développement (APD), technical consultants, and relevant ministry staff who helped implement and oversee the project—as well as beneficiaries and members of associations created or supported by the project. In general, interviews with implementers focused on project implementation, whereas our interviews and focus groups with beneficiaries and association members focused on stakeholder perceptions of implementation and program effects. In addition,

[5] We have not used this data to analyze whether prices changed differentially between the Sourou markets and other markets in Burkina Faso, because (1) the crop categories for which prices were reported are not consistent across time, (2) the markets for which customers can obtain prices are not the same over time, and (3) in the post-compact period the MIS only starts recording information on prices frequently from January 2017 onward.

we used compact documents, reports, and administrative data to help analyze project implementation, including any deviations from the initial design.

Table I.3. Qualitative data collection by evaluation and sources

Data source	Data collection method	Number	Evaluation	Area of focus
Project documentation				
Compact documents	Desk review	n.a.	All evaluations	• Project implementation/deviations from design
Reports from implementers	Desk review	n.a.	All evaluations	• Project implementation/deviations from design
Monitoring data	Desk review	n.a.	All evaluations	• Project implementation/deviations from design
MCA/APD/other implementing agencies				
Former and current staff from MCA/APD	Interviews	8	All evaluations	• Project implementation/deviations from design
			Rural markets, MIS, and integration of DA activities	• Project design
Former consultants and staff from Sher-GRET (AD7) and AECOM (AD10)	Interviews	5	All evaluations	• Project implementation/deviations from design • Regional differences in implementation
Land registrar at Di town hall	Interview	1	Di Perimeter evaluation	• Delivery of land tenure instruments
Former and current AMVS staff	Interviews	3	Di Perimeter evaluation, including Sourou O&M	• Project implementation/deviations from design • AMVS action plan • Irrigation maintenance on the Di perimeter and old Niassan perimeters • WUA capacity, and determinants of capacity • Life-span of irrigation infrastructure and evolution of land productivity
Staff from Regional directorate of Ministry of Agriculture	Interviews	6	Di Perimeter evaluation, including Sourou O&M	• Agricultural production on Di • AMVS action plan • AMVS O&M responsibilities
			Farmer training	• Adoption and adaptation of techniques from farmer training
Staff from Ministry of Water Resources	Interview	1	IWRM	• SDAGE implementation • CFE
Basin committee members and staff from basin agencies	Interviews	6	IWRM	• SDAGE implementation • Functioning of basin institutions • CFE • Factors determining functioning of IWRM institutions

Data source	Data collection method	Number	Evaluation	Area of focus
Beneficiaries & others				
PAPs	Focus group discussions Interviews	4 8	Di perimeter	• Potential harms to PAPs • Changes in well-being • Gender-specific changes in well-being • Perceptions of the compensation, of the process of compensation, and of land security
Spouses of PAPs	Interviews	5	Di perimeter	• Potential harms to PAPs • Changes in well-being • Gender-specific changes in well-being • Perceptions of the compensation, of the process of compensation, and of land security
WUA presidents from Di perimeter	Interviews	4	Di Perimeter evaluation; Sourou O&M	• Potential harms to PAPs • WUA capacity, and determinants of capacity • AMVS O&M responsibilities • Quality of CATG services
WUA board members and staff from Di	Focus group discussions	4	Di Perimeter evaluation; Sourou O&M	• Potential harms to PAPs • Perceptions of the compensation, of the process of compensation, and of land security • WUA capacity, and determinants of capacity • AMVS O&M responsibilities • Quality of CATG services
Former and current CATG staff	Interviews	4	Di Perimeter evaluation; Sourou O&M	• Potential harms to PAPs • WUA capacity, and determinants of capacity
WUA presidents and board members from Niassan perimeters	Focus group discussions	3	Sourou O&M	• WUA capacity, and determinants of capacity • AMVS O&M responsibilities • Quality of CATG services
Members of CLE governing bodies	Interviews	6	IWRM	• SDAGE implementation • Functioning of basin institutions • Factors determining functioning of IWRM institutions
Representatives of large water users such as Sosuco and mining companies involved in water conflict	Interviews	3	IWRM	• Effect of CLEs on water conflicts
Small water users involved in water conflict	Focus group discussions	3	IWRM	• Effect of CLEs on water conflicts • Perceived benefits of SDAGEs, CLEs, and basin committee institutions
Farmer training beneficiaries; Members of producer associations	Focus group discussions	4	Farmer training	• Adoption and adaptation of techniques from farmer training

Data source	Data collection method	Number	Evaluation	Area of focus
Site visits				
Rehabilitated markets	Site visits	4	Rural markets, MIS, and integration of DA activities	• Integration of DA activities • Functioning of markets • Use of markets by farmer training and Di beneficiaries
Farms of farmer training beneficiaries	Site visits	4	Farmer training	• Adoption and adaptation of techniques from farmer training

n.a. = not applicable.

CATG = Centre d'Appui Technique et de Gestion; CFE = Contribution Financière en matière d'Eau; CLE = Comité Local de l'Eau; DA = diversified agriculture; IWRM = integrated water and resource management; MIS = market information system; O&M = operations and maintenance; PAPs = persons affected by the project; SDAGE = Schéma Directeur d'Aménagement et de Gestion de l'Eau; WUA = water-user association.

Our data collection partner cleaned transcripts and conducted coding, and we identified themes that emerged from the data for each research question. We used a simple theoretical framework for this task, organizing stakeholder input into logic model categories (program design versus implementation versus results) as well as program components (Di perimeter versus farmer training versus IWRM). We conducted coding and analysis using NVivo, a data analysis software that helps identify themes across many diverse respondent groups and data collection methods. Once the data were coded, we wrote summaries of the themes, integrating the findings across all data sources into a common narrative, which includes pervasive perspectives as well as contrary opinions and cases.

II. DI PERIMETER EVALUATION

In this chapter, we summarize the interim findings from the Di perimeter performance evaluation.[6] First, we provide background and a summary of the evaluation design. Next, we present results on implementation of the Di perimeter construction, relocation, and compensation efforts, followed by a discussion of the agricultural and economic outcomes for PAPs.

A. Background

The largest single investment of the compact was the construction of the Di perimeter, a 2,240-hectare irrigated perimeter, designed to substantially increase land productivity. The perimeter is located on the east bank of the Sourou River near the border with Mali. The majority of the land was initially used for agriculture, but there were also sizeable portions of uncultivated and forested land.

The construction of the perimeter necessitated the expropriation of land cultivated by some of the PAPs living in the communities surrounding the perimeter. Approximately 50 percent of PAPs were from Di, 28 percent were from Oué, and 22 percent were from Bouna. All of the PAPs (1,469 people) received financial compensation for harvests lost during the construction of the perimeter, based on prices and harvests from the 2009/2010 season.

PAPs also received irrigated land within the new perimeter to compensate for their expropriated land. The size of PAPs' plots was based on the estimated value of the plots they lost. Because most lost non-irrigated land,[7] which is less productive than irrigated land, PAPs received a smaller plot in compensation than they had originally owned. Although the PAPs' original landholdings were governed by the prevalent and customary land tenure systems in the region, which vest rights in traditional authorities (Linkow 2016), PAPs received formal titles to these new plots. PAPs also received additional land as leasehold if the household had many members relative to the land received—specifically, if the ratio of the number of adult household

[6] In the Request for Quotations for this evaluation MCC referred to this evaluation as the Di PAP evaluation because it was meant to primarily assess the outcomes for Di PAPs. However, as our evaluation design changed to include quantitative data collection from all groups of beneficiaries for the update of the ERR in the final evaluation report, and implementation questions cover the entire perimeter, we change the name of the evaluation to Di perimeter evaluation.

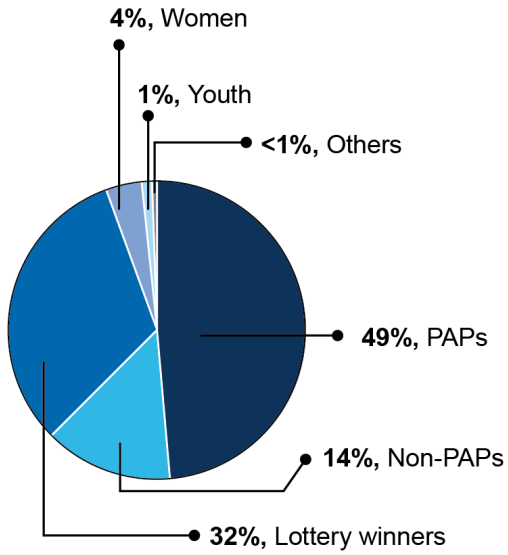
[7] Because the land was located close to the Sourou River, in the pre-compact period some PAPs were able to irrigate it using motor-pumps or by relying on naturally occurring flooding. PAPs using motor-pumps received more financial compensation than they would for non-irrigated land of the same size.

members engaged in agriculture relative to the amount of land received in compensation exceeded a given threshold.

Overall, land PAP households received amounted to about half of the total amount in the new perimeter. ADP distributed most of the remaining land to Di Lottery winners (discussed in Chapter III) and non-PAPs from neighboring communities. Female members of PAP families and PAP household members' children who were over age 15 ("youth") received small amounts of perimeter land, which were held in women's and youth groups (Figure II.1).

All beneficiaries who received land on the perimeter also received training in crop diversification, pest control, and irrigated production, as well as starter kits containing seeds and other inputs. The combination of irrigation and land tenure, training, and starter kits was intended to increase land investments, cropping intensity, diversity of crops, and crop yields, leading in turn to increased net revenue. Table II.1 summarizes all assistance offered to PAPs and other stakeholders as part of the Di Perimeter Sub-Activity, as well as Di perimeter investments.

Figure II.1. Area of Di perimeter land distributed, by recipient group



Source: MCA-Burkina Faso (2014)

Note: "Others" pertain to: tree nursery, National research institute (INERA), mixed-gender groups.

Table II.1. Summary of Di Perimeter Sub-Activity

Objective	• Increase land productivity through irrigation • Compensate PAPs for lost income and land associated with perimeter construction
Funding	• $89M
Target population	• PAPs, lottery winners, non-PAPs from neighboring villages, women and youth
Assistance	• Constructing a perimeter of irrigated land: new irrigation and drainage canal networks, seven pumping stations, guard drains, a levee, and roads and paths throughout the perimeter • Distributing land on the perimeter: formal titles to full ownership to PAPs for land received in compensation; formal leases to PAPs and other beneficiaries for non-compensation-related land. • Providing financial compensation to PAPs for lost harvest during the construction of the perimeter • Providing both training in agricultural technologies for irrigated land and starter kits (land preparation and inputs) during first growing seasons • Establishing water-user associations and CATG, and providing AMVS with TA to implement reforms (see O&M evaluation)
Implementers	• Construction: SOGEA-S—known under the contract number AD4 • Resettlement action plan: BERD (AD2) • Land allocation: Sher-GRET (AD7) • O&M: Sher-GRET (AD7) • Land tenure documentation: RLGP • Farmer training: AECOM (AD10)
Timeline	• Construction and resettlement were scheduled to be completed in 2013
Performance targets	• 2,033 hectares planned to be constructed—later increased to 2,240 • All 2,033—later 2,240—hectares under cultivation

AMVS = Sourou Valley Development Authority; CATG = Centre d'Appui Technique et de Gestion; PAPs = persons affected by the project

B. Evaluation objectives, questions, and methods

The objectives of the Di Perimeter Sub-Activity evaluation are to (1) assess the effects of the displacement and compensation on PAP households' economic well-being, agricultural production, agricultural productivity, and land tenure security, and (2) provide an economic assessment of the value of MCC's investment in the Di perimeter. This interim evaluation addresses five key research questions related to these topics through use of administrative and primary qualitative and quantitative data. (See Table II.2 for the analytic approach and data used to answer each question.)[8]

[8] In our final evaluation report, we will address additional research questions related to total area planted, average yield/hectare, total production, and total profit by focus crop, as well as the economic rate of return of the Di perimeter.

Table II.2. Di Perimeter Sub-Activity evaluation research questions (RQs) and approach

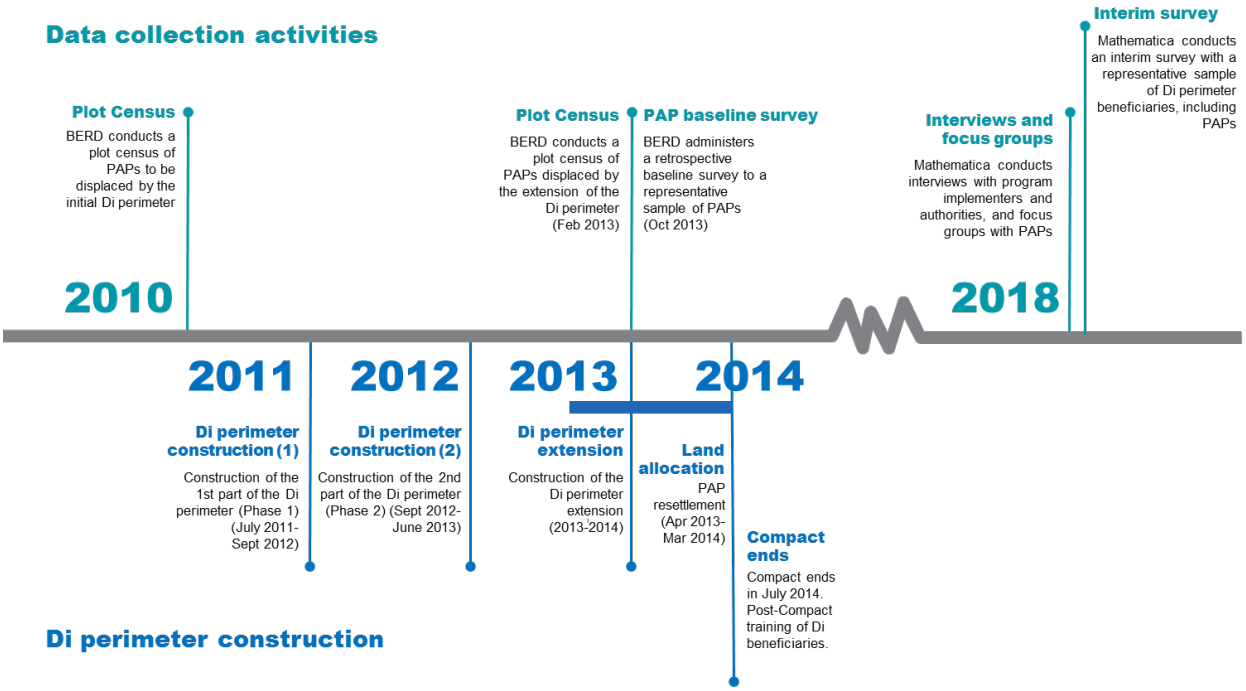
Key questions	Analytic approach	Data sources
1. Was the project implemented as planned?	Mixed-methods analysis featuring thematic analysis and triangulation of qualitative and quantitative data	• MCA monitoring data • Achievement report, APD final report, implementer report, and land allocation records • Interviews and focus groups with implementers and PAPs
2. Have PAPs adopted the practices and inputs featured in training?	Quantitative descriptive analysis	• Administrative and household survey data
3. What are the total area planted, average yield/hectare, total production, and total profit by focus crop?	Quantitative descriptive analysis	• Administrative and household survey data
4. What are project results in terms of land tenure security, land conflict, and land markets?	Mixed-methods analysis	• Interviews and focus groups with program participants and descriptive analysis of household survey data
5. How has PAP well-being changed?	Mixed-methods analysis	• Interviews and focus groups with program participants and descriptive analysis of interim household survey data.

Mathematica's interim evaluation draws from several rounds of data collection conducted by previous evaluators and other data collection firms from 2011 to 2013, as well as our own data collection in 2018 (see Figure II.2). The firm responsible for collecting information for the compensation process, the Bureau d'Etude et de Recherche pour le Développement (BERD), undertook **plot censuses** of PAPs—defined by the project as farmers who were cultivating land in the area that was expropriated to construct the Di perimeter[9]—in 2010 and in February 2013. We use this census to quantify the amount of land that PAPs lost, as well as the amount of financial compensation and land provided to each PAP. BERD also conducted household surveys with a selected sample of PAPs from the census in October 2013. This is the **PAP baseline survey,** which we use to infer PAPs' annual household revenue before they lost their land due to perimeter construction. Mathematica also conducted an **interim survey** of PAPs in early 2018, which covered the third and fourth growing seasons after PAPs were settled on the perimeter. We use the interim survey to report on PAPs' agricultural practices and outcomes following resettlement, as well as their income, sense of land tenure security, and reported well-being.[10]

[9] The definition of a PAP excludes household members who were not the primary decision makers on expropriated land.

[10] Our evaluation does not assess effects on the welfare of beneficiaries of women's or youths' gardens, or plots provided to residents in neighboring communities; both are outside the scope of the evaluation. In the final evaluation, we do include those agricultural profits when calculating the economic rate of return on the perimeter.

Figure II.2. Di Perimeter Sub-Activity implementation and data collection timeline



In mid-2018, approximately four years after the close of the compact, we **interviewed** program implementers and authorities, including MCA and ADP staff, the land registrar at Di town hall, former and current AMVS staff, staff from the regional directorate of the Ministry of Agriculture, WUA presidents and board members from the Di perimeter, and Centre d'Appui Technique et de Gestion (CATG) staff. We also conducted **focus groups and interviews** with PAPs.

To assess program implementation (RQ1), we triangulated stakeholder accounts in interviews and focus groups with official monitoring data and accounts in published reports. To characterize PAPs' agricultural practices and outcomes, financial outcomes, land tenure security, and well-being (RQs 2–5), we collected and analyzed interim survey data. In addition, we used interview and focus group data to conduct a thematic analysis of stakeholder accounts of project results on land tenure security (RQ4) and PAP well-being (RQ5).

To estimate total profits for the entire Di perimeter, we drew a representative sample from the plots assigned to each of the beneficiary categories that benefited from land on the Di perimeter, with the exception of Di Lottery beneficiaries. We did not retain the sample of Di PAP households from the baseline survey conducted in October 2013 because baseline respondents are not a representative sample of Di PAP households and, therefore, not representative of plots owned by Di PAP households. (See the discussion of baseline surveys in Ksoll et al. 2018). We analyze outcomes for Di Lottery beneficiaries in Chapter III.

C. Summary of baseline findings

Below, we provide a brief characterization of PAPs after they were displaced from their land starting in 2010 but before they received new plots on the perimeter in 2014. This information, based on Ksoll et al. (2018), places the interim findings below in context.

Nearly all PAPs are farmers, and most are men. The majority of PAPs are men between the ages of 30 and 60, and nearly all of them participate in the agriculture sector. Only 22 percent of individual PAPs were female. PAP households are relatively large and engage in a variety of productive and commercial activities, agriculture being the most common.

PAPs faced several barriers to healthy agricultural sales and income before they were resettled. These included undiversified production, poor access to credit, and a lack of agricultural training. In theory, MCA's provision of land and tenure documents could help PAPs overcome barriers to greater production and sales and MCC-funded training in agricultural practices could equip PAPs with new, practical knowledge that they could apply in diversifying their production on the perimeter to boost sales and income.

Overall, PAPs lost about half their land and most agricultural sales revenue during resettlement. PAPs lost, on average, 0.8 hectares of land and 83 percent of their agricultural sales revenue due to construction of the perimeter. The financial compensation and irrigated land distribution were intended to fully account for losses in profits from the land on which the perimeter was built.

Men lost an average of:

- 1 hectare
- 47 percent of their total land
- 81 percent of agricultural sales

Women lost an average of:

- 0.4 hectares
- 74 percent of their total land
- 90 percent of agricultural sales

Displacement affected male and female PAPs differently. Although men lost more land and more revenue overall than women, on average, women lost a greater share of their land and revenue than men. These findings suggest that although the resettlement had a substantive effect on all PAP's land holdings and revenue, female PAPs may have experienced particularly large effects on their livelihoods.

Taken together, these findings show that PAPs faced several barriers to healthy agricultural sales and income before they were resettled, including undiversified production, poor access to credit, and a lack of agricultural training. Most of PAPs' agricultural revenue—particularly female PAPs' revenue—was lost as a consequence of resettlement.

D. Interim findings

In this section, we present interim findings for the Di Perimeter Sub-Activity evaluation, based largely on follow-up surveys and focus groups with PAPs in 2018, as well as interviews with implementers and local authorities.

1. Was the project implemented as planned?

Below, we provide a brief summary of the Di Perimeter implementation, including (a) perimeter construction, (b) PAP compensation and land tenure assistance, and (c) agricultural training and starter kits.

a. Perimeter construction

Constructed in two phases, the perimeter was slightly larger than initially expected. Due to budget challenges, the perimeter was constructed in two phases: 1,740 hectares were constructed in an initial phase from 2011 to 2012 and the remaining 360 hectares were constructed in a second phase from 2012 to 2013. The compact originally envisioned a perimeter size of approximately 2,037 hectares. In 2013, MCC allocated additional funds to expand the perimeter to 2,240 hectares.

Delays in planning and constructing the irrigated perimeter generated delays in land allocation and a compressed training timeline. During the planning phase, there were delays in recruiting project consultants as well as in conducting the pre-project implementation studies. These delays generated delays in the construction phase, which were further exacerbated by high water levels during the dry season that the timeline had not accounted for. The project had originally anticipated completion of some sections of the perimeter by late 2012, but the first sectors were not delivered until 2013. Related to these construction delays, as well as to some complications with land allocation rules and data on persons affected, PAPs were not relocated until late 2013. These delays in resettlement were a source of frustration for PAPs, who cited lengthy and complicated compensation and reinstallation processes.

Although they were generally pleased with the quality of the perimeter's infrastructure, stakeholders voiced some minor concerns. Interviewed representatives from MCA, APD, and CATG—as well as Di Lottery winners and PAPs—were generally pleased with the overall quality of perimeter construction and noted that the system was fully functional year-round. However, implementing staff reported some defects in the construction materials used to build levees and canals. These issues could negatively affect the lifespan of the structures and result in cracks, leaks, flooding, and unnecessary waste of water. Stakeholders also voiced concerns that there were issues with the final leveling of some plots. However, the staff noted that these issues were minor in relation to the full set of construction activities.

> **"The Di perimeter... is downright a Mercedes next to a [original VW] Beetle… The new perimeter is totally new with new technologies and it... is really a source of pride. Even aside from the repair work and all the other small problems that remain to be solved, we are nevertheless aware that we are facing a functional perimeter."**
>
> ***–CATG***

> **"The quality of the work is good, I recognize that. But there are some defects, not construction defects but defects of the construction materials."**
>
> ***–APD***

b. PAP compensation

Although program implementers saw financial compensation as generous overall, large land owners prior to resettlement said the amount they received was insufficient. According to analyses of compensation data in the baseline report, on average, PAPs received around 189,000 FCFA (Franc CFA, US$396) in financial compensation for lost harvests (Table II.3) (Ksoll et al. 2018). According to an analysis of the PAP baseline survey conducted in 2013, PAPs lost nearly double that amount in average lost revenues associated with perimeter construction: 355,734 FCFA (US$745). The same data, however, show that median revenue lost was smaller than the median amount of compensation received: 75,000 FCFA (US$157) lost versus 91,423 FCFA (US$191) received. Means are highly influenced by outliers—very large or

very small values—whereas median values are not. These two comparisons suggest that outliers—PAPs with large land holdings prior to construction—may have been disadvantaged by the compensation formula. In focus groups, PAPs who previously owned multiple hectares largely corroborated this finding; PAPs stated that the commission in charge of determining compensation amounts did not properly take into account the profitability of their initial landholdings (Table II.3). The "typical PAP" with relatively modest landholdings prior to construction was, however, well compensated for lost earnings, as shown by median compensation amounts. Indeed, small landowners in focus groups did not voice concerns with the amount of compensation they received for lost agricultural sales. This is corroborated by implementers who perceived financial compensation to be actually generous for most, and particularly for PAPs with smaller land holdings prior to construction. PAPs overall viewed the financial compensation process as timely and orderly.

Table II.3. PAP perceptions on ADP services and materials

Component	Summary of benefits	PAPs' experiences	Illustrative quotes from PAPs
Financial compensation process	• PAPs (1,469 people) received financial compensation for harvests lost during the construction of the perimeter. Assessed values were entered into a database and PAPs collected compensation at a pre-arranged time and venue.	• **Largely positive experiences:** In focus groups, several PAPs reported that the financial compensation process went smoothly and their compensation was fully documented.	• **PAP with a positive experience:** *"Everything went well, we had no problem [with financial compensation]. The receipt you were given, the money was based on that receipt so there was no difficulty."*
Financial compensation amount	• The amount of financial compensation PAPs received was based on estimated annual revenue per hectare and average costs of inputs for the crop previously cultivated on the land, taking into account whether the land was irrigated with motor-pumps and based on prices and harvests from the 2009/2010 season.	• **Mixed experiences:** PAPs that lost relatively large plots felt that the monetary compensation amounts were low compared to what they had lost. They felt the commission in charge did not take into account the real values of the different areas when financially compensating the PAPs. A minority of PAPs reported that they thought they were supposed to receive a second round of financial compensation in the situation where the perimeter construction was not done after the first year. However, this second round of compensation did not materialize.	• **PAP with a negative experience:** *"The compensation services had said that if they take your field during [perimeter] development, they will give you compensation and if the development is finished at the end of a year, there won't be a second compensation; but if the development work isn't done [in that time], there will be a second round of compensation."* • **PAP with a positive experience:** *"If you ask some people, they will tell you they are not satisfied. ... Me anyway…what I received was good. (laughs)."*
Land allocation process	• The size of the plots that PAPs received in compensation was based on the estimated value of the plot they lost. Initially, aerial photos were used to estimate the size of the land parcels that PAPs lost. Due to PAP complaints with this method, however, staff were sent out to the fields to take measurements. Two rounds of measurement were required to correct original measurements.	• **Mixed experiences:** Some PAPs complained about the process of determining the measurements of the plots of land that were lost—namely, the initial use of aerial photos. Others complained that the land allocation process seemed disorganized and, as a result, gave land to people who did not previously own plots of land. PAPs cited the absence of some farmers during the census process and implementers' inability to identify all landholders prior to developing the perimeter as key factors that compromised the fairness of the process.	• **PAP with a negative experience:** *"We went into the fields and it was planned that everyone would show the boundaries of their fields for them to see. But this was not the case, because instead they showed us photographs, images taken from an airplane… We looked at the photos, but to tell you the truth, the work was not done properly because they identified people who were supposed to have their fields in the picture while others did not."* • **PAP with a mixed experience:** *"…we could say the process was acceptable but not necessarily satisfactory for all. Because it appears that after the construction, some lost 10 hectares but what they received in compensation was no more than 3 hectares." – PAP focus group*

Component	Summary of benefits	PAPs' experiences	Illustrative quotes from PAPs
Land quantity and quality	• Because irrigated land on a perimeter has higher economic returns than the land that was lost, which for the most part was not irrigated, PAPs received a smaller plot in compensation than they had originally owned. PAPs received full ownership of this land and formal titles. The amount of land received was calculated according to a formula that included estimated revenue per hectare lost (Sher-GRET 2013).	• **Mixed experiences:** PAPs generally complained that the land they received in compensation was smaller in size than the land they lost. As a result of having a smaller parcel of land, some PAPs even reported that they were forced to rent or buy plots of land outside the perimeter to meet all of their needs. However, PAPs generally agreed that the perimeter land was more fertile and productive than their original holdings. As a result of this increased productivity, several PAPs reported that they now produce crops in larger quantities during the winter season as well as during the dry season.	• **PAP with a negative experience:** *"…I received only 0.5 ha, and it is insufficient; it's my brothers because of the brotherhood that gave me of their land so that I could feed my family."* • **PAP with a positive experience:** *"If in the past you might harvest 10–15 bags of maize and now you harvest closer to 20 bags of maize, 30 bags of maize, you see that there was an increase. If you were riding a bike and now you are riding a motorcycle, you could not say there was not an increase."*
Land tenure assistance	• Some PAPs received their land titles in 2015; others received them in 2016; this was after compact closure.	• **Largely positive experiences:** The distribution of land titles was reportedly a smooth process that encountered little more than slight delays.	• **PAP with a positive experience:** *"There were no difficulties [with the distribution of the land documents]"*

PAPs took issue with the land allocation process—particularly a perceived lack of transparency and the use of inaccurate and incomplete data. During focus groups and interviews, PAPs often expressed a lack of clarity surrounding how different sized plots were allocated across PAPs, and what organizations were involved. PAPs also cited inaccuracies in the process of cataloguing all PAPs' land holdings—particularly the use of aerial photos to develop a full listing of land holdings that were affected by perimeter construction. PAPs felt this process generated inaccurate information that, in some cases, was never corrected, leading to the receipt of too much or too little land in compensation for lost plots. Program implementers echoed these concerns, citing complications in establishing, merging, and managing databases on PAPs' characteristics and land holdings. For example, several PAP households could not be found in initial PAP databases; as a result, these people were initially excluded from compensation lists.

PAPs received less land than they lost, but were pleased with the perimeter's higher productive potential. As noted above, PAPs lost around half of their total land holdings—0.8 hectare of land, on average. To compensate for their losses, PAPs received, on average, about 0.5 hectares of land in compensation, nearly all of which was for polyculture (Table II.4). In focus groups and interviews, 8 out of 25 PAPs remarked that the plots they were assigned were smaller in area than the land they lost. However, these PAPs were generally optimistic about their ability to make good use of their newly acquired irrigated land on the perimeter, which they described as very fertile and productive (Table II.5).

Table II.4. Compensation received

	Mean		
	Total	Female	Male
Amount of land received (ha)			
Total	0.49	0.19	0.60
Polyculture	0.45	0.19	0.55
Rice	0.03	0	0.05
Amount of money received (FCFA) (mean)	188,788	60,269	231,998
Amount of money received (FCFA) (median)	91,423	41,600	117,065
Inferred annual revenue from sale of crops on land lost (FCFA) (mean) [a]	355,734	115,650	429,336
Inferred annual revenue from sale of crops on land lost (FCFA) (median) [a,b]	75,000	0	122,500
Sample size (PAPs)	**1,445**	**350**	**1,041**

Source: Di PAP Baseline Survey (2013); Land allocation spreadsheet; Plot Census (2010); Plot Census (2013)

Note: Statistics shown are unadjusted means. Sample sizes shown are for the full sample; some outcomes may have a smaller sample size because of missing data.

[a] In the baseline survey, we note a number of caveats to the construction of this inferred annual revenue (Ksoll et al. 2018).

[b] The median value for females is low because some PAPs did not report revenue or farming any of the key crops.

Although the project attempted to list all individuals in the household who were cultivating land, not all women were registered. Because the project defined a PAP as any individual who was the main decision maker on land in the area of the later Di perimeter, it also registered female farmers. About 24 percent of PAPs were female. Respondents in focus groups and interviews reported that some women were never given plots on the perimeter, even though they gave up parcels of land during the perimeter construction.

Land received in compensation was given to households in one contiguous plot, and this made it easy for some household heads to claim the entire land for themselves, even if it was legally allocated to the woman. Some women reported that their parcels were given to their husbands and then it was up to the husbands on whether or not they gave the land back to their wives.[11] Respondents reported that most of the disputes around these cases were resolved in community meetings organized by the project. To make matters worse, in cases in which women's land was added to parcels given to their husbands, women were told they could not register for women's groups (to gain access to perimeter land) because they had already received land compensation.[12]

> **"We, the female PAPs, they wrote down our names. Previously, we farmed our lands. But after, when the perimeter was finished, our land was added to the land given to our husbands. and it was up to [our husbands] to give us back our shares. But many men refused to give back those shares to their wives."**
>
> ***– Female PAP***

c. Agricultural training and starter kits

Perimeter construction delays led to training delays. As a result of delays in providing land to PAPs in the new perimeter, PAPs did not receive the envisioned two full years of training during the compact period. However, farmer training to PAPs on the Di perimeter continued post-compact under the management of the APD and the Government of Burkina Faso (GOBF), such that most PAPs received around two full years of agricultural training and technical assistance from 2014 to 2016.

Three-fourths of PAP households reported receiving training from AECOM (AD10) or MCA. As noted above, the baseline analysis found that PAPs' lack of agricultural training in vegetable production and irrigation practices may have been a sizable barrier to improved outcomes at baseline. As such, the fact that 75 percent of PAP households reported receiving training from AECOM—known locally under the contract number AD10—or MCA is a positive development (Table II.5). However, this training rate falls short of the 100 percent training rate of PAPs initially envisioned. In addition, training receipt varied by gender: 79 percent of heads of male-headed PAP households reported receiving training, compared to only 48 percent of heads of female-headed PAP households. Trained PAPs reported receiving regular sessions on soil management, including different techniques of land preparation (double-ridging, planting

[11] We do not know how the project communicated the expectation that husbands would provide their wives who were PAPs with the land due in compensation, so we are not sure why the project was not clear or whether husbands chose to ignore project communication.

[12] The exclusion of these women from women's groups is consistent with the eligibility criteria for vegetables plots which excluded individuals for whom land had already been provided in compensation.

onions on high platforms), techniques in irrigation management, and techniques for the dry season crop production of tomatoes and onions.[13]

As envisioned, almost all PAPs confirmed that they received a starter kit through the project. Almost all PAP households reported receiving seeds and fertilizer as part of the starter kit, with no differences in the responses of households of male and female PAPs (Table II.5). In focus groups, PAPs reported that they found the kits very useful, but some did not understand that they were actually a one-time support: many PAPs expected to continue receiving the kits on an annual or seasonal basis.

Table II.5. ADP benefit receipt, by gender of PAP head of household

	Percentage		
	All	Female	Male
Type of documentation			
Land title	98	93	98
Lease document	2	0	2
Receipt of starter kit	96	97	95
Received any training through AD10 or MCA	75	48	79
Sample size (PAPs)	**273**	**29**	**244**

Source: Di PAP Baseline Survey (2013); Plot Census (2011, 2013); Interim Survey (2018)

AD10 = Agricultural training consortium AECOM known locally under its contract number AD10; MCA = Millennium Challenge Account-Burkina Faso.

2. Have PAPs adopted the practices and inputs featured in training?

PAPs diversified their production in the post-compact period. Before the perimeter was built, the most commonly grown crops in the region were grain sorghum, maize, and rice. Tomatoes and onions were also grown, but in smaller quantities and not for commercial purposes. After the perimeter was constructed, PAPs reported diversifying their crops substantially—generally following a pattern of grain production in the winter and onion and tomato production in the dry season for commercial sales.

[13] Because the number of female PAP household respondents who say they received training is so low, we do not assess the types of training received separately for men and women.

Many PAPs are engaging in modern irrigated agriculture on the perimeter. Although the PAP baseline survey did not collect detailed information on PAPs' agricultural practices at baseline, we found that, before the project, only half of PAPs irrigated crops on the land on which the Di perimeter was constructed, under 20 percent used motorized pumps, and around 10 percent used tractors (Ksoll et al. 2018). After construction of the perimeter, almost all PAPs use irrigation and chemical fertilizer, around 70 percent use improved seeds during the rainy season, over 80 percent use animal-drawn plows, and over 50 percent make use of tractors to prepare land.

> **"If we take a simple example, at the level of Di today nobody, practically nobody, uses donkey-drawn carts to carry out agricultural activities. [Before] when people wanted to go to the field they used carts…but now there are what's commonly called tricycles that are used. It means that there is a form of progress. We also encounter more tractors…modern agricultural equipment."**
>
> ***– Former AECOM staff***

PAPs adopted several practices and technologies featured in training. In particular, nearly all PAP households reported using inputs from starter kits, over half reported growing maize in the rainy season, and around half reported growing onions and tomatoes in the dry season (Table II.6). These were precisely the practices that were featured most heavily in MCA training. However, only around half of PAPs reported using organic fertilizer during the dry season (and less reported doing so during the dry season). Overall, about three-fifths of PAPs report any use of organic fertilizer in either season. Stakeholders explained that the labor intensity and tediousness of making organic fertilizer through composting or collection of animal droppings contributed to lower than optimal level of organic fertilizer application. This limited use of organic fertilizer may reduce long-term fertility of the land, because irrigated land needs its nutrients replenished by manure or compost.

Table II.6. PAPs' adoption of practices and technologies featured in training (either season)

Reported practice or technology	Percentage
Used inputs from starter kit	99
Use irrigation	100
Rainy season maize production	96
Applying organic fertilizer	60
Growing onions in the dry season	95
Growing tomatoes in the dry season	72
Sample size (PAPs)	**260**

Source: Interim Survey (2018).

3. What are the size, average yield/hectare, production, and profit of PAPs' areas planted?

On average, PAPs who were sampled for the interim data collection planted over 1.5 hectares year-round, mostly growing maize in the rainy season and cash crops in the dry season. As PAPs mostly received land suitable for polyculture, they planted crops that were appropriate for polyculture plots and for which they had received training: maize in the rainy

season, and onions, tomatoes, and some maize in the dry season. The average total area planted by each PAP in our sample on the Di perimeter was almost identical in both the dry and the rainy seasons—around 1.7 or 1.8 hectares.[14] This suggests that PAPs had high cropping intensity, as envisioned by the program logic.

Table II.7. PAPs' crop choices and cultivation areas

	Rainy	Dry
Average total area cultivated (ha)	1.78	1.69
Percentage of PAPs who cultivated:		
Tomatoes	2	72
Onions	2	95
Maize	96	36
Rice	12	11
Cowpeas	0	0
Soybeans	0	0
Average area cultivated (ha)		
Tomatoes	0.01	0.27
Onions	0.04	0.98
Maize	1.54	0.21
Rice	0.17	0.16
Cowpeas	0.00	0.00
Soybeans	0.00	0.00
Sample size (PAPs)	**266**	**266**

Source: Interim Survey (2018).

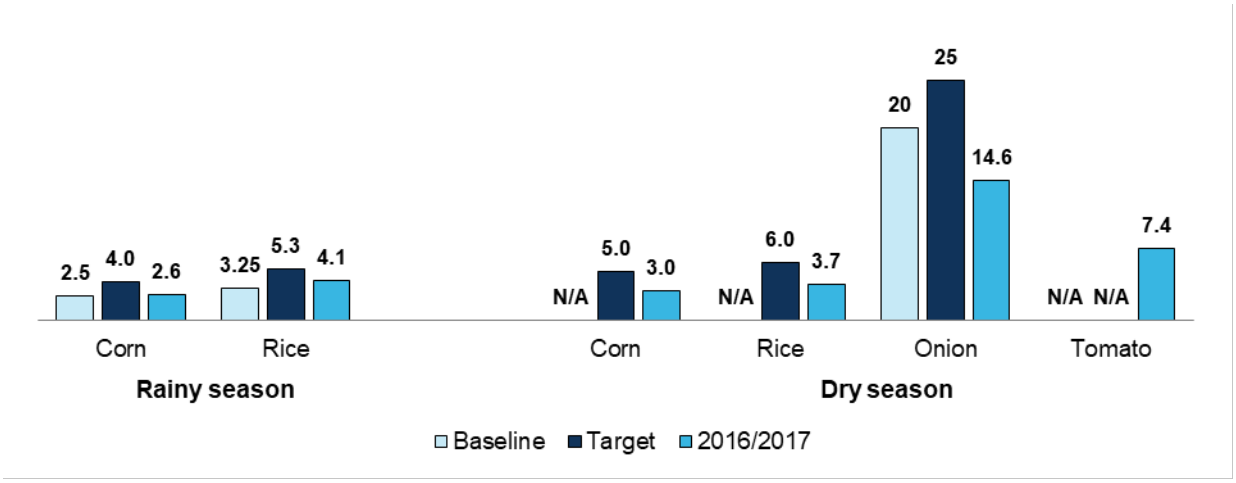
Although stakeholders reported much-improved yields on the perimeter, Di perimeter productivity in 2016/2017 did not appear to meet programmatic targets. In focus groups, PAPs reported that their maize and onion productivity was much improved from previous years due to the irrigated perimeter, improved soils, and new agriculture practices. However, according to data from Mathematica's interim survey, productivity levels for maize and onions in 2016/2017 were below target levels for the perimeter (Figure II.3).

"If in the past you might harvest 10–15 bags of maize and now you harvest closer to 20 bags of maize, 30 bags of maize, you see that there was an increase. If you were riding a bike and now you are riding a motorcycle, you could not say there was not an increase."

– Di PAP

[14] PAPs in our sample were selected based on sampling from strata defined by gender and the type of land received. Within the most common strata—male PAPs receiving polyculture land—the probability of sampling was proportional to the size of land received (Ksoll et al. 2018). This is the reason for the high average area cultivated in Table II.7 relative to land received as shown in Table II.3.

Figure II.3. PAP grain and vegetable productivity on the Di perimeter, 2016/2017 (tons per hectare)



N/A = Not available

Increased production generated higher income for smaller producers. In focus groups, small farmers reported that they doubled, tripled, or even quadrupled their crop production after the perimeter development. In particular, they reported that their transition to growing and selling onions and tomatoes in the dry season helped grow their income relative to previous years, while growing maize in the rainy season ensured food security. Although we cannot verify the different contributions, it is likely that a combination of receiving an equivalent or even larger parcel of land, the land being irrigated, and farmers changing their crop patterns to include cash crops in the dry season all contributed to farmers' increased income.

Table II.8 presents average profit and income of PAPs for the 2016/2017 agricultural year. On average, PAPs reported household earnings of about 1,192,000 FCFA (US$2,000 per year), with the bulk of household income being agricultural profit. The small difference between household income and agricultural income—which includes agricultural profit, agricultural wage employment, income from land rental, and income from transformation of agricultural products—suggests that households must dedicate themselves primarily to agricultural activities; the demands of farming on the perimeter may leave them little time to devote to non-agricultural activities. Comparing information from the interim survey with baseline information on agricultural outcomes provides evidence of the magnitude of the change: the agricultural profit in 2016/2017 of about 1,141,000 FCFA is about three times the inferred value of sales at baseline and, therefore, at least three times baseline agricultural profit (Table II.3).[15]

[15] It is not possible to construct profit from the baseline survey due to the absence of cost information. A simple comparison of baseline and interim sales is not meaningful as costs for irrigated production are much higher.

Table II.8. PAP profit and income, by gender of PAP (in 1,000 FCFA)

	All	Female	Male
Agricultural profit	1141	825	1178
Agricultural income	1173	834	1213
Household income	1227	846	1273
Agricultural profit (including value of unsold harvest)	1308	866	1361
Agricultural income (including value of unsold harvest)	1340	875	1396
Household income (including value of unsold harvest)	1395	887	1455
Sample size (PAPs)	**273**	**29**	**244**

Source: Interim Survey (2018)

Note: Unsold harvest is the value of the harvest that was not sold and also not lost to rodents or pest after crops were harvested. This unsold harvest is valued at the median price in the region. Agricultural income includes agricultural profit, income from agricultural land rental, and income from agricultural employment and from transformation of agricultural products.

Increased production did not translate to higher income for larger producers. In focus groups, both large and small farmers reported that they increased their crop production after the perimeter development. However, they faced difficulties in obtaining what they consider good prices for their crops—which they primarily blamed on a lack of accessible roads to and from the perimeter and associated lack of traders accessing the perimeter. The additional production on the Di perimeter may thus have saturated sales opportunities within the Sourou Valley according to stakeholder interviews and PAPs, causing prices of some products (particularly onions and tomatoes) to dip and decreasing producers' bargaining power. According to PAPs who participated in focus groups, higher input prices, water fees, and other expenses related to their new land also ate into profits. As a result of these challenges, a significant proportion of relatively large farmers estimated that they were earning less money compared to before, especially after factoring in the payment of taxes and fees. These PAPs remarked that they needed to pay closer attention to the market prices for their production, so as to avoid selling their crops at a loss. Although smaller producers also faced the same challenges, they were generally better off, as access to irrigated land on the Di perimeter allowed them to engage in the more lucrative dry season production—often for the first time— and the land allocation rules favored smaller landholders.

"Nowadays, we should have a lot but if we take a look, we don't earn much, basically similar to what we were earning before the perimeter was developed... Take a plot of 800m2 and you could grow tomatoes and sell them for 500,000 to 1,000,000...You could sell onions for 800,000. Nowadays, the sales are not as regular. There is a lack of customers and the roads are not good, these are our major difficulties."

—OUEA president

4. What are the project results in terms of land tenure security, land conflict, and land markets?

"In any case, that's what they said. That if we manage to maintain it, it belongs to our children, grandchildren, and great-grandchildren. That the land is ours. But that if we do not manage to honor the [rules regarding] the payment of water, they will take back the land even though we have the papers."

– Spouse of a PAP

PAPs generally feel secure about their tenure on the perimeter. In possession of formal land titles following resettlement, over 90 percent of male PAPs did not think they would lose access to their land within the next five years (Table II.9). The proportion in households of female PAPs could be lower, but sample sizes are too small to draw any conclusions.

Table II.9. PAPs' Di perimeter land tenure outcomes, by gender (percentage)

	All	Female	Male
Expectation of loss of land access in next 5 years: not at all	89	76	91
Expectation of loss of land access in next 5 years: a little	5	17	4
Expectation of loss of land access in next 5 years: a lot	7	7	7
Right to bequeath land	61	52	62
Right to sell land	33	34	33
Right to let land	55	41	57
Any land investment in last three years	8	7	8
Applied for a loan with bank or microfinance institution in last three years	28	10	30
If applied for a loan, used Di perimeter plot as collateral	18	33	18
Involved in land conflict on the perimeter	0	0	0
Rented out land	6	0	6
Sold lease or title for Di plot	0	0	0
Sample size (PAPs)	272	29	243

Source: Interim Survey (2018).

Fewer than half of the PAPs understand their rights to sell land, but most understand that renting out their plots is an option. In terms of the rights that are associated with the Di perimeter, not all households are aware of land transfer rights. Only 60 percent reported that they have the right to bequeath their land, 55 percent recognized their right to rent the land, and only about one-third believed they have the right to sell their land (Table II.9).[16] Even among respondents who do not think they have the legal right to rent out land, many still think they can do so in practice.

[16] One caveat to this analysis is that it may confound land owned and land held in leasehold. This is because households received one contiguous plot of land that comprises the parts received in compensation, for which they received a title, as well as the land received as leasehold, and households reported land rights by plot. The final evaluation will consider separate land rights questions for these two different types of land access. Because

Low levels of collateralized credit and equally low investments in land suggest that any effect of land tenure security on these outcomes would be small. Only 20 percent of the 30 percent of male PAPs who applied for a loan have used their land as collateral for a loan, while female PAP households do not appear to use land for this purpose. The increased land security has had minimal effects on land investments, with only 8 percent of households reporting any investments in the last three years, primarily in planting trees. Respondents stated that their lack of investments is due to the absence of necessary resources; land tenure security—even in combination with the other compact benefits—was not enough to encourage investment.[17]

There is an active land rental market on the perimeter. Stakeholders noted that PAPs and other beneficiaries of land on the perimeter are actively engaged in land rental transactions. In focus groups, PAPs noted that renting the land out is a good option if someone does not have the resources to pay the regular water bill. A common arrangement is a seasonal rental, in which PAPs who have enough money to pay for WUA fees and inputs sublet a portion of their land for the dry season only, while they cultivate it themselves during the rainy season. Respondents also mentioned sharecropping arrangements and long-term contracts with large landholders as renters.

> **"It's easy because whoever cannot manage all of their land can entrust it to the OUEAs who will then find someone to rent the land and that person pays the water bill. Once the landowner feels they can pay their bills, they can recover their land. Also, a person who wants to rent the land could get in touch with a landowner directly …Either way, it is easy to rent [land]."**
>
> ***– Male PAP***

Overall, the number and intensity of land disputes diminished significantly since the development of the perimeter. According to our survey data, not a single PAP was involved in a dispute over land on the perimeter. Instead, disputes have centered on water distribution or seed overflow. The disputes around water distribution were sometimes amplified by power cuts, water leaks, or water blockages in the system. For example, users—who take turns receiving water according to a fixed schedule—might try to use irrigation water longer once the power is back on, or water leaks could result in users being accused of taking more than their share. Other reported disputes have been between a landowner and the renter of the land, particularly if one party fails to uphold his or her end of the bargain with respect to paying water fees or fines.

> **"I can say that even if [land conflicts] exist, it is not frequent because here in Di, everyone knows…that such and such ground belongs to such and such person…everyone is aware; often there are small twitches of the kind of an overflowing of seedlings between the plots. However, arguing about a field or say that someone sold the field to me is rare"**
>
> ***– WUA president***

households have the right to bequeath titles and leaseholds, the low percentage of households that are aware they can bequeath the land nonetheless is a clear indication that households are not fully aware of their land rights.

[17] The program logic for the effect of land titles suggests that effects might occur as early as 2016, or three years after respondents receive land and titles. Due to a delay in the provision of land titles some PAPs only received formal land documentation in 2016 so that we might only see investments at the time of the final data collection.

According to some female focus group participants, the land allocation process generated some land disputes between husbands and wives. When the perimeter was finished, some of the land that legally had been given to female PAPs was in most cases adjacent to the land given to their husbands. Some husbands took control over the entire land, thus depriving women of access to the land. Most of these cases were resolved in community meetings organized by the project. However, PAPs reported some instances in which men refused to return the land.

> **"Even now, there are still some women whose husbands have refused to give them their land and they are very unhappy. When the men refused to give the fields [back] to the women, there were meetings and after that some men ended up giving the women back their land parcels."**
>
> ***– Female PAP***

5. How has PAPs' well-being changed?

PAPs reported being better off now than they were before perimeter construction, at least in terms of food security. About three-quarters of PAPs reported increased net agricultural income compared to 2010, despite increased agricultural costs. Perhaps more importantly, 95 percent of PAPs reported reduced food insecurity in the interim survey (Table II.10). In focus groups, PAPs noted that they are now able to grow crops for commercial sale, not just to feed their family; they can acquire modern equipment for farming; and their children are going to school and staying in school longer. Citing these favorable conditions, several PAPs cited cases in which emigrants returning home to Burkina now plan to stay, given their new land on the perimeter, which they viewed as newfound potential to make a profit.

> **"There have been a lot of changes. Take for example, [one community member] who was living in Côte d'Ivoire. But when he came back, there were parcels [of land] that he farms and now he doesn't plan to return to Côte d'Ivoire. He said that here is like Côte d'Ivoire, what he was earning there is what he can now earn here. Now in this area, there isn't any more youth migration in search of work and money. They can find those things here."**
>
> ***– OUEA respondent.***

Table II.10. PAP perspectives on income, costs, and food security (percentage)

	All	Female	Male
Agricultural profits have increased compared to 2010	73	68	73
Food security has increased compared to 2010	95	95	95
Sample size (PAPs)	227	19	208

Source: Interim Survey (2018).

Some female PAPs reported that men may have experienced more benefits than women. Women reported that as a result of relocating to the perimeter, they were less reliant on the help of their husbands to pay for daily expenses. However, some female focus group participants contended that male PAPs may have benefited more from land allotment, due to the fact that female PAPs often received smaller parcels of land or their land went to their husbands.

E. Summary of findings

Our key findings regarding the Di perimeter evaluation are summarized in Table II.11.

Table II.11. Key findings for the Di Perimeter Sub-Activity evaluation

Key finding	Discussion
1. **Was the project implemented as planned?**	**Despite substantive delays, implementers successfully constructed the 2,240-hectare Di perimeter.** Delays in planning and constructing the irrigated perimeter generated delays in allocating land and compressed the training timeline. Stakeholders considered the quality of the irrigation infrastructure to be high, despite a few minor issues with leveling of fields. **Overall, PAPs received the program benefits they were expected to, but some farmers who started out with larger landholdings considered the land they received to be insufficient compensation.** Nearly all PAPs received all program benefits, which consisted of financial compensation, land, ownership and leasehold documents, training, and starter kits. Large farmers did not see land they received to be enough compensation for the land they lost, whereas small farmers—whom the land allocation favored with overall and per-adult-member minimum land allocation amounts—did not express this dissatisfaction. **Although around one-fifth of PAPs were women, some women who previously cultivated land were reportedly not compensated.** The project considered all individuals within the households who cultivated land. As a result, women were also registered and they comprised 24 percent of the PAPs. Some women, however, were reportedly not registered. In addition, because all land allocated in compensation was combined into a single plot, some female PAPs reported that their husbands kept control of the entire plot.
2. **Have PAPs adopted the practices and inputs featured in training?**	**PAPs reported adopting several practices and technologies featured in training.** In particular, nearly all PAP households reported using inputs from starter kits, three-fourths reported using soil management techniques in the dry or rainy season, over half reported growing maize in the rainy season, and around half reported growing onions and tomatoes in the dry season (Table II.7). These were precisely the practices that PAPs reported being featured most heavily in MCA training. However, only around three-fifths of PAPs reported using organic fertilizer during either the dry or the rainy season. This may reduce long-term fertility of the land, as irrigated land needs replenishment of nutrients through organic fertilizer either in the form of manure or compost.
3. **What is the total area planted, average yield/hectare, total production, and total profit by focus crop?**	**Yields per hectare are substantially higher than they were at baseline, but they still did not meet the project targets and may not be sustainable.** Because PAPs now generally apply modern practices for irrigated agriculture—they use fertilizer, improved seeds, and some machinery—yields are substantially higher than before the perimeter was built. Yet, yields lag behind project targets for the project-promoted focus crops. The outlook on yields is negative, because soil testing indicates that soils are nutrient poor and only about three-fifths of farmers replenish nutrients by applying organic fertilizer.
4. **What are project results in terms of land tenure security, land conflict, and land markets?**	**Most PAPs said their land tenure security increased, but many of them are confused about land transfer rights.** PAPs feel secure in their land rights vis-à-vis others, but the possibility that land could be withdrawn for nonpayment of WUA fees introduces a new type of insecurity. Fewer than half of the PAPs believe they have the right to sell land and stakeholders disagree over whether land sales are permitted by the authorities. Most PAPs understand that renting out their plots is an option in practice, though only half believe they have the right to do so.
5. **How has PAP well-being changed?**	**PAPs reported being better off now than they were before the perimeter was built—at least in terms of food security.** Although nearly all PAPs reported reduced food insecurity, only three-quarters of PAPs reported increased net agricultural income. Because of unfavorable trends in the prices of focus crops—perhaps linked to increased supply in the area and the lack of accessible roads to and from the perimeter —some PAPs with initially larger landholdings noted that their increased production did not translate to higher incomes.

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III. DI LOTTERY EVALUATION

In this chapter, we summarize the interim findings from the Di Lottery evaluation. First we provide background on the activity, a summary of the evaluation design, and key findings from the baseline analysis for context. Next, we present interim results on the impact of winning the lottery on farmers' benefit receipt and agricultural and economic outcomes.

A. Background

As discussed in Chapter II, approximately 30 percent of the land in the Di perimeter was distributed to selected eligible applicants from the Boucle du Mouhoun region via a public lottery—the Di Lottery. The Di Lottery beneficiary selection process was a multi-stage process (described in detail in Ksoll et al. 2018). Applicants who met certain requirements and scored highly on a set of scoring criteria—including location of residence, available household members for agriculture, and experience in irrigated agriculture—were admitted to the Di Lottery. The winners were then selected in a public lottery on February 25, 2014 to receive either a plot suitable for growing rice or a polyculture plot—primarily used to grow maize in the rainy season and onions and tomatoes in the dry season. The selection of participants in the lottery was designed to ensure that—with high probability—at least 20 percent of beneficiaries were female. Table III.1 provides a summary of the Di Lottery, including its target population, program implementers, and all forms of assistance offered to lottery winners—including land, leaseholds, and agricultural assistance.

Table III.1. Summary information on the Di Lottery

Objective	Distribute land in the Di perimeter in a transparent manner to: (1) Select applicants who would likely put the land on the perimeter to good use (2) Meet distributional criteria with respect to gender
Target population	Applicants in the Boucle du Mouhoun region who meet certain eligibility criteria and who score highly on a set of scoring indicators
Assistance	- Access to land on the Di perimeter as leasehold, with beneficiaries randomly receiving either land suitable for polyculture or rice cultivation - Leasehold documents - Training in agricultural technologies for irrigated land - Starter kits (land preparation, materials, and inputs)
Implementer	BERD (verification of applications and eligibility information) Burkina Faso National Lottery (for the lottery)
Planned timeline	Lottery beneficiaries were meant to receive access to land at completion of the perimeter, and receive two years of support and training during the compact.
Performance targets	- 503 Di Lottery beneficiaries to be selected, with a wait-list of 150 additional applicants - 20 percent of beneficiaries should be female

BERD = Bureau d'Etude et de Recherche pour le Développement.

B. Evaluation objectives, questions, and methods

The Di Lottery randomly selected lottery winners, thus allowing for an RCT comparing winners (treatment group) to non-winners (control group). In the Di Lottery evaluation, we compare treatment and control group outcomes at follow-up to determine the impact of receiving access to irrigated land—in combination with training in irrigated farming technologies, start-up materials, and land tenure documents—on Di Lottery winners and their households. The key research questions for this interim evaluation, and the methodological approach used to address them, are listed in Table III.2.[18]

Table III.2. Di Lottery evaluation questions and approach

Key questions	Analytic approach	Data sources
1. Was the lottery implemented as planned?	Mixed-methods analysis featuring thematic analysis and triangulation of qualitative and quantitative data	• Eligibility data • In-depth interviews with program implementers • Implementer reports • Finalized MCA-BF monitoring data
2. Did Di Lottery beneficiaries receive all benefits they were meant to receive (land, formal lease documents, training in agricultural technologies, starter kits)	Descriptive analysis	• Interim surveys of Di Lottery beneficiaries
3. What impact does winning the Di Lottery have on agricultural practices, production, total agricultural income, and overall household income of the Di Lottery beneficiaries?	Impact analysis using an RCT	• Interim surveys of Di Lottery applicants
4. What are the project results in terms of land tenure security for Di Lottery beneficiaries?	Descriptive analysis	• Interim surveys of Di Lottery beneficiaries

Notes: The question on implementation of the Di Lottery (RQ1) is a new research question for this report that was not part of the design report.

MCA = Millennium Challenge Account-Burkina Faso; RCT = randomized controlled trial.

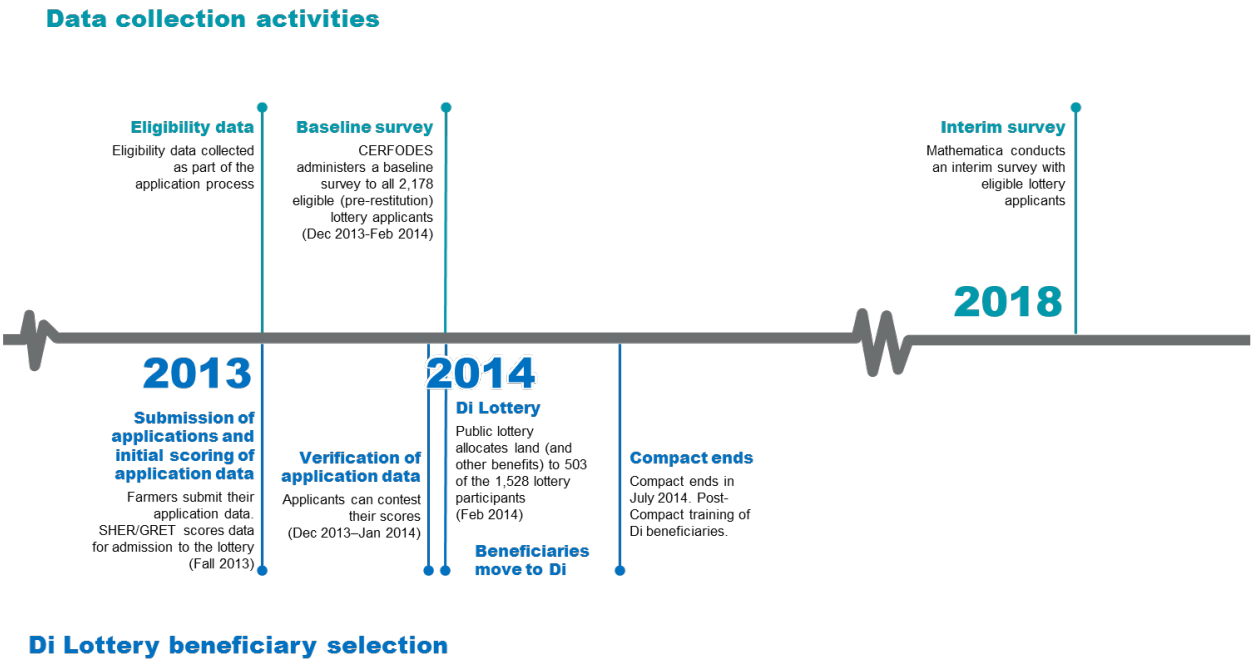
We used eligibility data, baseline survey data, and an in-depth review of program documentation and monitoring data, as well as interviews with program implementers, to determine if the lottery was implemented as planned (RQ1). We analyzed benefit receipt (RQ2) and the impact of winning the Di Lottery (RQ3) using interim surveys fielded in 2018 (Figure III.1).[19] The evaluation's period of exposure is around three years from the date of the baseline to the agricultural period covered by the interim survey, or around two and a half to three years

[18] The final evaluation will feature a methodological study—known as a within-study comparison—that compares the estimated impacts of the Di Lottery RCT with the impacts estimated through a regression discontinuity design (RD). The final evaluation will also analyze the impacts of winning the Di Lottery on land tenure security and land conflicts.

[19] We also used baseline data to control for treatment-comparison differences at baseline.

following lottery winners' receipt of land. This means that impact estimates presented below should be interpreted as the impact of winning the Di Lottery, around two and a half to three years after receiving land.

Figure III.1. Di Lottery implementation and data collection timeline



To estimate the causal impact of the Di Lottery on results and outcomes, we estimate the following regression specification using ordinary least squares:

$$(1) \qquad y_i = \alpha + \beta Treatment_i + X_i + \theta_i + \varepsilon_i$$

where y_i is the outcome variable for applicant or applicant household *i*; $Treatment_i$ is an indicator equal to one if applicant or applicant household *i* randomly obtained irrigated land through the lottery; X_i is a vector of demographic, social, and economic characteristics of *i*; θ_i is a plot preference fixed effect for *i* (i.e., an indicator for individual *i*'s plot preferences);[20] and ε_i is a random error term. The parameter of interest is β, which captures the difference between the treatment and control groups. It is the causal estimate of the causal impact of winning the Di Lottery.

[20] In the empirical analysis, we consider three preference strata: applicants who accept a polyculture plot only, applicants whose first choice is polyculture plot but who will also accept a rice plot, and applicants whose first choice is a rice plot. The inclusion of the indicator for the first strata is necessary to reduce bias, as this group has a different probability of winning from the other two groups. The second and third groups have equal probability of selection, but we include an indicator to distinguish between the two groups to reduce the variance of the estimate (Ksoll et al. 2017).

In the most basic specification, we do not include any variables as part of the vector X_i. In our preferred specification, the vector X_i includes variables such as gender and land rights that are unbalanced at baseline, as determined by the analysis presented in the baseline report (Ksoll et al. 2018). In addition, we include available baseline information on agricultural outcomes. In an additional specification, we include all variables used to score the applications in addition to the variables that are unbalanced, based on the analysis in the baseline report (Ksoll et al. 2018). Appendix Table A.2 lists the included covariates for these three specifications. In Table A.3, we document that survey response rates for both treatment and control groups are higher than 90 percent, though treatment households are about 6 percentage points more likely to have been surveyed.

C. Summary of baseline findings

To provide context for the interim analysis, we review our key findings from the analysis of Di Lottery baseline data (Ksoll et al. 2018). These data provide a snapshot of Di Lottery applicants in early 2014, at the time they applied for land through the lottery.

Di Lottery applicants tended to be men of working age who were the head of large households. In contrast, female applicants tended to be the spouse or sibling of the head of household.

Applicants likely did not own enough irrigated land at baseline. Only half of applicants reported owning plots, and of those only 40 percent irrigated any plots at baseline. Interestingly, Di Lottery applicants irrigated most of their rented plots. This suggests that applicant households had a need for—and could make productive use of—irrigable land. Lottery winners' greater access to irrigated land and certainty of land tenure were thought to be conducive to larger agricultural investments and greater production.

Applicants' use of traction animals, improved seed, fertilizer, and pesticide suggest they could take advantage of new plots. Most applicants possessed traction animals to plow their fields, placing them in a good position to cultivate the full area of their Di perimeter plots. In addition, applicants' use of improved seed, fertilizer, and pesticide could also help optimize production on the new perimeter plots.

Male applicants had some advantages over female applicants. Although outcomes for male and female applicants were not vastly dissimilar, male applicants owned more cultivable land and had more experience in irrigation and rice production than female applicants. Although literacy rates were low across all applicants, male applicants were also more likely to be literate. These findings highlight the importance of assessing the impact of winning the Di Lottery by gender, as men may have been better positioned than women to take advantage of new land on the perimeter, training, and inputs.

Taken together, these findings suggest that many Di Lottery winners were well positioned to take advantage of irrigated land on the perimeter, given their experience with irrigation and use of modern agricultural techniques at baseline. Potentially, a lack of access to irrigated land—which the Di Lottery provided—could have been the largest obstacle to increased production and income for many eligible lottery applicants. This was somewhat expected, as the lottery's

eligibility criteria were designed to select farmers who were likely to put the land on the perimeter to good use.

D. Interim findings

In this section, we present interim findings for the Di Lottery impact evaluation, based on administrative information, interviews with implementers, and surveys of Di Lottery winners and applicants who did not receive land on the perimeter.

1. Was the Di Lottery implemented as planned?

Delays in the construction of the perimeter and land allocation to PAPs led to delays in the selection of Di Lottery winners. Di Lottery winners were to receive land after PAPs were compensated, and women, youth, and beneficiaries from neighboring communities had received plots. According to the initial timeline, this was planned for mid-2013. However, allocations to lottery winners were delayed as a result of delays in the land allocation process for these other groups—in turn caused by delays in perimeter construction. Because of numerous errors in the applications, and in an effort to maintain transparency, the MCA-BF also determined in 2013 that an additional process for contesting the application information was necessary, further delaying the lottery. The lottery was held in February 2014, a few months before the end of the compact.

The lottery selected winners in a transparent process and exceeded the target for female winners. The ADP developed a transparent process for selecting winners, which included an application process, verification and scoring of application information, publication of the application information in town halls, and a process for contesting the verified information. After this process was set, the Commission pour l'Attribution de la Terre (CAT), in collaboration with MCA-BF and the MCC, set the cutoff for participation in the lottery at 60 points, resulting in roughly three-quarters of eligible applicants being permitted to participate in the lottery. In total, 1,528 applicants entered the lottery, which was conducted by the Loterie Nationale Burkinabè—the national lottery—and validated by a cabinet of lawyers. In total, 503 Di Lottery winners were selected in a public lottery from among 1,528 participants. The proportion of female winners exceeded the project target of 20 percent.

The selection of winners through the lottery lead to treatment and control groups that appear generally similar to each other. According to an analysis of applicant baseline data, Di Lottery treatment and control applicants and households were balanced across the overwhelming majority of variables. This treatment-control balance suggests that the lottery successfully implemented a fully random selection process, which is conducive to a rigorous impact analysis (Ksoll et al. 2018).

Most lottery winners assigned to rice plots said they would have preferred polyculture plots. The lottery distributed 230 plots suitable for rice cultivation—rice plots—of about two hectares each and 273 plots suitable for polyculture cultivation of one hectare each. Based on project documentation, there were proposals both to have separate lotteries by plot type and by gender. In the end, however, only a single lottery was implemented that nonetheless incorporated applicant preferences to some extent. The selection of winners proceeded as follows: To start the process, a volunteer from the public would draw the name of a lottery participant from the main

tombola. If the selected participant's first choice of plot was available, a plot of this type was selected for the participant from the rice or polyculture tombola. If the selected participant's first choice was not available, but he or she had indicated a second choice, a volunteer drew an available plot from the indicated tombola. To illustrate how much more popular polyculture plots were, 100 percent of the lottery winners who received polyculture plots got their first preference, whereas most (70 percent) of the winners who were awarded rice plots would have preferred a polyculture plot (Table III.3).

Table III.3. Di Lottery winner preferences and land receipt (percentages)

Di Lottery preferences	Received rice plot	Received polyculture plot
Preference for rice plot	31	0
Preference for polyculture plot	69	100

2. Did Di Lottery winners receive all benefits as planned?

Nearly all Di Lottery winners received leases and starter kits; over half reported receiving training. The overwhelming number of lottery winners in the evaluation sample report receiving formal documents[21], and over 85 percent received a starter kit of agricultural inputs. However, only about 56 percent of lottery winners in the sample reported participating in training (Table III.4).

Most—but not all—lottery winners cultivated the land they were awarded. Around three-and-a-half years after they received access to perimeter land through the lottery, about 90 percent of the winners of polyculture plots and 85 percent of winners who received rice plots reported cultivating some of the land they received through the lottery. Relatively lower land take-up among winners who received rice plots likely reflects that these winners wanted polyculture plots and thus had weaker incentives to cultivate the rice plots they received.

Table III.4. Di Lottery benefit receipt (percentages)

	All	Female	Male
Selected for rice plot	45%	49%	44%
Selected for polyculture plot	55%	51%	56%
Reported receiving land title	28%	22%	29%
Reported receiving lease	60%	63%	60%
Starter kit	88%	89%	87%
Among those who reported receiving starter kits, household reported receipt of:			
Seeds	88%	89%	88%
Fertilizer	95%	93%	96%
Phytosanitary products	21%	23%	20%
Agricultural tools and equipment	15%	16%	14%

[21] Di Lottery beneficiaries were not eligible to receive titles granting them full ownership of the land. The 28 percent of beneficiaries who say they received a title, likely they mean a formal document that proves their land right. We separately present both variables to show beneficiaries' confusion over their land rights documentation.

	All	Female	Male
Land preparation materials	7%	4%	8%
Training by AD10 or MCA	55%	62%	53%
Cultivated land	88%	85%	88%
Sample size (Di Lottery beneficiaries)	**489**	**112**	**377**

Source: Land Allocation Database (2014); Interim Survey (2018)

AD10 = Agricultural training consortium AECOM, known locally under its contract number; MCA-BF = Millennium Challenge Account-Burkina Faso.

About 10 percent of control households accessed land in the perimeter. One out of 10 household heads who participated in the lottery, but did not win, said they or someone in their family had access to land on the Di perimeter. Most of these respondents noted that they—or someone from their household—received the land through MCA assistance, but our survey did not ask which beneficiary group they received land through.

Our analysis estimates the effect of winning the lottery—as opposed to cultivating land after winning the lottery. Because of imperfect take-up of land by lottery winners and the fact that a nontrivial portion of control group households had access to land by 2017, the evaluation estimates the impact of winning the lottery (as opposed to winning the lottery and taking up the opportunity to farm it). This effect, called the intent-to-treat effect, is typically smaller than the average treatment effect (Angrist and Pischke 2009).[22]

3. What impact does winning the Di Lottery have on agricultural practices, production, total agricultural income, and overall household income?

Winning the lottery has a significant impact on amount of land cultivated, the types of crops grown, and agricultural practices during the dry season. By 2017, Di Lottery winners cultivated around one more hectare than control group households, reflecting the land they received in the lottery. In addition, lottery winners engaged in modern irrigated agriculture on the perimeter, investing in inputs such as hired labor and using modern agricultural equipment, fertilizer, and improved seeds. Lottery winners leveraged their access to irrigated land to shift into the cash crops promoted by farmer training in the dry season (Table III.5; we present results for the rainy season, which focuses on food crop consumption, in Appendix Table A.4.)

[22] Because there is two-sided non-compliance, we cannot estimate the treatment effect on the treated (ToT). Conceptually, it is not clear what the instrumental variables estimator would estimate, because (1) even if treatment observations are not cultivating the land, some of them are renting out land; and (2) the treatment received by the control observations might not have been the same as for treatment observations if, for example, amount of land received is much smaller.

Table III.5. Land access, crop cultivation, and agricultural practices for Di Lottery applicants and their households (dry season)

Outcome	Treatment group mean	Control group mean	Estimated difference	*p*-value of difference
Irrigates land (percentage)	99%	53%	46%	<0.01***
Cultivates any land on the Di perimeter (percentage)	89%	16%	73%	<0.01***
Total area cultivated-dry season (hectares)	1.37	0.45	0.93	<0.01***
Crops cultivated during dry season (percentage):				
Tomatoes	34%	16%	17%	<0.01***
Onions	78%	47%	30%	<0.01***
Maize	17%	4%	13%	<0.01***
Rice	27%	12%	14%	<0.01***
Hired labor during dry season (any plot) (percentage)	56%	27%	29%	<0.01***
Use of agricultural inputs during dry season (percentage):				
Chemical fertilizer	89%	51%	38%	<0.01***
Organic fertilizer	12%	12%	1%	0.67
Phytosanitary products	84%	47%	37%	<0.01***
Improved seeds	67%	34%	33%	<0.01***
Number of different types of modern agricultural equipment used in the dry season	2.30	1.14	1.16	<0.01***
Cost of inputs (1,000 FCFA)				
Chemical fertilizer	205	83	123	<0.01***
Organic fertilizer	1	0	0	0.29
Phytosanitary products	18	9	9	<0.01***
Improved seeds	62	26	36	<0.01***
Hired labor	38	16	22	<0.01***
Sample size (Di Lottery participants)	**489**	**923**		

Source: Interim Survey (2018).

*Significantly different from zero at the .1 level, two-tailed test.

**Significantly different from zero at the .05 level, two-tailed test.

***Significantly different from zero at the .01 level, two-tailed test.

Winning the lottery has a significant impact on productivity and income. Lottery winners' total annual agricultural sales revenue—or total sales before accounting for costs—during the 2016-2017 seasons was almost two and a half times that of controls (Table III.6). As sales revenue in the dry season is much higher than in the rainy season, dry season sales drive the impact on annual revenue (Figure III.1). The impact on total annual profits—or sales revenue minus costs—is substantial at 296,000 FCFA (around US$600). However, the impact on profits is smaller than the impact on sales because lottery beneficiaries farm more intensively on the Di perimeter, leading to higher input costs. The impact on agricultural income and total household income—while substantial and statistically highly significant—are smaller than impacts on agricultural profits as households shift their economic activity from other income generating activities to labor-intensive irrigated agriculture. These estimated effects are robust across a number of different specifications and both genders (see Appendix Tables A.5 and A.6). Appendix Table A.7 investigates whether impacts vary by background characteristics. Because we do not control for important background characteristics, the results in Table A.7 constitute correlations. As part of the final evaluation we will present analyses that control for a comprehensive set of background variables.

Table III.6. Impact on agricultural outcomes (in 1,000 FCFAs)

Outcome	Treatment group mean	Control group mean	Estimated difference	*p*-value of difference
Agricultural sales revenue	1435	636	800	<0.01***
Agricultural profits[a]	656	360	296	<0.01***
Agricultural income[a]	692	400	292	<0.01***
Total household income[a]	865	605	260	<0.01***
Sample size (Di Lottery participants)	**489**	**923**		

Source: Interim Survey (2018).

Note: Agricultural income includes agricultural profit, income from agricultural land rental, and income from agricultural employment and transformation of agricultural products.

[a] Primary outcomes; we conducted multiple hypothesis testing for these primary outcomes and show the results in Appendix Table A.4.

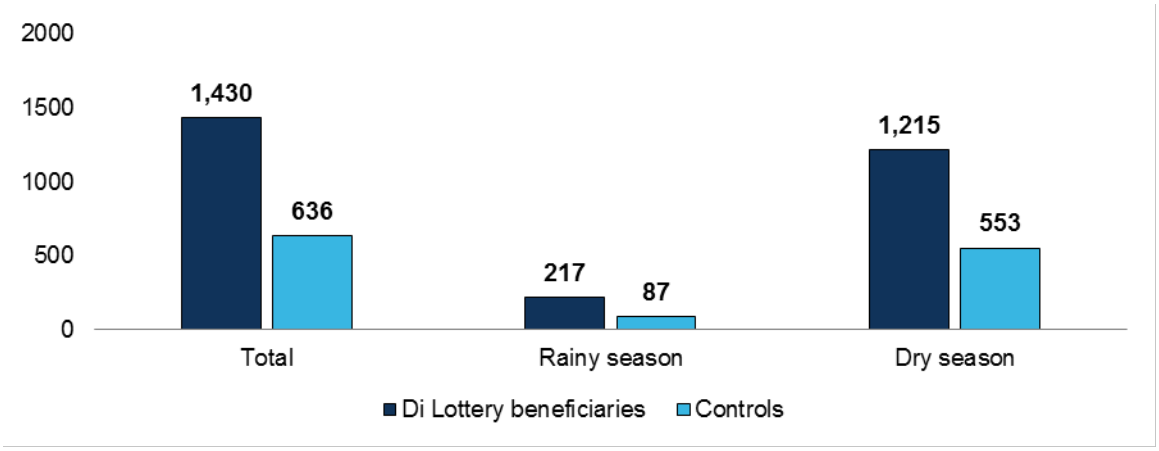
*Significantly different from zero at the .1 level, two-tailed test.

**Significantly different from zero at the .05 level, two-tailed test.

***Significantly different from zero at the .01 level, two-tailed test.

FCFA = Franc CFA.

Figure III.2. Agricultural sales revenue for lottery winners and controls, by season (in 1,000 FCFAs)



Benefits are concentrated among beneficiaries of polyculture plots. Because two types of land were allocated through the lottery, we conducted the analysis separately by land type received (See Table III.7). Although revenue from both kinds of agricultural sales is similar, we found that the impact on agricultural profit and income for polyculture beneficiaries is about two and a half times higher than it is for rice plot beneficiaries. This is likely because of the higher labor cost for rice cultivation, as well as the lower take-up of the rice plots. It is plausible that these same factors are behind the finding that the impact on household income for rice plot beneficiaries is not statistically significant.

Table III.7. Impact on main outcomes by type of land received (in 1,000 FCFA)

	Rice				*Polyculture*			
Outcome	Treatment group mean	Control group mean	Estimated difference	*p*-value	Treatment group mean	Control group mean	Estimated difference	*p*-value
Revenue from agricultural sales	1375	650	725	<0.01***	1438	638	800	<0.01***
Agricultural profits	508	369	138	0.03**	749	368	382	<0.01***
Agricultural income	555	414	141	0.06*	778	407	372	<0.01***
Total household income	724	609	115	0.23	962	624	338	<0.01***
Sample size (Di Lottery participants)	**204**	**703**			**249**	**679**		

Source: Interim Survey (2018)

*Significantly different from zero at the .1 level, two-tailed test.

**Significantly different from zero at the .05 level, two-tailed test.

***Significantly different from zero at the .01 level, two-tailed test.

FCFA = Franc CFA

4. What are the project results in terms of land tenure security for Di Lottery beneficiaries?[23]

Di Lottery beneficiaries are less secure about their tenure on the perimeter than PAPs. Though in possession of formal leases after winning the lottery, almost a quarter of Di Lottery beneficiaries state that they are very worried about losing access to their land within the next five years (Table III.8). About two thirds, however, state that they are not at all worried. Overall, Di Lottery beneficiaries are less secure in their tenure than PAPs (Table II.9).[24]

Table III.8. Di Lottery beneficiary land outcomes, by gender (percentage)

	All	Female	Male
Expectation of loss of land access in next 5 years: not at all	68%	71%	67%
Expectation of loss of land access in next 5 years: a little	15%	12%	15%
Expectation of loss of land access in next 5 years: a lot	23%	21%	23%
Right to bequeath land	42%	51%	40%
Right to sell land	28%	32%	27%
Right to let land	44%	54%	41%
Any land investment in last three years	13%	16%	12%
Applied for a loan with bank or microfinance institution in last three years	24%	29%	22%
If applied for a loan, used Di perimeter plot as collateral	14%	3%	18%
Involved in land conflict on the perimeter	3%	2%	3%
Rented out land	10%	12%	10%
Sold lease or title for Di plot	1%	0%	1%
Sample size (Di Lottery beneficiaries)	486	111	375

Source: Interim Survey (2018).

Fewer than half of Di Lottery beneficiary households understand their rights to bequeath and to rent out land. In terms of the rights that are associated with a lease on the Di perimeter, many Di Lottery beneficiary households are not aware of land transfer rights or incorrectly assume they have additional rights. Only about 40 percent reported that they have the right to bequeath their land and 44 percent recognized their right to rent the land. Close to 30 percent believed they have the right to sell their land, which they do not; Di perimeter land held as leasehold can be sublet but not sold (Table III.8).

[23] Due to a programming error, we did not collect information on land tenure outcomes for the control group, and a subsequent data collection effort to obtain this information was not finished in time for the final version of the interim report. We will collect this information during June 2019. In the final evaluation, we will investigate the impacts of the lottery on medium-term and long-term land tenure security and land conflicts.

[24] These differences may be due to Di Lottery beneficiaries receiving leases while PAPs received titles for the land received in compensation and leases for any additional land. Di Lottery beneficiaries who did receive land tenure documents received documents later than PAPs as well.

Similar to PAPs, few Di Lottery beneficiaries have used their land as collateral or have invested in their land. Only 14 percent of the 24 percent of Di Lottery beneficiaries who applied for a loan have used their land as collateral for a loan. Regarding land investments, 13 percent of households reported any investments on their land in the last three years, primarily in planting trees. Di Lottery beneficiary households are 6.9 percentage points more likely than Di Lottery control households to make any investment in their plots.[25]

E. Summary of findings

We summarize key findings in Table III.9.

Table III.9. Key findings for the Di Lottery evaluation

Key finding	Discussion
Was the Di Lottery implemented as planned?	Despite substantial delays, 503 Di Lottery beneficiaries were selected from among 1,528 participants in a public lottery in early 2014. The proportion of female beneficiaries slightly exceeded the project target of 20 percent. Joint tests of significance and balance tests suggest that the lottery was properly implemented. Together with the transparent public lottery, this analysis confirms that the Di lottery was properly implemented to support a rigorous evaluation design.
Did Di Lottery beneficiaries receive all the benefits they were meant to receive (land, formal lease documents, training in agricultural technologies, and starter kits)?	Nearly all lottery winners received formal leases, and 90 percent of lottery winners are currently cultivating their plots on the perimeter. Since rice cultivation is more time intensive and less profitable than polyculture cultivation, a smaller proportion of rice plot beneficiaries than polyculture plot beneficiaries are currently cultivating their plots on the perimeter. Di Lottery winners who cultivated land reported receiving incentive kits, and over half reported receiving compact-funded training.
What impact does winning the Di Lottery have on agricultural practices, production, total agricultural income, and overall household income of the Di Lottery beneficiaries?	Di lottery winners cultivate more land than control households and are significantly more likely to use improved agricultural techniques—including fertilizer, pest control, and improved seeds. They are also significantly more likely than non-lottery winners to use agricultural machinery and hire labor on their fields. Sales of agricultural production, agricultural profits, agricultural incomes and household income of Di Lottery beneficiaries are significantly higher than they are among the control group, but benefits are concentrated among winners of polyculture plots.
What are the project results in terms of land tenure security for Di Lottery beneficiaries?	Di Lottery beneficiaries are less secure about their tenure on the perimeter than PAPs. While almost two thirds of Di Lottery beneficiaries stated that they are not at all worried about losing their land on the Di perimeter, a significantly higher proportion (25 percent) of Di Lottery beneficiaries than PAPs (7 percent) stated that they are very worried about losing access to their land within the next five years.

[25] We note that differences in characteristics of the land held by Di Lottery beneficiaries and Di Lottery control households, which include possible differences in land quality; the type of irrigation; and the distance to the plots, limit this comparison.

IV. SOUROU OPERATIONS AND MAINTENANCE EVALUATION

A. Background

The O&M Sub-Activity of the WMI Activity provided capacity building and TA for sustainable and effective management of the irrigation infrastructure. The sub-activity aimed to create and train WUAs in the Di perimeter and the Niassan perimeters in the Sourou Valley. It also provided capacity building and technical assistance to the Sourou Valley Development Authority (AMVS), the government agency in charge of maintaining primary canals and pumping stations in Sourou Valley, supervising the WUAs, and providing farmers in the region with technical support. The goal of this assistance was to help AMVS implement its strategic plan, which outlined a set of activities to enable the agency to focus exclusively on water provision and supervising WUAs, and to transfer its existing farmer support activities to the regional directorate for agriculture in the Boucle du Mouhoun region. Millennium Challenge Account (MCA)-funded technical assistance would also help AMVS create the Sourou Valley maintenance fund, with which AMVS could undertake infrastructure rehabilitation and emergency repairs (see Table IV.1 for a summary of the sub-activity, including performance targets).

Table IV.1. Summary information on the O&M Sub-Activity

Objective	• Sustainable and effective management of the irrigation infrastructure
Funding	• $6.6M
Target population	• Farmers with plots on the Di perimeter and the Niassan perimeters
Assistance	• Create seven WUAs in the Di perimeter and one each in nine other perimeters in Sourou Valley. Provide assistance and training to all established WUAs. • Capacity building to AMVS to implement a set of reforms contained in the AMVS action plan.
Implementer	• Sher-GRET
Planned timeline	• WUAs were meant to receive two full years of technical assistance after completion of the perimeter before the end of the compact.
Performance targets	• 16 WUAs established in the old and new perimeters in the Sourou Valley (7 in Di and 9 in other perimeters) • 160 members of WUAs trained in the Sourou (with gender targets) • WUA raw water charge collection rate of 100 percent • Creation of a Sourou Valley maintenance fund, which AMVS could access to rehabilitate primary canal and pumping stations

O&M = operations and maintenance; WUA = water-user association; AMVS = Sourou Valley Development Authority.

To contextualize the findings below, Table IV.2 outlines the responsibilities of AMVS and WUAs in managing irrigation infrastructure in the post-compact period. The table also summarizes relevant technical, organizational, and financial assistance provided to WUAs by CATG, a private consulting firm that received subsidies to provide assistance to WUAs on the Di perimeter for three years post-compact. At first, CATG's assistance to WUAs in the post-compact period was almost fully subsidized, but subsidies were reduced by 20 percentage points

each year. Nearly all subsidies had been removed by the time of data collection in 2018, such that WUAs were asked to bear nearly the full cost of CATG's training, technical assistance, and technical staff stationed within WUAs. These subsidies were financed by loan repayments from the Rural Finance Activity.

Table IV.2. O&M actors' irrigation infrastructure responsibilities and assistance

Domain	AMVS responsibilities	WUA responsibilities	CATG assistance
Technical	Operation and maintenance of primary canals	Operation and maintenance of secondary canals, pumps, irrigation	Mechanical services for repairs and maintenance
Organizational	Supervise and guide WUAs	Organize water schedule and water turns. Mediate water conflicts	Experts to assist with WUA governance and organizing perimeter farmers for repairs and maintenance
Financial	None	Collect water user fees and make required payments to AMVS	Assistance with fee collection and financial management

O&M = operations and maintenance; AMVS = Sourou Valley Development Authority; WUA = water-user association; CATG = Centre d'Appui Technique et de Gestion.

B. Evaluation objectives, questions, and methods

The goal of the performance evaluation of the Sourou O&M Sub-Activity is to assess whether the project created and supported institutions that are operating effectively and maintaining the irrigation infrastructure in the Sourou Valley. Table IV.3 presents the research questions we will answer in this interim evaluation, as well as our analytic approach and data sources. For this evaluation, data collectors interviewed MCA ADP, AMVS, and CATG representatives, and held focus groups with WUA staff on the Di and Niassan perimeters. We disaggregate findings for the Di perimeter and Niassan perimeters because of the different challenges facing them and their different oversight arrangements. First, the infrastructure of the Niassan perimeters is much older than of the Di perimeter and necessitates rehabilitation. Second, AMVS is responsible for agricultural development on the Niassan perimeters, but not the Di perimeter.

Table IV.3. Analytic approach for the O&M evaluation

Key questions	Analytic approach	Data sources
1. Was the project implemented as planned? 2. What are WUA perceptions of the quality of the different CATG services? 3. To what extent are the compact supported irrigation perimeter institutions functioning and fulfilling their anticipated roles? 4. To what extent are the Di perimeter and the old perimeters at Niassan effectively and sustainably operated and maintained?	Mixed-methods analysis featuring thematic analysis and triangulation of qualitative and quantitative data	• In-depth interviews with AMVS, CATG, and the regional directorate of the Ministry of Agriculture • Focus groups with WUA staff • Annual reports • Finalized MCA-BF monitoring data and WUA financial records of repayment

WUA = water-user association; AMVS = Sourou Valley Development Authority; CATG = Centre d'Appui Technique et de Gestion; MCA-BF = Millennium Challenge Account-Burkina Faso.

To assess all research questions, we triangulated stakeholder accounts in interviews and focus groups with official monitoring data and accounts in published reports. To analyze WUA perceptions of the quality of CATG services (RQ2), we synthesized themes from focus groups and interviews with WUA board members and presidents. In analyzing the extent of WUA and AMVS functioning (RQ3), we examined the extent to which WUAs and AMVS currently comply with their core responsibilities on (1) technical, (2) organizational, and (3) financial dimensions. We also use data from the interim survey (from the Di perimeter and farmer training samples) to summarize water users' accounts of their interactions with WUAs, which provide insight into WUAs' technical and organizational capacity.

To assess how well perimeters are operated and maintained (RQ4), we examined (1) the extent to which perimeters provide irrigated water year-round according to a predetermined schedule, (2) the extent to which WUA staff maintain perimeter infrastructure—including pumping stations, secondary canals, and tertiary canals, and (3) WUA recovery rates. We use administrative data from CATG to calculate WUA recovery dates.

C. Findings

1. Was the project implemented as planned?

Program implementers established WUAs on the perimeters according to plan, but faced some initial resistance on Niassan perimeters. First, Sher-GRET, the implementing organization, conducted informational meetings with the farmers in the Di and Niassan perimeters, in which they explained the role that new WUAs would play and how they would interface with agricultural cooperatives and the other existing organizations. Second, Sher-GRET staff helped organize and facilitate general assemblies to draft by-laws. Lastly, stakeholders legally established WUAs, approved their bylaws, selected their board, and contracted appropriate technical and financial staff. MCA representatives and program implementers noted that gaining initial community support for WUAs was not easy on the Niassan perimeters, as they had to convince water users that WUAs would actually contribute to better irrigation outcomes and higher levels of production by professionally managing irrigation. Stakeholders noted that this resistance was likely due to previous negative experiences between water users and water authorities on the Niassan perimeters.

> **"The establishment of the WUAs on the ground has not been easy…people [in the Niassan perimeters] thought that the WUAs actually came to diminish their power…when we talked about the WUAs, we wanted to separate water management from the management of other aspects of agricultural management in the field…little by little it was made clear that [WUAs wouldn't] take their power; they would actually make farming much more efficient."**
>
> ***–MCA representative***

WUA set-up and training was completed on a delayed timeframe. Sher-GRET was successful in meeting its target of creating 16 WUAs during the compact period—including seven in Di and nine in other perimeters. Sher-GRET also exceeded its performance target of training 160 WUA members in technical, organizational, and financial aspects of water management, with a total of 207 WUA staff trained. However, delays in the perimeter construction at Di cascaded into WUA training, to the extent that only three of the seven WUAs on the Di perimeter had received a full cycle of training by the end of the compact. MCC and MCA also funded the creation of and capacity building for CATG, which could subsequently provide TA to the WUAs post-compact. The post-compact entity APD also hired AECOM to complete the initially planned two years of training for the WUAs and financed additional subsidized technical assistance by CATG for all seven WUAs in Di from 2014 to 2016.

AMVS did not implement the action plan by the end of the compact, and stakeholders failed to establish the Sourou Valley maintenance fund. According to initial plans, MCA-funded technical assistance would enable AMVS to implement its action plan by the end of the compact. This action plan prescribed that AMVS transition to providing irrigation infrastructure maintenance and technical support for WUAs, potentially with resources saved from discontinuing its technical support services for farmers. The action plan also called for the creation of the Sourou Valley maintenance fund, which could be used for larger maintenance and rehabilitation activities. According to stakeholders, AMVS did not implement the AMVS action plan by the end of the compact due to low level of interest in implementing the reforms recommended by the action plan, thus failing to create the Sourou Valley maintenance fund. As a result, AMVS could not undertake several large maintenance and rehabilitation activities on the

Niassan perimeters during the compact period. We describe AMVS's activities in the post-compact period in Section 3 of this chapter as part of our analysis of AMVS' current functioning.

2. What are WUA perceptions of the quality of the different CATG services?

WUAs on the Di perimeter highly value CATG-provided staff experts. From 2014 onward, CATG has provided new WUAs with the services of mechanics, managers, and accountants who have provided WUA staff with technical assistance and formalized training in accounting, financial management, good WUA governance, irrigation planning and perimeter maintenance, and computing. CATG technical staff have also helped WUAs make equipment repairs, create irrigation schedules, and generate financial reports, among other tasks. In focus groups, WUA staff reported that CATG has fulfilled its responsibility of providing training and technical assistance, and widely rated this assistance as highly valuable—particularly CATG's assistance with developing calendars and crop plans, and its help with emergency repairs to irrigation infrastructure. WUA staff expressed that the knowledge they gleaned from CATG assistance provided a strong basis for their continued technical, organizational, and financial activities on the perimeter.

"If there had not been this idea of setting up the CATG, I think the project would not have succeeded to this point; this idea of setting up the CATG has been an opportunity to bring a lot of ideas and good practices to many of us."

–WUA member on a Niassan perimeter

At least two WUAs on the Niassan perimeter have stopped working with CATG due to cost constraints, and one WUA on the Di perimeter has contracted outside help. In focus groups, two WUAs on the Niassan perimeter reported that CATG previously provided them with administrative support and technical assistance, but they had to cut ties with CATG in recent years because they could not afford its assistance. One WUA representative cited CATG's increasing yearly fees as critical to the decision. In addition, citing the rising cost of CATG assistance, at least one WUA on the Di perimeter contracted an outside accountant to help with financial management. These increased costs of CATG services reflect the gradual removal of subsidies for their technical assistance over a four-year period. In the first year, the subsidy funded 80 percent of the cost of the service, with a reduction of the subsidy by 20 percent during each additional year. As WUAs are increasingly asked to pay the full price of CATG assistance, some have determined that they cannot afford it.

3. To what extent are the compact supported irrigation perimeter institutions functioning and fulfilling their anticipated roles?

All new WUAs are functioning, but WUAs on the Di perimeter have better performance on technical and financial aspects. According to interviews with CATG and WUA staff, WUAs on the Di perimeter appear to be fulfilling their core technical, organizational, and financial responsibilities—particularly with respect to fee collection (Table IV.4). In contrast, WUAs on the Niassan perimeters appear to have lower levels of technical competency, as they have some "old habits" with respect to operations and maintenance, according to CATG staff. These include WUA leaderships' unwillingness to hire sufficient staff and to pay market rates, and—for some board members—an unwillingness to accept term limits. According to stakeholders, fee collection also appears to be more of a challenge for WUAs on the Niassan perimeters than for WUAs on the Di perimeter, as WUAs on the Niassan perimeters

cannot cut off water access to non-paying members due to technical challenges, whereas WUAs on Di perimeter can and do, as necessary.

Table IV.4. Post-compact functionality of WUAs by perimeter

Dimension	Di perimeter	Niassan perimeters
Technical Maintaining pumping stations, making infrastructure repairs, and enforcing the irrigation calendar	**Assessment:** Generally positive • CATG and WUA representatives generally agree that WUAs have the tools and knowledge to maintain the basic functioning of the perimeter in the long term. However, they will continue to need external technical assistance to design maintenance plans and monitor technical aspects of the perimeter.	**Assessment:** Mixed • CATG staff believe WUAs have generally mastered the operations and maintenance techniques they were taught, despite some difficulties in changing WUAs' existing "old habits" with respect to operations and maintenance. However, illiteracy of WUA staff and the poor state of current infrastructure could negatively affect WUAs' ability to maintain the infrastructure in the long term.
Organizational Conducting good governance, including holding regular meetings and upholding bylaws	**Assessment:** Generally positive • CATG representatives said WUAs now understand how to organize and run WUA meetings, take votes, and implement key decision from meetings. In interim surveys, water users verified that WUA meetings are taking place, with an average of nearly three WUA meetings on the Di perimeter per year (Table IV.5).	**Assessment:** Generally positive • CATG representatives said WUAs in Niassan have become more responsible in holding WUA meetings, taking votes, and upholding bylaws with respect to WUA term limits. In interim surveys, water users verified that WUA meetings are taking place, with an average of two to three WUA meetings on Niassan perimeters per year (Table IV.5).
Financial Fee collection, compensating CATG, and financial management	**Assessment:** Generally positive • **Fee collection.** WUAs and CATG agree that collection is still a difficult task, requiring a high level of effort to persuade water users to pay their fees. But over time, the collection rate has improved, aided in part to WUAs' willingness to close off the water points to people who do not pay. In interim surveys, 98 percent of water users reported making WUA payments (Table IV.5). • **Compensating CATG.** In general, WUAs on the Di perimeter reported they are compensating CATG for its technical assistance services or opting to contract outside services. • **Financial management.** According to CATG representatives, WUAs still need help preparing realistic budgets. CATG still provides several WUAs with financial management support, but CATG representatives believe it's time the WUAs take full ownership of their own financial management, as they have built the basic capacity to do so.	**Assessment:** Mixed • **Fee collection.** According to WUAs, collecting fees has been a challenge, as some producers do not pay their fees. For technical reasons, WUAs do not have the ability to shut off water access for those in arrears. In interim surveys, only 61 percent of water users reported making WUA payments (Table IV.5). • **Compensating CATG.** Perhaps linked to their low collection rates, some WUAs on the Niassan perimeters are not paying CATG for its technical assistance services. Other WUAs have cut ties with CATG, citing the high cost of its assistance. • **Financial management.** According to CATG representatives, many WUAs on the Niassan perimeters struggle with financial management.

WUA = water-user association; CATG = Centre d'Appui Technique et de Gestion.

Surveyed water users do not corroborate higher WUA payment compliance on the Di perimeter. Based on an analysis of interim household survey data, self-reported WUA payment compliance on the Di perimeter is as high as it is on the Niassan perimeter. Average payment amounts are higher for Di versus Niassan (Table IV.5). The Di perimeter has stricter enforcement as discussed above: 12 percent of respondents with a plot on the Di perimeter reported having paid a penalty to the WUA and 4 percent reported being prevented from accessing water (as opposed to 6 and 1 percent, respectively, on the Niassan perimeters).

Table IV.5. WUA payments, labor contributions, penalties, and meeting attendance (Di perimeter versus Niassan perimeters)

Outcome	Di perimeter	Niassan perimeters	Difference	*p*-value of difference
WUA payments				
Paid (in percentage)	98	97	0.01	0.61
Amount (in 1,000 FCFA)	146	119	27	<0.01***
Difference in WUA fees for different crops (percentage)	47	21	26	<0.01***
Frequency of cleaning and labor contributions				
Frequency of cleaning per year	2.08	2.10	-0.02	0.82
Provided unpaid labor to WUA (in percentage)	17	17	-0	0.88
Days of unpaid labor provided to WUA	2.82	2.72	0.10	0.74
Provided WUA with other in-kind contribution (in percentage)	3	6	-3	0.04**
Prevented from using irrigation water (in percentage)	4	1	3	0.03**
Paid penalty to WUA (in percentage)	12	6	6	0.02**
Frequency of WUA meetings per year (in percentage)				
At least once a month	7	23	-15	<0.01***
At least once a quarter	19	37	-18	<0.01***
At least once every 6 months	54	30	24	<0.01***
At least once a year	20	11	9	<0.01***
Attended last WUA meeting (in percentage)	53	61	-8	0.05*
Number of observations	**732**	**289**		

Source: Interim Survey (2018).

WUA = water-user association.

AMVS partially implemented the AMVS action plan in the post-compact period. The APD final report outlines four key elements of the AMVS action plan: (1) clarifying responsibilities with WUAs, (2) rehabilitating perimeters and electrifying pumping stations, (3) disengaging from production and marketing activities, and (4) improving organizational and financial capacity (APD 2017). We discuss each of these in turn.

1. **WUAs do not have a clear understanding of how maintenance responsibilities are divided between them and AMVS.** As of May 2018, there was still confusion as to whether AMVS is responsible for rehabilitation and maintenance on the perimeters. AMVS

pointed to ministerial decrees that transferred responsibility for maintenance to WUAs.[26] Some WUAs asserted that maintenance of drainage and primary canals remained AMVS's responsibility, whereas others noted that AMVS had informed them of a change in responsibility but had not presented the relevant documents in writing. Participants from the Niassan WUAs noted that AMVS had not conducted necessary repair activities on their perimeter in recent years. Overall, 10 out of 18 WUA board members from Niassan perimeters stated, or agreed with the statement, that AMVS did not fulfill its responsibilities, whereas three respondents thought that AMVS was helpful to their WUA. The confusion over maintenance responsibilities does not bode well for the continued functioning of primary canals and pumping stations, which require regular review and maintenance. This lack of clarity has already generated tangible detrimental effects on the irrigation infrastructure: blockages were beginning to form in drainage and primary canals that were not regularly maintained.

"So far, the AMVS has not done anything on their part because they are saying that we are the ones who have to pay development taxes … so that the government in turn can help us. But we have been paying taxes for a long time and we do not understand … people are tired because they cannot manage these plots because the water stagnates in places."

–WUA member

2. **Pumping stations have been electrified, but Niassan perimeters have only partially been rehabilitated.** AMVS completed the electrification of pumping stations during the post-compact period. AMVS records also indicate that—as of May 2018—it had completed rehabilitation of two perimeters at Niassan as well as one other perimeter in the Sourou Valley, and had also rehabilitated irrigation access roads and transmission infrastructure. (We note that additional activities were planned to be conducted in 2018 at the time of the qualitative survey, but they had not yet been implemented).

3. **AMVS has not transferred responsibility for production and marketing activities for the Niassan perimeters, and is making a case to regain authority for these activities on the Di perimeter.** As of 2016, AMVS has formal oversight of irrigation infrastructure and WUAs on the Di perimeter, whereas the regional directorate of agriculture is now responsible for agricultural production and marketing activities on the Di perimeter. AMVS remains responsible for agricultural production and marketing activities in the rest of the Sourou Valley, including the Niassan perimeters. AMVS' response to the draft interim report in Appendix C and interviews with key informants highlight that AMVS is attempting to reclaim the responsibility for production and marketing activities on the Di perimeter, which it had transferred to the regional directorate of agriculture.

4. **Activities to improve organizational and financial capacity have not been implemented.** The APD final reports notes that the planned activities to reinforce AMVS organizational and financial capacity had not been implemented by October 2017 (APD 2017). Instead, the government opted for another study to assess reform options. As of this writing, we have not been able to obtain AMVS reports that would shed light on whether such reforms have been implemented.

[26] A first step toward the establishment of clearer responsibilities for Niassan perimeters that were not the focus of compact activities has been taken on the Niassan perimeters, AMVS has set up 10 additional WUAs in the post-compact period, bringing the total number of WUAs to 26.

Overall, AMVS has thus only partially implemented the action plan in the post-compact period, and is actively seeking to reclaim responsibility for agricultural production and marketing activities on the Di perimeter.

4. To what extent are the Di perimeter and the old perimeters at Niassan effectively and sustainably operated and maintained?

Stakeholders reported that WUAs allocate water according to a pre-set schedule and perform regular maintenance. CATG representatives reported that WUAs on Di and Niassan perimeters complied with pre-set irrigation schedules, performed necessary maintenance to secondary canals and other perimeter infrastructure and approached CATG or AMVS for support with major repairs. In interim surveys, water users corroborated this regular maintenance, reporting that irrigation infrastructure on the perimeters was cleaned twice per year, as expected (Table IV.5).

Assuming proper maintenance, stakeholders estimated the lifespan of the Di perimeter to be at least 20 and 25 years. Although few key informants provided an estimate of the lifespan, those that did generally provided a minimum number of years that they thought the perimeter would be functional, assuming that minimum maintenance occurs on a regular basis. In coming up with an estimate, one respondent specifically referred to the Niassan perimeters as a reference point: a large part of the Niassan perimeters needed rehabilitation after 20 years and the Di perimeter is better built. These perceptions of perimeter lifespan will be complemented with an in-depth engineering assessment during the final evaluation.

Across the Di and Niassan perimeters, fee payments are often paid late. A key aspect of sustainable perimeter operations is WUAs' ability to recoup the costs of distributing irrigation water, also known as the recovery rate. Minimal recovery rates on the Niassan perimeters by the due date inhibit scheduled maintenance (Figure IV.1). On-time recovery rates have also been falling on the Di perimeter and are particularly low on sectors with a large proportion of rice plots. Longer-term recovery rates include late payments and are substantially higher than the on-time recovery rates (Figure IV.2).

Figure IV.1. On-time recovery rates

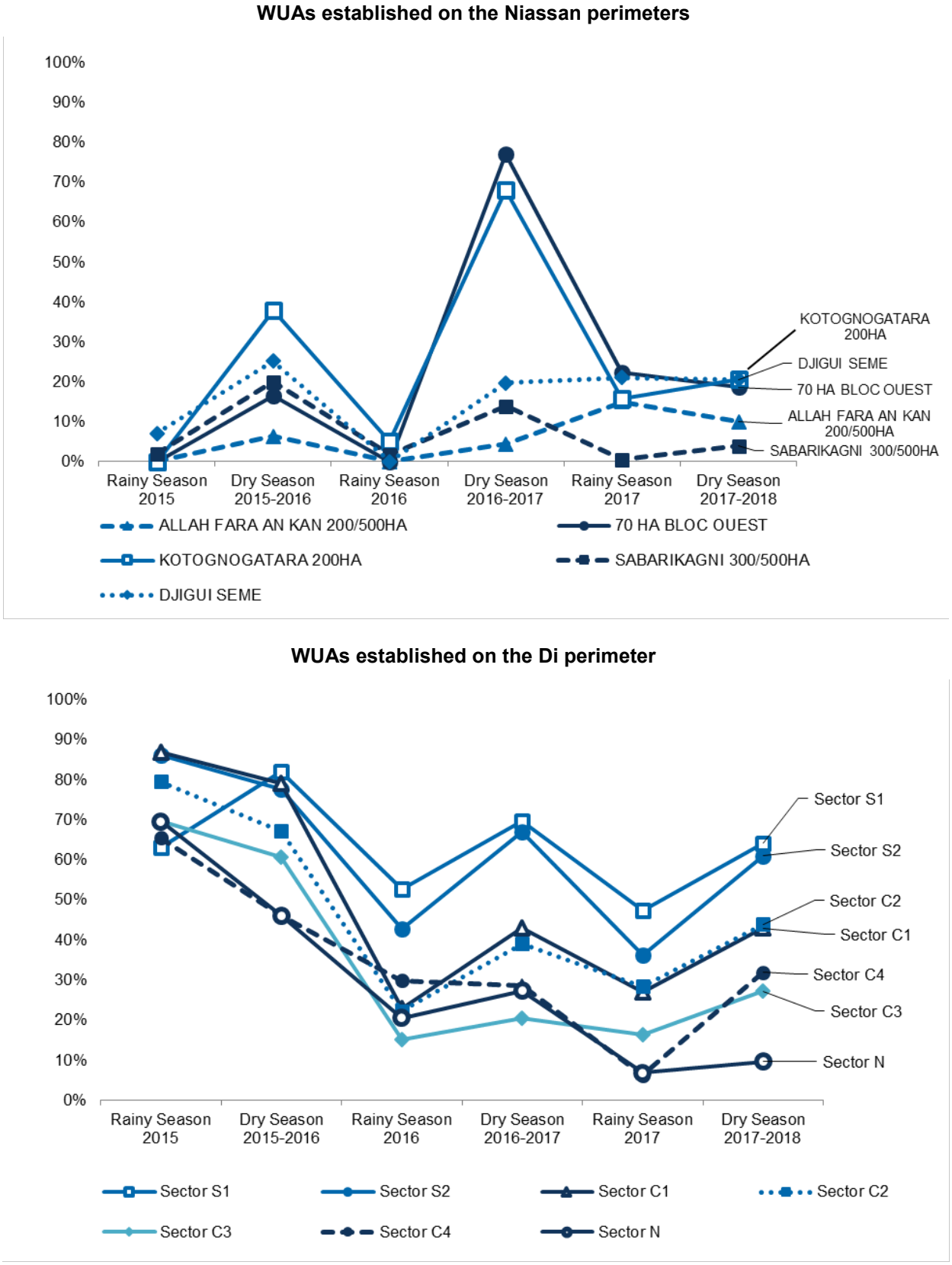
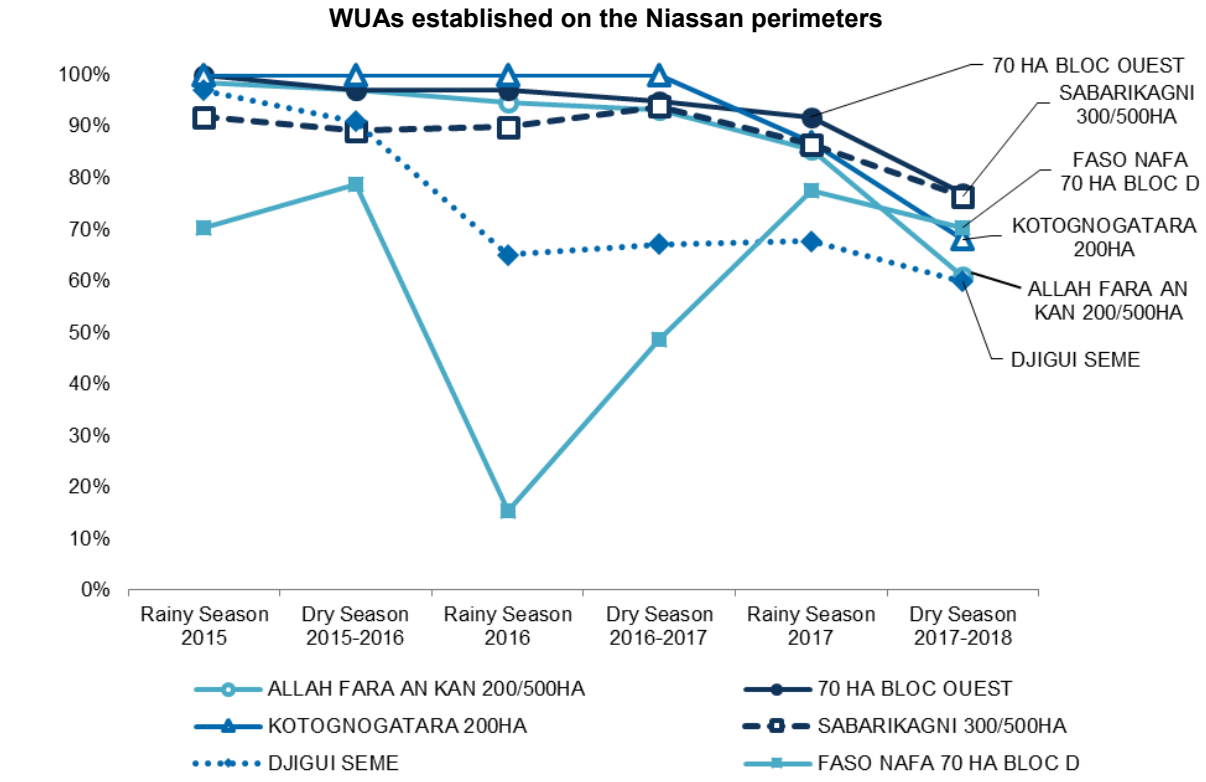
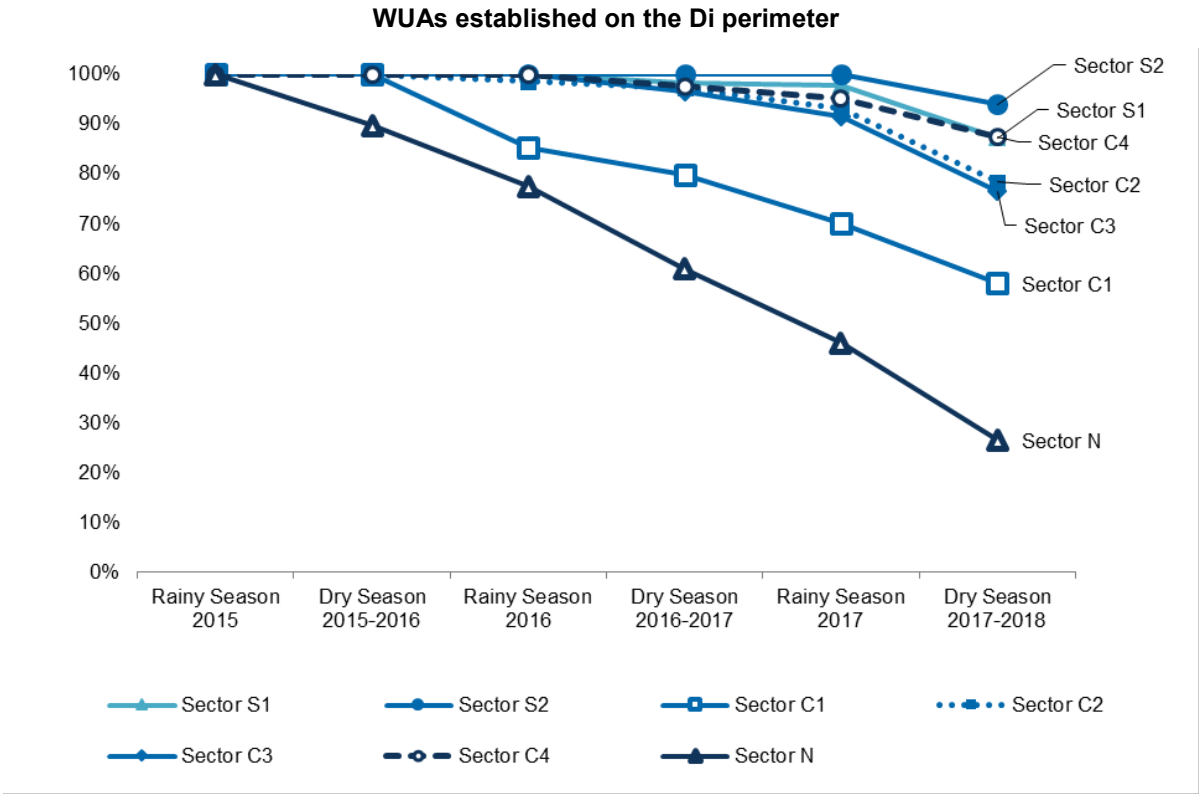


Figure IV.2. Recovery rates (as of January 2019)





Longer-term recovery rates on the Di perimeter are generally sustainable, except for two sectors with large proportion of rice plots. Recovery rates for sectors S1, S2, C3, and C4 were high from the 2015 rainy season until the 2017 dry season, remaining at or above 90 percent. These rates bode well for WUAs' cost recovery and financial health. However, recovery rates are not sustainable for two sectors with large proportion of rice cultivation: sectors N and C1 on the Di perimeter (Figure IV.2). This is likely related to the lower profit margin of rice production (as compared to polyculture production). This low profit margin of rice production was documented in the MCA-commissioned due diligence report, in which consultants estimated that the operation and maintenance costs of irrigated water for paddy rice were almost equivalent to the producer's cash income (MCA-BF 2008). Our analysis in Table III.6 of Chapter III provides supporting evidence for this assessment as the impact of winning the lottery was one third for rice plot winners and—since their plots were twice the size of polyculture plots—one-sixth of polyculture plots on a per hectare basis. The rapidly declining recovery rates for nearly half the WUAs in the Di perimeter raise questions about the financial sustainability of O&M on these three sectors.

D. Summary of findings

We summarize key findings in Table IV.6.

Table IV.6. Key findings for the Sourou O&M evaluation

Key finding	Discussion
1. Was the project implemented as planned?	• **Assistance to WUAs.** The delays affecting the construction of the Di perimeter also delayed the creation and support for WUAs. By the close of compact, only one of 16 newly created WUAs had received the full anticipated training and support covering two years of agricultural production. The post-compact entity APD ensured that 16 new WUAs received the full set of benefits anticipated under the compact. It also funded the creation of a private consultancy—the CATG—to continue to provide TA to the WUAs post-compact. • **Assistance to AMVS.** Because of limited interest among AMVS and GOBF officials, AMVS did not implement its action plan by the end of the compact.
2. What are WUA perceptions of the quality of the different CATG services?	• WUAs appreciate CATG services and consider them to be of high quality. However, the reduced subsidy on CATG assistance has made their services too expensive to several WUAs. WUAs on the Niassan perimeters have stopped paying for CATG services, while WUAs on the new perimeter have hired some staff directly to reduce costs.
3. To what extent are the compact supported irrigation perimeter institutions functioning and fulfilling their anticipated roles?	• **WUA operations.** WUAs have the capacity to complete recurring tasks but require continued support for some functions. Stakeholders suggested that WUAs on the Di perimeter can conduct basic maintenance, organize themselves and collect WUA fees. WUAs, however, do not have the capacity to address larger repairs and complete more technical tasks such as setting up maintenance plans or developing water schedules. • **AMVS only implemented some key elements of the AMVS action plan in the post-compact period.** As of April 2018, AMVS has electrified pumping stations and rehabilitated two perimeters, but it has made only limited progress on the other key elements of the action plan in the post-compact period. WUAs are still confused about the division of responsibilities for maintenance, AMVS has not transferred responsibility for production and marketing activities for the Niassan perimeters, and is attempting to regain responsibility for these activities on the Di perimeter; planned APD-funded activities to support organizational and financial capacity have not been implemented.

Key finding	Discussion
4. To what extent are the Di perimeter and the old perimeters at Niassan effectively and sustainably operated and maintained?	• **Operations and maintenance.** Water users reported that WUAs allocate water according to a pre-set schedule and perform regular maintenance. With regular maintenance, stakeholders believe the Di perimeter has a lifespan of at least 20-25 years. • **Cost recovery.** Rapidly declining WUA fee collection rates in two sectors with rice plots raise questions about the financial sustainability of O&M on these sectors.

O&M = operations and maintenance; WUA = water-user association; ADP = Agriculture Development Project; AMVS = Sourou Valley Development Authority; GOBF = Government of Burkina Faso; CATG = Centre d'Appui Technique et de Gestion.

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V. INTEGRATED WATER RESOURCE MANAGEMENT EVALUATION

In this chapter, we summarize the interim findings from the IWRM performance evaluation. First we provide background and a summary of the evaluation design. Next, we present results on implementation sub-activity, followed by a discussion of the activity's lasting effect on water management in the Mouhoun and Comoé Basins.

A. Background

The final sub-activity of the WMI Activity was the IWRM Sub-Activity in the Mouhoun and Comoé Basins, which sought to create, strengthen, and train water management institutions, thereby improving public and private stakeholder capacity to engage in participatory IWRM. The ultimate objectives of this sub-activity were biodiversity protection and sustainable water management—in particular, rational and equitable resource allocation and reduced conflict over resources. The IWRM Sub-Activity can be viewed as complementary to the construction of the Di perimeter, as it was designed to help water management institutions to better manage water, thereby ensuring the adequacy of water supply for the Di perimeter as well as other perimeters, communities, and businesses in the Mouhoun Basin.

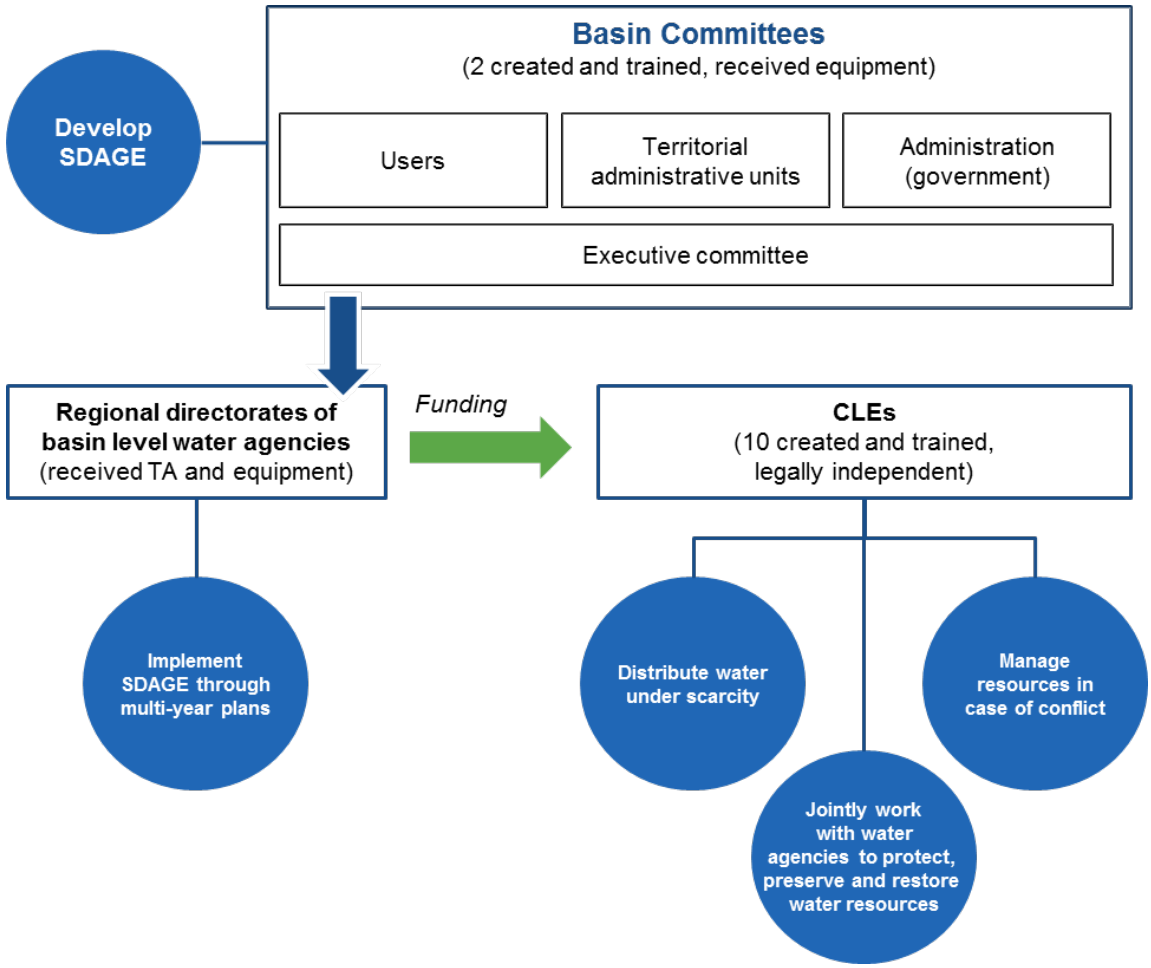
Under this sub-activity, the MCC supported the creation and capacity building of basin and sub-basin institutions envisaged under Burkina Faso's Action Plan for Integrated Water Resources Management (Plan d'Action pour la Gestion Intégrée des Resources in Eau—PAGIRE 2003) for the Mouhoun and Comoé Basins. In 2003, the GOBF divided the country into five geographic areas corresponding to five river basins—generally considered the most appropriate unit for the management of water resources (Burton 2003). The GOBF determined that the best institutional framework to manage these river basins would be basin agencies structured legally as associations of public interest ("groupement d'intéret public") of which a variety of stakeholders could be members (Ki et al. 2013). However, before 2008 only one of the five required basin agencies—the Nakanbé Basin agency—had been created. In 2010, the Mouhoun and Comoé Basin agencies were established as legal entities, but they largely existed in name only.

MCC funded the creation, equipping and training of **two regional directorates** of the basin agencies—one for each of the Mouhoun and Comoé Basins. These regional directorates are the office of the basin agency tasked with managing the basins' water resources by conducting water studies, intervening to ensure safe drinking water, rehabilitating water infrastructure, and intervening in basin-level water conflicts. The IWRM support project implementer, COWI, provided regional directorates with capacity building in technical, administrative and financial issues related to water management—including training on project management software as well as customized modeling software—known as hydrological models—to model water resources and water flows for both basins. These models would inform the directorates' water management activities through simulations of water use scenarios under different conditions of water availability or scarcity.

As part of the IWRM activity, COWI also helped create and train **basin committees** to set basin agencies' agendas and oversee their work. Composed of users, administration, and local

authorities, basin committees would develop basin management plans—or Schéma Directeur d'Aménagement et de Gestion de l'Eau (SDAGEs)—which regional directorates of basin-level water agencies and local water committees would in turn implement through multiyear plans. Optimally, basic committee members would develop SDAGEs in a representative and participatory process, integrating local input into these basin water management plans. To build their capacity to develop SDAGEs, members would receive training in principles of basin water resources management.

Figure V.1. IWRM institutions and their relationships



IWRM = integrated water resource management; SDAGE = Schéma Directeur d'Aménagement et de Gestion de l'Eau; CLE = Comité Local de l'Eau ; TA = technical assistance.

Finally, the sub-activity also funded the creation and training of 10 local water committees, or **CLEs**, 7 in Mouhoun and 3 in Comoé, These local water committees would be tasked with water resource management, strategic planning, and conflict prevention at the sub-basin level (Figure V.1). To build their capacity on these tasks, COWI would train CLE members in (1) roles and responsibilities of the CLEs, (2) principles of good CLE governance including developing by-laws and holding assemblies, (3) administrative and financial management of the

CLE, (4) acquisition of financing from NGOs and government offices, (5) planning and implementation of activities, and (6) conflict resolution.

Table V.1 provides more info on the IWRM support project, including its funding, target population, and planned timeline, and performance targets.

Table V.1. Summary information on the IWRM Sub-Activity

Objectives	• Create, strengthen, and train water management institutions, thereby improving public and private stakeholder capacity to engage in participatory IWRM • Achieve biodiversity protection and sustainable water management
Funding	• $5.0M
Target population	• Water users in the Mouhoun Basin and the Comoé Basin (estimated in 2015 to be 5,529,240 inhabitants of the Boucle du Mouhoun and 723,385 inhabitants of la Comoé) • Institutional staff in the Direction Generale des Ressources en Eau, members of the Mouhoun and Comoé Basin committees, staff at the Agence de l'Eau du Mouhoun and the Agence de l'Eau de la Comoé, members of the CLE to reinforce their management capacity for water resources
Assistance	• Create and train basin committees in Mouhoun and Comoé in IWRM • Create and train local water committees, known as CLE • Provide technical assistance and equipment to two Departments of Water Resources and basin-level water agencies in Mouhoun and Comoé • Develop basin-level IWRM plans, known as SDAGEs • Establish basin-level hydrological models
Implementer	• COWI (general implementation)
Planned timeline	• Completion of SDAGEs in 21 months: 2011-2013 • Creation of CLEs in 24 months: 2011-2013 • All committees created and trained during the compact period
Performance targets	• Two basin committees created and trained • Two SDAGES validated and put into practice • Ten local water committees created and trained

IWRM = integrated water resource management; SDAGE = Schéma Directeur d'Aménagement et de Gestion de l'Eau; CLE = Comité Local de l'Eau.

B. Evaluation objectives, questions, and methods

We conducted a performance evaluation of the IWRM sub-activity to (1) document whether and how water use and environmental plans have been implemented; (2) examine how the water management institutions created and supported by the compact are functioning; and (3) assess the effects of MCC's investments on water resources and water conflict management. The evaluation draws on a document review, interviews with stakeholders, and focus group discussions with water users to answer its key research questions (Table V.2). For this evaluation, we interviewed MCA and ADP representatives, staff at the general directorate of the basin agency (DGAE), basin committee representatives, CLE representatives, WUA leaders, and staff at the Permanent Secretariat for IWRM at the Ministry of Water and Sanitation (Ministère

de l'Eau et de l'Assainissement). In addition, data collectors held focus groups with small water users involved in water conflict.

Table V.2. IWRM evaluation questions, approach, and data

Key questions	Analytic approach	Data sources
1. Was the project implemented as planned? 2. Have the SDAGEs been put in practice as planned? What are the primary factors influencing their implementation? 3. How well are the CLE and basin committee institutions functioning? What are the primary factors influencing their operation? 4. Are the water user/polluter fees (CFE) fully defined, and to what extent are they being collected? Are the funds from these fees being directed to the CLEs and the basin committees or to the national treasury? 5. What are the effects of IWRM on (a) water resources and (b) water conflicts?	Mixed-methods analysis featuring thematic analysis and triangulation of qualitative and quantitative data	• In-depth interviews with basin committee representatives, staff from the basin agencies responsible for implementing the SDAGEs, and board members from CLEs • Focus groups with small and large water users • Annual reports • Finalized MCA monitoring data

SDAGE = Schéma Directeur d'Aménagement et de Gestion de l'Eau; CLE = Comité Local de l'Eau; CFE = Contribution Financière en matière d'Eau; IWRM = integrated water resource management; MCA = Millennium Challenge Account.

To assess all research questions, we triangulated stakeholder accounts in interviews and focus groups with official monitoring data and accounts in published reports. In analyzing whether SDAGEs were put into practice (RQ2), we examined the extent to which regional directorates implemented the following core activities specified in the plans: (1) conduct rehabilitation activities, (2) conduct studies, (3) intervene to ensure safe drinking water, and (4) intervene in water conflicts. To examine how well CLEs were functioning, we assessed the extent to which they are fulfilling their core functions of (1) monitoring, (2) outreach, and (3) dispute resolution. Because we did not have access to administrative data on water user fees, we synthesized stakeholder accounts of fee collection (RQ4).

C. Findings

1. Was the project implemented as planned?

Stakeholders created IWRM institutions, but behind schedule. As planned, COWI supported the creation of the two basin committees and created all 10 CLEs during the compact period (Table V.3). However, there were substantive delays: according to administrative records,

creating and training the two basin committees took 38 months, compared to the planned 24 months. Similarly, CLEs were set up two years later than scheduled.

Table V.3. IWRM Sub-Activity benchmark performance

Indicator	Target	Achieved
Local Water Committees (CLEs) established and operational in the Comoé and Mouhoun Basins	10	10
Basin Water Resources Development and Management Master Plan (SDAGE) developed and validated	2	2
Basin committees established	2	2

IWRM = integrated water resource management; CLE = Comité Local de l'Eau; SDAGE = Schéma Directeur d'Aménagement et de Gestion de l'Eau.

Basin agency, basin committee, and CLE training was more limited in scope than initially conceived. After establishing basin committees and CLEs as legal entities, COWI staff trained the board of directors of the basin committees, directorate staff, and CLE staff on various technical aspects of resource management, including how to use the hydro-basin software. Although CLEs were scheduled to receive two training sessions, they received only one due to implementation delays. Basin agency staff noted that the available training did not cover some topics in depth—particularly topics outside of SDAGE development such as the basin-level hydrological models, for which only one staff member for the Comoé Basin and two for the Mouhoun basin were trained.

> **[The basin agency staff] have not benefited … from a real training like that … they designed ... conceived the software, came to present [the basin agency] the software, here is the software, without [the basin agency staff] really having a good knowledge of the software. "**
>
> ***—Basin committee member***

SDAGE development and validation were also delayed. In order to define a long-term vision of water resources planning and management, basin committees developed two SDAGEs. The SDAGE development process was scheduled to take 21 months, but ultimately took 38 months. This was generally attributed to delays with the inventory phase of the SDAGEs, which took much longer than anticipated, as well as delays associated with getting all stakeholder input at key points in the development process. Basin agency staff remarked that community stakeholders and water users weren't involved in initial SDAGE drafts, which were largely technical documents that outline water resources, their potential risks and strategies for resource management to address these risks. However, user's perspectives and expectations were gradually incorporated into later drafts of the SDAGEs.

> **At the beginning…it was really focused on technical documents and stakeholders on the ground were not sufficiently integrated…As soon as we had initial drafts of the SDAGE, we went to talk with the local populations to ask them about their problems with water management. What are their experiences? …. As a result this allowed to take into account the expectations of the users in the process of writing the SDAGE … In fact it's a consensus document and that tries to bring together all users who are affected by the basin."**
>
> ***—Former MCA staff***

2. Have the SDAGEs been put into practice as planned?

Basin agencies have put SDAGEs in practice, prioritizing critical activities. Developed by basin committees, SDAGEs were adopted by the Council of Ministers in 2014 and cover the period 2014–2030. Both basin agencies have adopted five-year implementation plans to operationalize activities under the SDAGE. Under these plans, both agencies currently conduct studies to increase knowledge about water resources—the primary objective of the first phase of the SDAGEs. In addition, basin agencies intervene as possible to ensure safe drinking water, conduct rehabilitation activities, and intervene in water conflicts. In interviews, basin committee representatives noted that the committees' efforts in recent years have prioritized securing and protecting riverbanks, ensuring people do not farm too close to these resources, as well as too close to areas that are highly degraded.

3. How well are the CLE and basin agency institutions functioning?

CLEs are operational in the post-compact period. CLEs are tasked with three core activities: (1) outreach to raise awareness of the importance of preserving and managing natural resources, (2) monitoring rivers, construction, and businesses, and (3) resolving disputes between large and small water users. In interviews, stakeholders affirmed that CLEs conducted each of these activities with some success. Shortly after they were established, CLEs worked closely with water users during sensitization campaigns to make sure the users were aware of and understood the integrated water management system that was being put in place, as well as inform them on a regular basis about the state of their water resources. The CLEs also focused on raising awareness about good water management practices and the protection of water resources through trainings and sensitization campaigns. CLEs also worked to get farmers along the riverbanks to stop agricultural production near water bodies to reduce pollution and riverbank destruction. Through the CLEs, water agencies also organized monitoring trips to inspect work being done on the different rivers. These trips allowed the agencies to have an idea of the current water flows as well as the amount of water that was available and could be mobilized, which helped the agencies implement an effective program for water distribution. CLEs were also an important component in the resolution process for water disputes, often playing a key role in mediating disputes between large water users (such as ONEA and SN-SOSSUCO) and small water users (market gardeners). CLEs often facilitated dialogues between the opposing sides to resolve conflicts surrounding water usage.

Examples of CLEs' outreach work

- Members of CLE Mouhoun Tougan conducted riverbank protection activities, reforestation activities, and campaigns to convince farmers to move their planting areas back, away from riverbanks, in an effort to protect the water from pollution.
- Members of CLE Banfora conducted campaigns to convince the public to not use non-approved pesticides, in an effort to reduce water contamination, undertook reforestation activities, and did water and soil conservation and restoration.

CLEs are taking an integrated approach to water resources management, as anticipated by the project. The key novelty of the IWRM approach to water resources management is that it integrates both environmental goals with the economic and health needs of affected populations. A particularly effective strategy that CLEs are using for riverbank rehabilitation is to provide a substitute for the agricultural activities conducted on riverbanks through fruit tree planting projects.

> **For water users, when you tell them you are doing a census, they think it is a way to take away their plots of land. Therefore, it's necessary to find ways to reassure them that in reality, it is not to take away their land. It's actually to protect the resources for them. That's why there is even the introduction of fruit plants, the fruit trees there to compensate ..., with the time it gives fruits and it is for them what. It can make up for the losses."**
>
> ***Basin agency staff***

Water users praised CLEs' outreach and monitoring work, recognizing the vital role CLEs play in allocating water. According to basin committee representatives, CLEs successfully keep the public informed about the state of the local water resources, train water users on good water management practices and protection of water resources, and effectively manage water allocations. In particular, public authorities praised CLEs' reforestation activities, riverbank protection efforts, and efforts to monitor the distribution of water to ensure users aren't taking more than their share.

> **"It's the CLE who controls the quantity of water to use, the amount of water that should flow to us farmers and market gardeners in the Comoé. If the CLE didn't exist, this work couldn't be done well."**
>
> ***– Small water user in Bandora***

Factors that limit basin agency and CLE operations are a lack of technical expertise and lack of data. During the compact, only a total of three basin agency staff received in-depth training—spanning 11 days over multiple sessions—on the use of the hydrological model. Even though some staff received training through other channels post-compact, the models do not seem to be in extensive use in both agencies, in some cases because of technical expertise, in others because of a lack of input data that is needed for the models to provide more accurate projections at sub-basin levels.

4. Are the water user fees being collected?

Basin agencies have difficulty collecting user fees. Basin institutions depend on water user fees to support their outreach and management activities, with each basin institution receiving a fixed share of the collected fees. In the Mouhoun Basin, the CLEs receive 20 percent of the *Contribution Financière en matière de l'Eau* collected, and the basin committee and the basin agency regional directorate each receive 40 percent. However, basin agency staff have difficulty collecting fees from various users with some fees litigated in court. Not all users are reliable in the payment of their fees and this affected the effectiveness of the basin institutions. A lack of understanding of how fees work and no clear enforcement mechanisms appear to stand in the way of better fee collection. In focus groups, water users reported being vaguely aware about their fee payment obligation, though not all knew exactly what amount was owed. Some water users remembered seeing flyers "around town," but they did not know who or how much to pay.

User fee shortfalls jeopardize IWRM institutions' sustainability. Water user fees, which were meant to provide dedicated funding for basin institutions, remain challenging to collect. Enforcement is a lengthy legal process to the point that contributions are, in practice, largely

voluntary. As a result, IWRM institutions lack funding to scale activities to fully meet their objectives of managing water resources.

5. What are the effects of IWRM on water resources and water conflicts?

IWRM institutions have influenced strategic development planning and annual agricultural planning at the basin level. As part of the development of the SDAGE in Mouhoun, the projections from the hydrological models were used to substantially limit the size of potential perimeters in the Samendéni Sub-Basin due to insufficient water resources. Similarly projections from the hydrological model are influencing annual agricultural planning in the Mouhoun Basin, for example, to inform staff from the Ministry of Agriculture how many hectares can be planted for a third season given available water resources.

> **"If I take for example the case of Sourou and Samendéni, they had planned to develop 21 thousand hectares [in Samendéni]…and it is thanks to the SDAGE that we could say no. With the water we have at our disposal there, we cannot develop all the 21 thousand hectares of Samandeni … you can do a maximum of 10 thousand hectares."**
>
> ***Basin agency staff***

Water users appreciate CLEs for their role in resolving conflicts and managing scarce resources. Conflicts arise both between small water users; as well as between large water users and small water users. The CLEs play a key role in helping water users sort out conflicts with each other. The CLEs are charged with bringing the conflicting water users together, gathering evidence and documentation, and making sure all users are being taken into account when resolving a water dispute. The collective management, that sought to be inclusive of all users, was a well-organized framework that helped facilitate constructive dialogue to find solutions to problems. The CLE has also been instrumental in disseminating information about the status of the water resources in the area. This way, water users are informed on whether or not there is a blockage or a problem further upstream that might affect them. Some water users mentioned that the CLE was a structure that could help regulate water availability, especially in times of scarcity, and it was truly beneficial to them.

> **"The [farming] activities in the rice fields by the rice growers benefit them, and us who do the market gardening earn a little, we produce lettuce, tomatoes, but the lack of water was a problem and it caused us difficulties and some of us saw our produce dry up, others saw their produce perish. But with the opportunities that the CLE gave us by overseeing water distribution, it has allowed us to save our [agricultural] production, this initiative gave us a slight improvement of the situation."**
>
> ***–Small water user Banfora***

General directorates are taking action to avoid health crises. One respondent from the Comoé Basin Committee gave an example of how the water analysis laboratories were used to support the general directorate of water in making sure people were drinking clean water. When they discovered in the commune of Berega that inhabitants were showing negative effects of drinking the water, they had the water tested and it

> **"In the case of Bérégadougou, we have just had a problem with the water from a borehole, and with the pesticides, the water is off ... we found that every time the inhabitants drank the water, they got pimples sticking out of their skins. When they contacted us…analyses were made, and it was found that the quality of the water was not [acceptable]. So we closed the borehole."**
>
> ***Basin agency staff***

showed it was contaminated with pesticides, the general directorate of water shut down the drilling in that area.

D. Summary of findings

We summarize key findings in Table V.4.

Table V.4. Key findings for the IWRM evaluation

Key finding	Discussion
Was the project implemented as planned?	**Despite substantial delays, all project targets were met.** Stakeholders successfully created the two basin committees and 10 CLEs that were planned, and developed the first two basin management plans (SDAGEs) in Burkina Faso. Although initial training and support for IWRM institutions were somewhat limited, basin committees successfully developed and validated the SDAGEs for the Comoé and Mouhoun Basins. The 10 planned CLEs were put in place by the end of the compact period.
Have the SDAGEs been put in practice as planned?	**Basin committees and water agencies are putting SDAGEs into practice as planned.** Using the SDAGE as guidance, basin agencies and basin committees have drafted multi-year plans that outline concrete plans for 5-year periods. Activities for the first five-year plan centered on knowledge of water resources.
How well are the CLE and basin committee institutions functioning?	**Post-compact, IWRM institutions are engaged in fulfilling their core functions at basin and local levels, but are constrained by available resources.** Basin agencies have conduct an inventory of water resources as part of the five year plan—the key target for the first multiyear plan. At the local level, CLEs successfully conduct outreach, monitoring, riverbank rehabilitation and dispute resolution activities. Specifically, water users and other stakeholders appreciate CLEs for their role in resolving water conflicts. However, lack of funding and capacity constraints keep the IWRM institutions from scaling activities to fully meet their objectives of managing water resources.
Are the water user fees being collected?	**Water user fees are being partially collected.** Water user fees being collected from large users, but due do lengthy legal enforcement, users —including mining companies—but enforcement is difficult so many companies pay fees voluntarily.
What are the effects of IWRM on (a) water resources and (b) water conflicts?	**IWRM institutions have influenced planning at the basin level.** IWRM institutions have influenced both strategic plans by placing limits on the development of additional perimeters, and the annual agricultural plans. **CLEs play an important role in resolving water conflicts.** The CLEs are charged with bringing together water users who are in conflict with each other, gathering evidence and documentation, and making sure all users are being taken into account when resolving a water dispute. Large and small water users, basin agency staff and Ministry of Water staff all highlighted the important role that CLEs play in reducing conflict and mediating water disputes.

IWRM = integrated water resource management; CLE = Comité Local de l'Eau; SDAGE = Schéma Directeur d'Aménagement et de Gestion de l'Eau.

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VI. FARMER TRAINING EVALUATION

A. Background

With funding of nearly $21.6 million, the Technical Assistance Sub-Activity of the DA Activity provided training to farmers and livestock holders with the goal of improving agricultural production techniques and income.[27] Mathematica is evaluating the farmer training component of this sub-activity, which aimed to train nearly 10,000 farmers, half of them women (ideally), from 30 villages in the Sourou Valley and Comoé Basin. The sub-activity was envisioned as providing farmers with training, technical assistance, and production inputs, which would enable them to develop modern agricultural practices and diversify their production, thus leading to sustainable increases in productivity, yields, and profits.

Conducted by AECOM, training and technical assistance focused on teaching farmers new production techniques applicable to both rain-fed and irrigated crops. To facilitate the adoption of crops and techniques featured in training, AECOM cultivated crops using the new techniques on validation and demonstration plots in communities in which trainings occurred, and distributed incentive kits containing agricultural inputs to farmers who participated in training and adopted new practices on demonstration plots. See Table VI.1 for a summary of the farmer training component, including training topics and performance targets.

Table VI.1. Summary information on the farmer training component of the Technical Assistance Sub-Activity

Objective	Enable farmers to increase their productivity, yields, and profits
Funding	$21.6 million
Target population	Farmers in 30 villages, 21 villages in Sourou and 9 villages in Comoé
Assistance	Use of validation and demonstration plots to reinforce concepts and practices from the theoretical training Training on compost production and use, pesticide and chemical fertilizer use, use of improved seeds, improved planting and harvesting techniques, crop rotation Incentive kits with certified seeds or plants, fertilizers, basic farm tools and sacks for post-harvest storage and selling
Implementer	AECOM (AD10)
Planned timeline	2011-2013
Performance targets	9,800 farmers trained, 50 percent female

[27] We have not been able to obtain disaggregated expenditures separately for the farmer training component.

B. Evaluation objectives, questions, and methods

The objectives of this evaluation are to (1) understand the implementation of the farmer training component of the sub-activity and (2) assess the effectiveness of the training and assistance provided to farmers. To accomplish the evaluation objectives, we will address several key research questions (RQ) found in Table VI.2. We use a mixed-methods approach that relies on qualitative and quantitative data sources, summarized below.

Table VI.2. Farmer training evaluation questions, approaches, and data

Key questions	Analytic approach	Data sources
1. Was the project implemented as planned?	Mixed-methods analysis featuring a thematic analysis of qualitative data	Administrative data—including ITT, achievement report, APD final report, Implementer report—and interviews and focus groups with implementers program participants
2. Have participating farmers used the incentive kits that they received as part of the training? Have they continued to invest in improved seeds/fertilizers?	Descriptive quantitative analysis	Interim survey data of trained farmer households
3. To what extent have farmers adopted or adapted the improved production practices proposed by the project?	Mixed-methods analysis featuring a thematic analysis of qualitative data	Interviews and focus groups with program participants and descriptive analysis of interim survey data
4. Do participating farmers diversify their crop production more than they did before the project?	Pre-post comparison	Baseline and interim survey data of trained farmer households
5. Have the participating farmers' yields per hectare, overall agricultural incomes and profits increased, decreased, or remained the same compared with their incomes and profits before the project?	Pre-post comparison	Baseline and interim survey data of trained farmer households

ITT = Indicator Tracking Table; APD = Agence de Partenariat pour le Développement.

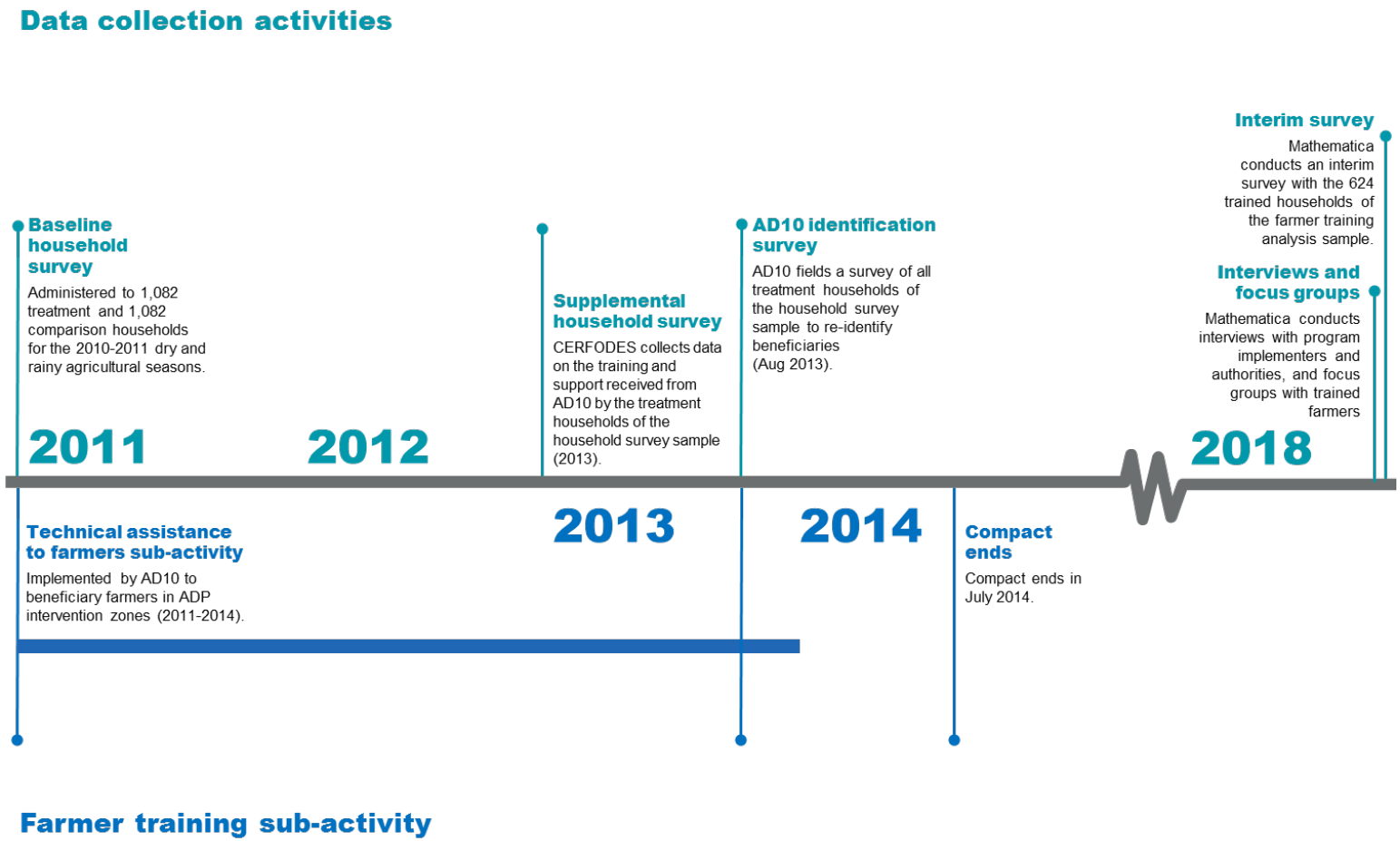
We use several data sources for this evaluation, including a **baseline household survey** administered in two rounds to 2,164 households between 2011 and 2012. The survey collected information on each household's demographics, agriculture and livestock activities, use of credit and expenditures, food security, and health. We present analyses on the subsample of 624 households who were identified as participants of the Farmer Training Sub-Activity through AECOM's **identification survey,** which was administered to all households in the treatment sample in August 2013. We also use the **supplemental household survey** to provide information on benefit receipt and usage of incentive kits. We also conducted an **interim survey** of trained farmers in January–March 2018. The interim survey collected data on farmer training,

agricultural practices and outcome, as well as water availability and farmers' payments and labor contributions to WUAs.

We also conducted **interviews** with former and current staff from MCA-BF and APD, staff from the regional directorate of the Ministère de l'Agriculture et des Aménagements Hydrauliques and **focus groups** with trained farmers and producer associations to obtain participants' perspectives on agricultural techniques featured in training.

To understand how the Farmer Training Sub-Activity was implemented relative to the plans for the sub-activity (RQ1), we reviewed project records, including the strategic plan, reports compiled by the implementers, administrative data such that was collected as part of the compact's M&E effort, and interview and focus group transcripts. To understand farmers' use of incentive kits and practices featured in training (RQ2-3), we used a descriptive analysis of interim survey data as well as farmer accounts from focus groups. To assess agricultural outcomes (RQ4-5), we conducted a pre-post evaluation in which we compared outcomes before the intervention (from the two rounds of the baseline survey in 2011 and 2012) with outcomes after the intervention (from the interim survey six years later in 2018) (Figure VI.1).

Figure VI.1. Timeline of farmer training data collection activities



C. Findings

1. Was the project implemented as planned?

As planned, AECOM used validation and demonstration plots to reinforce concepts from the theoretical training. Following the initial training plan, AECOM delivered training in 30 targeted communities. First, AECOM staff built validation plots in each community to ensure that featured training techniques could yield successful results in the region. Next, AECOM staff delivered theoretical training in each community, and helped a limited number of trained farmers to set up small demonstration plots in the communities. These demonstration plots allowed farmers to test the new practices and crops for themselves, and demonstrate their success to fellow farmers. AECOM staff noted that using demonstration plots worked remarkably well, as they allowed the larger population of trained farmers in each village to see the strong potential of new crops and practices firsthand, thus motivating them to diversify their production.

> **"... You bring the two technologies side by side. For example there is a [first] field where we use the traditional practices; there is a [second] field where we apply the technology we want to encourage. ... It was so convenient because you yourself are going to look at the old practice and look at the [new] technology [side by side]. The result is clear, so we do not even have to convince people …because they saw that [with the new technology] they could have the most return."**
>
> ***Former AECOM staff***

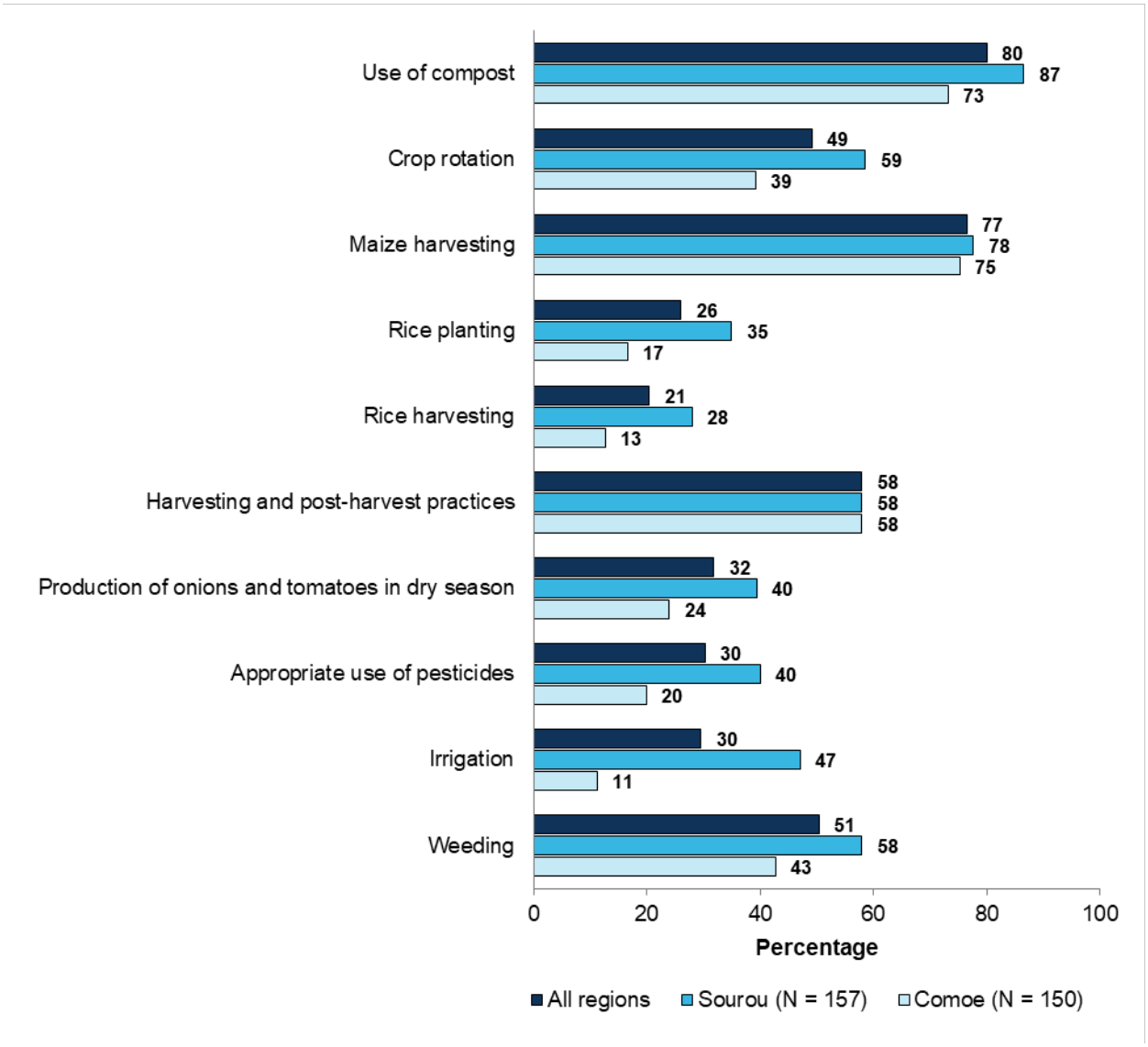
Training was tailored to farmers' level of education, personal interests, and geographic location. To accommodate the fact that many farmers could not read well, theoretical sessions on production and harvesting techniques featured visual materials that illustrated practices in action—as opposed to written materials. Although there was a standard menu of topics that training could cover, trainers selected topics in consultation with farmers in each class, so as to ensure that training covered the practices and crops of most interest. However, given different conditions across regions, focus crops generally varied somewhat by region: training in the Comoe Basin focused on the production of rice and vegetables (including cowpeas), whereas training in Sourou focused on the production of onions and tomatoes. Training in the Sourou Valley also put a greater emphasis on rice cultivation and irrigated agriculture, given farmers' access to rice plots or a plot on one of the Niassan perimeters. Training in both regions focused on input use and land preparation techniques—such as double ridging—for maize production during rainy and dry seasons.

> **And beyond that, there was what was called producer model fields [farmer field schools]. This was an opportunity to see in a practical way what we taught them. At the end of the theoretical sections […] there are practical parts on the ground. After that, there was the follow-up. The follow-up was [for the extension agent] to go and see if the producer put into practice on his field what we taught him."**
>
> ***Former AECOM staff***

Trained farmers most commonly reported receiving modules on compost use, maize harvesting, and general harvesting/post-harvesting practices. In follow-up surveys, most trained farmers reported receiving training on making and using compost as well as maize harvesting. About half of trained farmers report receiving training on general harvesting/post-

harvesting practices (Figure VI.2).[28] Onions were also a key focus in Sourou, with 42 percent of households receiving training on using high platforms for onion cultivation, and 20 percent reporting they received training on the cultivation of winter onions (not shown).

Figure VI.2. Percent reporting receiving training, by type and region



Source: Supplemental household survey (2013)

Note: Statistics shown are unadjusted means. The sample size is restricted to households that reported receiving training.

[28] Because trainers had the opportunity to tailor the content of their training modules to group members' interests, we do not know what the target percentage would have been for each topic. The figure primarily highlights the differences between regions.

Trainings were generally attended and well received by the farmers, but had some common drawbacks. The majority of farmers felt engaged in theoretical training and found that it was an effective way to learn and adopt new agricultural techniques. Farmers remarked that trainings were scheduled at a convenient time and the lessons were easy to understand. However, farmers also reported low teacher-to-participant ratios, scheduling and space issues, and some trainers' lack of mastery of the materials all served as barriers to farmers' full engagement and understanding of the material.

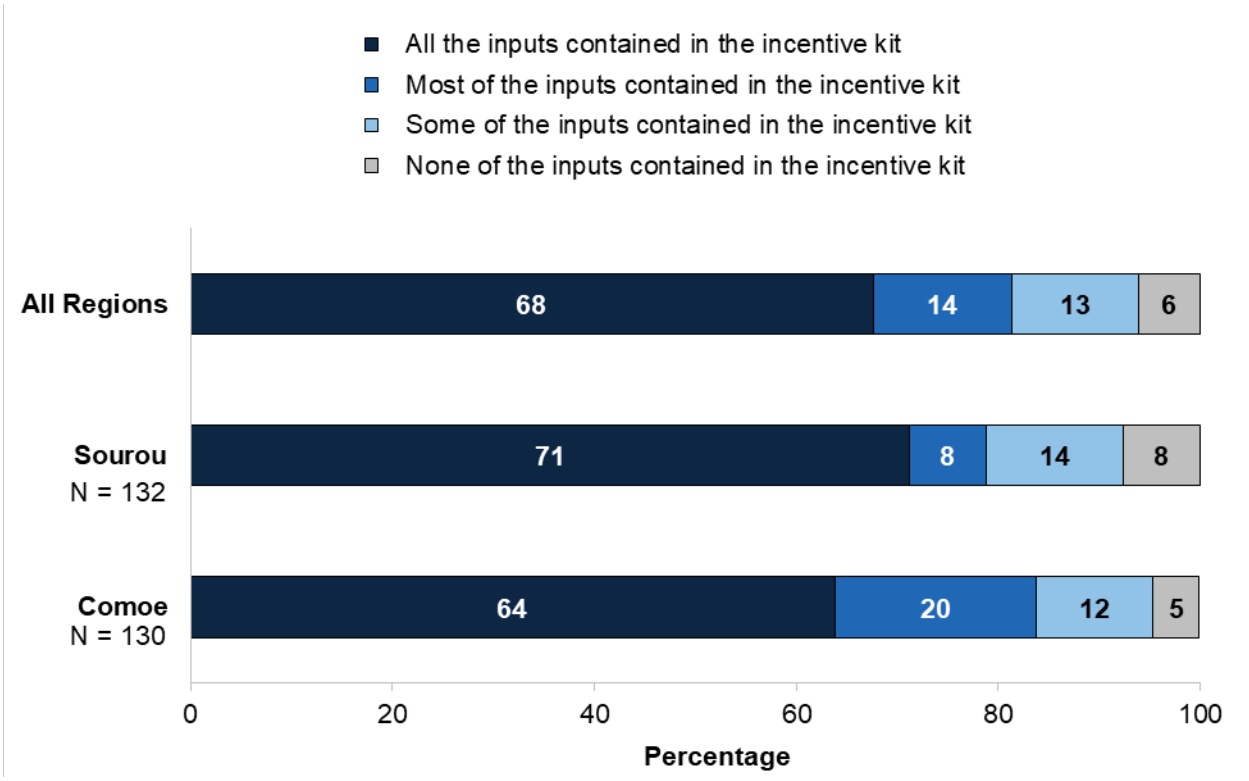
> **"Trying to teach 50 people how to use a technology, that isn't easy… When you have a big group, you try to keep everyone's interest, and that takes time. Even if you give one minute to each person, that's 40 minutes for 40 people. It wasn't easy, but those who really were interested, they followed along [the training]."**
>
> ***- Regional directorate of the Ministry of Agriculture***

Training and kit distribution exceeded initial targets, according to monitoring data. According to the MCA final report, implementers conducted training with over 9,900 farmers—exceeding the target of 9,800—and distributed 5,109 kits. About 30 percent of these farmers were beneficiaries of a plot on the Di perimeter and are not the focus of this chapter. The project slightly exceeded the target of 50 percent for the proportion of female training participants. According to the achievement report, implementers also conducted around eight follow-up technical assistance sessions per farmer, on average, to help them with demonstration plots or in adopting practices on their plots.

2. Have participating farmers used the incentive kits that they received as part of the training? Have they continued to invest in improved seeds/fertilizers?

In follow-up surveys, most trained farmers reported using the full contents of their incentive kits. The content of the incentive kits depended on the training received. All incentive kits included fertilizer and improved seeds—and kits for some training streams contained agricultural equipment such as a rotary hoe used in rice cultivation. Among households who reported receiving an incentive kit, over two-thirds used all of the contents, and four out of five used most or all contents of the kits. (Figure VI.3).

Figure VI.3. Use of contents of incentive kits received by region (self-reported)



Source: Supplemental household survey (2013).

Note: Statistics shown are unadjusted means. The sample size is restricted to households that received incentive kits.

Most trained farmers continue to use chemical fertilizer post-compact, but year-round use of improved seeds is not widespread. At the time of follow-up household surveys in 2018, nearly all trained farmers reported continued use of chemical fertilizer and insecticides, pesticides or herbicides (Table VI.3). However, use of improved seeds was relatively low in the Comoé Basin and the Sourou Valley during the rainy season. The use of improved seeds has decreased from the time of the baseline when close to 90 percent of households used improved seeds in the dry season and almost 50 percent in the dry season (Ksoll et al. 2018). During the dry season, about half of trained households reported using improved seeds, presumably for vegetable production. Use of organic fertilizer in the dry season was also relatively low, and somewhat surprising considering the emphasis that training placed on the year-round use of compost.[29]

[29] At baseline, roughly two-thirds (one-quarter) of households applied compost during the rainy (dry) season.

Table VI.3. Input use, by season (percentage)

	All	Sourou	Comoé
Household used input (rainy season)			
Chemical fertilizer	93	90	99
Organic fertilizer	74	68	83
Insecticides/pesticides/herbicides	87	80	97
Improved seeds	25	20	32
Household used input (dry season)			
Chemical fertilizer	69	78	56
Organic fertilizer	35	23	52
Insecticides/pesticides/herbicides	64	72	53
Improved seeds	53	55	51
Sample size (Farmer training)	**612**	**365**	**247**

Source: Interim survey (2018)

3. To what extent have farmers adopted or adapted the improved production practices proposed by the project?

Most trained farmers reported applying at least one technique from the training. Among farmers who AECOM listed as having been trained, 88 percent reported using a technique they learned directly from AECOM in follow-up surveys. This is notably higher than MCA's estimate that 67 percent of trained farmers applied the new techniques (MCA-BF 2014). New practices that were commonly adopted by farmers included double-ridging, cultivating onions on a high platform, soil management, and composting (Table VI.4).

Farmers did not report modifying or tailoring new practices. Farmers generally adopted the techniques as they were taught and demonstrated by AECOM, with little modification. In follow-up surveys, less than 5 percent of households reported modifying the technique they learned from AECOM.

Table VI.4. Adoption of ADP promoted agricultural practices (if taught), by region (percentages)

	All	Sourou	Comoé
Double ridging	89	84	100
Low platform	89	79	97
Use of mucuna as follow-on culture	72	62	NA
Onions on high platforms	85	84	NA
Winter harvest of onions	68	67	NA
Use of the rotary hoe in rice growing	76	76	NA
Soil management	73	75	71
Composting	63	52	77
Sample size (Farmer training)	**612**	**365**	**247**

Source: Interim survey (2018).

ADP = Agriculture Development Project.

Most farmers cited new practices' usefulness, time savings, and positive effects. In focus groups, most farmers reported that the training incentivized them to adopt distinct practices for the dry and rainy seasons for the first time. Specifically, farmers reported that mulching, double-ridging, low platforms, and organic fertilizer (through composting) allowed them to increase their yields. In addition, vegetable crop preservation practices helped the farmers avoid rot in their tomatoes and onions in the Sourou Valley. However, farmers reported that soy cultivation practices featured in training were not useful, because there was no market for soy, and it was no longer grown in the perimeter.

4. Did participating farmers diversify their crop production?

Farmers shifted to onion production in Sourou in the dry season and cowpeas in the rainy season in Comoé. This suggests that farmer training may have had a lasting effect on farmers' production, given that farmers appeared to shift into high-value crops featured in training in both regions (Figures VI.4 and VI.5). In follow-up surveys, trained farmers also reported transitioning to producing maize in both regions during the rainy season. This may also reflect some influence of farmer training, as maize harvesting techniques figured prominently in the training modules.

Figure VI.4. Pre-post changes of area planted by season with focus crops in Sourou (in hectares)

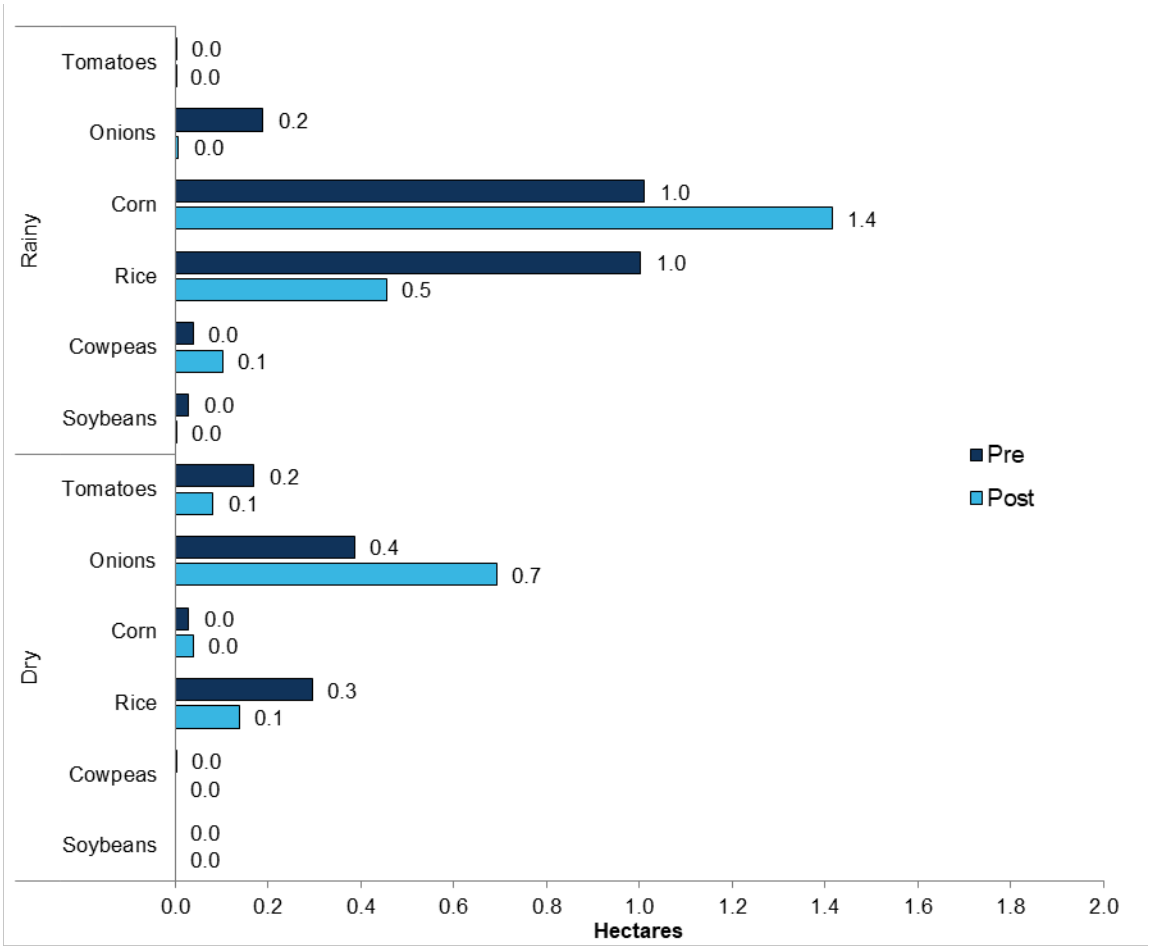
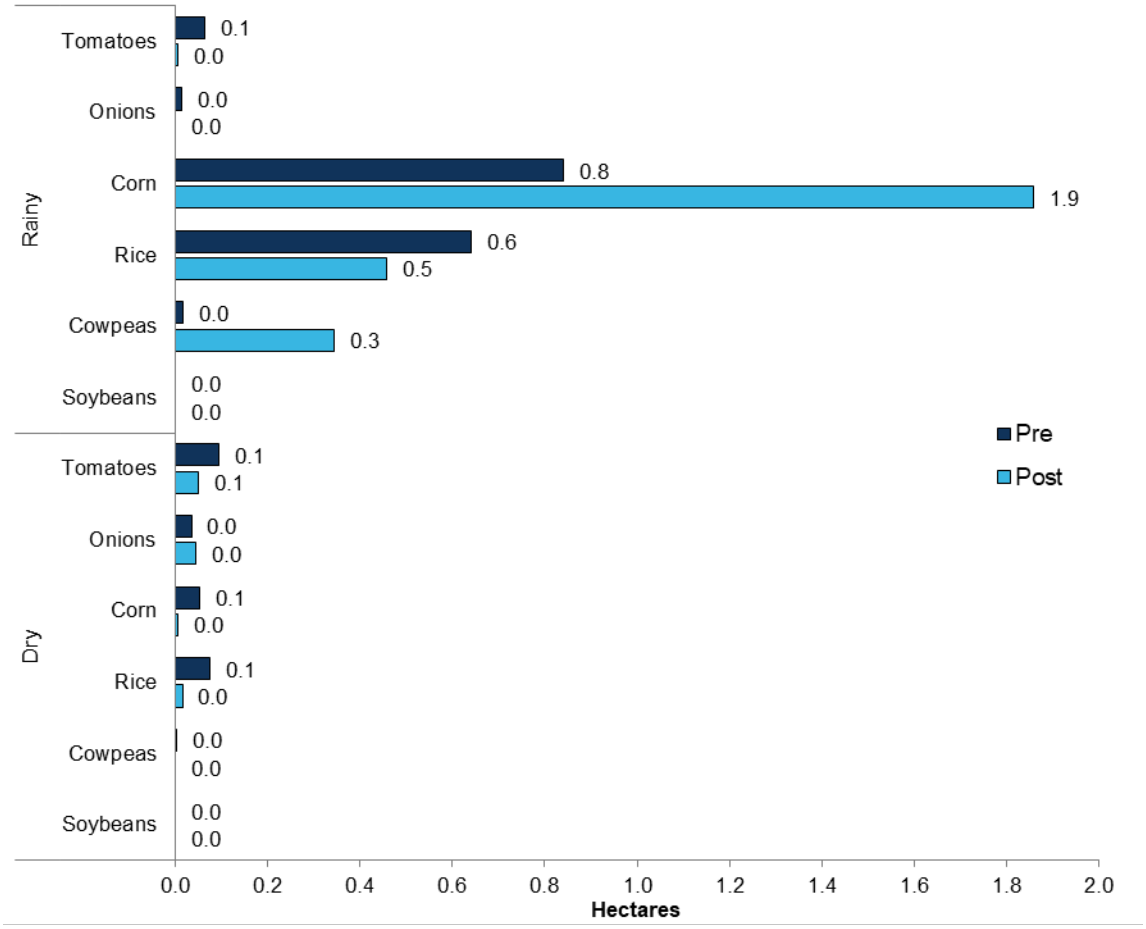


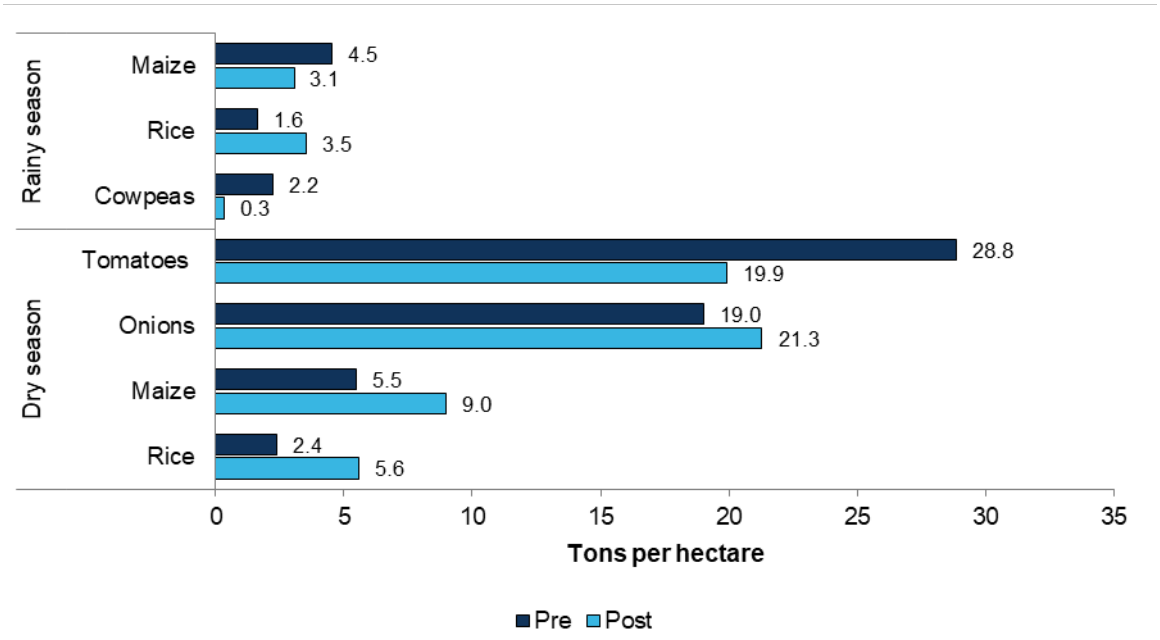
Figure VI.5. Pre-post changes of area planted by season with focus crops in Comoé (in hectares)



5. Have the participating farmers' yields per hectare, overall agricultural incomes and profits increased, decreased, or remained the same?

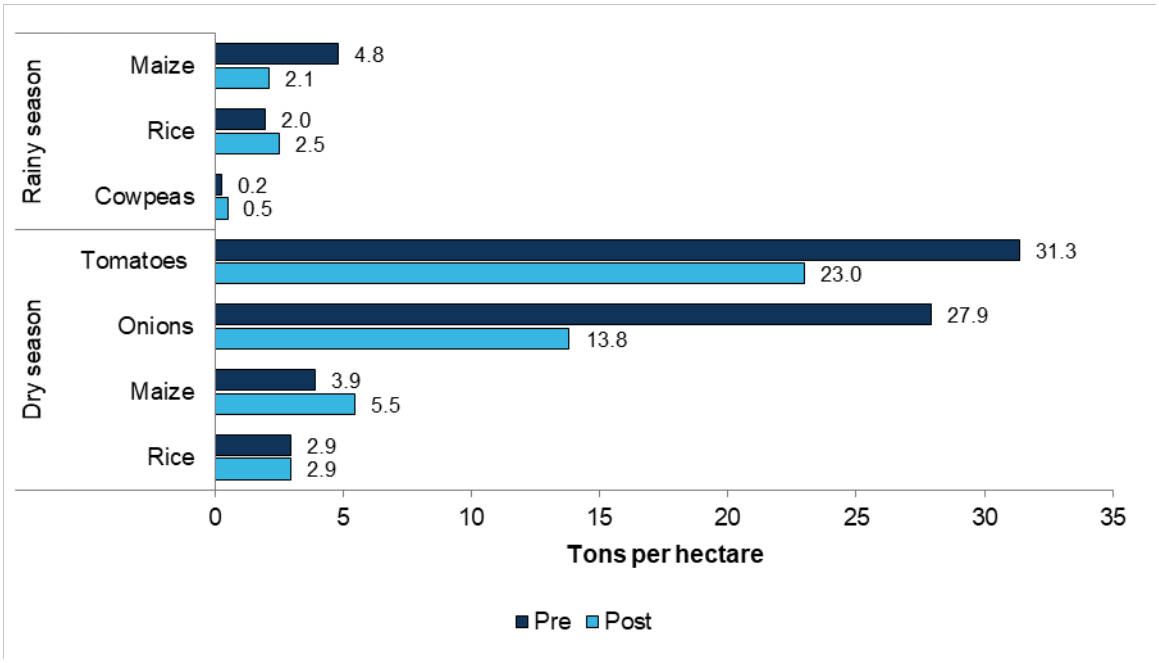
Trained farmers had lower yields per hectare following training, likely due to below-average rainfall in 2017. Based on household surveys conducted in 2018, trained farmers in both regions reported substantially lower yields per hectare for most focus crops in the 2017 rainy season compared to the 2011-2012 rainy season—including maize and cowpeas. This is consistent with trends in national production during this period, given below-average rainfall in Burkina Faso in 2017. However, farmers' yields of irrigated maize and rice in the dry season were higher in the post-training period, suggesting some positive effects of training modules on maize and rice production—as well as potential positive effects of some trained farmers' newfound access to irrigation as a result of Di perimeter construction.

Figure VI.6. Pre-post changes in yields per hectare by season of focus crops in Sourou (in tons/hectare)



Note: Yields are not presented for tomatoes and onions in the rainy season because there were too few observations to estimate reliable average yields.

Figure VI.7. Pre-post changes in yields by season per hectare of focus crops in Comoé (in tons/hectare)



Note: Yields are not presented for tomatoes and onions in the rainy season because there were too few observations to estimate reliable average yields.

Annual profits decreased in both regions relative to before training was implemented region. Trained farmers in both regions reported lower profits in the 2016-2017 dry season compared to the 2011-2012 dry season, and lower profits in the 2017 rainy season compared to 2011-2012 (in constant 2011 FCFA). This was potentially due to the low levels of rainfall affecting agricultural production as well as wholesale price decreases associated with increased production of onions in the region (Table VI.5).[30]

Table VI.5. Pre-post changes in agricultural profit (in 1,000 FCFA)

	2011-2012 (Pre)	2017-2018 (Post)	Difference
Sourou	991	814	-177
Comoe	870	735	-135
Total	**940**	**782**	**-158**

D. Summary of findings

We summarize key findings in Table VI.6.

Table VI.6. Key findings for the Farmer Training evaluation

Research question	Key finding
Was the project implemented as planned?	The sub-activity exceeded the training targets, and the proportion of trained households in target communities was high. Trainings were generally well received by the farmers, although they reported low teacher-to-trainee ratios and logistical complications.
Have participating farmers used the incentive kits that they received as part of the training? Have they continued to invest in improved seeds/fertilizers?	In follow-up surveys, most trained farmers reported using the full contents of their incentive kits. As of 2018, most trained farmers continued to use chemical fertilizer, but year-round use of improved seeds and organic fertilizer was not widespread.
To what extent have farmers adopted or adapted the improved production practices proposed by the project?	Trainees generally adopted the new practices and many continue to apply them. Citing the new practices' usefulness, time savings, and positive effects on yields, trained farmers continue to apply the techniques they learned from AECOM, particularly soil management, double-ridging, composting, and cultivating onions on a high platform.
Do participating farmers diversify their crop production more than they did before the project?	Trained farmers have substantially changed their cropping patterns, shifting cultivation to project-promoted focus crops. Trained farmers in Sourou are now more likely to grow maize and onions during the dry season, whereas trained farmers in the Comoé Basin have transitioned towards cowpea production.

[30] If the evaluation design had relied on a counterfactual—for example, by including other regions with similar baseline characteristics—the analysis would have been able to control for low levels of rainfall. However, Ksoll et al. (2017) document that the villages initially chosen as comparison villages had substantially different cropping patterns in the dry and rainy seasons.

Research question	Key finding
Have the participating farmers' yields per hectare, overall agricultural incomes and profits increased, decreased, or remained the same compared with their incomes and profits before the project?	Yields of primarily rain-fed crops were substantially lower in the period covered by the interim survey than they were at baseline, most likely due to the below-average rainfall in the country. Overall profits were also lower in 2017 than they were in 2011-2012.

VII. RURAL MARKETS, MIS AND INTEGRATION OF DA ACTIVITIES

A. Background

In addition to farmer training, the DA Activity included various market-related components designed to reduce transaction and marketing costs and thus increase agricultural incomes. The Rural Markets Sub-Activity—which sought to improve market conditions—funded (1) the establishment and training of nine market committees; (2) the rehabilitation of four rural markets; and (3) an outreach campaign to provide vendors with information on hygiene, parking, safety, and taxes. Three of the markets that MCC selected for rehabilitation were located in the Sourou Valley and one was in the Comoé Basin, the regions in which ADP farmer training was conducted.

The DA Activity also funded the creation of an MIS, which sought to enable producers to make more informed marketing and production decisions by providing timely information on prices. To get price information about a product, farmers would be able to either (1) send an SMS at the nominal rate of 10 CFA (around 2 cents) and receive a response free of charge or (2) phone a call center at current rates for calling. The sub-activity implied an investment in staff that could maintain the MIS with up-to-date prices, as well as respond to phone and SMS requests for price information. Table VII.1 provides more information on the sub-activity, including its funding, implementers, and performance targets.

Table VII.1. Summary information on the Rural Markets Sub-Activity

Objective	Improve farmers' market access
Funding	Rural markets: 5.48M
Target population	Farmers in Sourou and Comoé who participated in MCC-funded farmer training
Assistance	(1) Establishment and training of market committees (2) Rehabilitation of rural markets (3) Outreach campaign in newly rehabilitated markets (4) Creation of an MIS (5) Staffing and training employees to maintain MIS and fulfill requests
Implementer	• Rural markets: GERBA-AT, VMAP-B, S.ART.DECOR (AD12) • MIS: AECOM (AD10)
Planned timeline	Duration of compact
Performance targets	• Nine market committees established and trained • Four rural markets fully rehabilitated • Functional MIS with access to up-to-date market prices and weather information

The rural market strengthening and rehabilitation efforts and MIS sub-activity served as complementary investments to MCC-funded farmer training and Di perimeter construction. The new MIS and market improvements were to have been introduced along a time frame similar to that of other ADP activities, such that farmers who received training—and in some cases, land on the perimeter—could sell their newly diversified production at rehabilitated markets, thus reducing transaction and marketing costs. These farmers could also use MIS pricing data to make more informed production and marketing decisions, leading to higher net income.

B. Evaluation objectives, questions, and methods

In this chapter, we present our final findings with respect to the evaluation of rural markets, MIS, and integration of DA activities—namely the extent to which farmers who received training and land through the ADP also benefited from the project's investments in rural markets and an MIS. The evaluation also investigates the current functioning of the MIS and the rehabilitated rural markets. (The market committee strengthening and outreach campaign activities, however, are outside the scope of this evaluation.) The evaluation answers the research questions in Table VII.2 through a performance evaluation design that draws on qualitative and administrative data sources.

Table VII.2. MIS and market rehabilitation evaluation questions and approach

Key questions	Analytic approach	Data sources
1. To what extent were the various ADP components implemented in a cohesive way? If not, why not? 2. Are the rural markets and the MIS functioning and being used by farmers who benefited from technical assistance or received land in the Di perimeter?	Mixed-methods performance evaluation featuring a thematic analysis of qualitative data	• Interviews with MCA implementers • Administrative data • Data from surveys with ADP-assisted farmers

To evaluate the extent to which the project components were implemented in a cohesive way (RQ1), we reviewed project documentation, conducted in-depth interviews with people who were involved in the implementation, and analyzed data from the farmer training evaluation. For this analysis, we define cohesive implementation as (1) provision of multiple forms of assistance along the value chain—including inputs, planting, harvesting, post-harvest processing, and marketing—to farmers who received training in agricultural production so as to meet all their agricultural needs; and (2) timely sequencing of the assistance activities to help participating farmers maximize their net income. To determine whether the MIS and rural markets were functioning as intended (RQ2), we conducted site visits to the markets and tested the MIS system by submitting price queries. For this analysis, "market functionality" means that most market structures are being used by sellers and buyers for their original intended purposes. To assess whether beneficiaries are using the markets and MIS in the post-compact period, we conducted descriptive analyses of quantitative data from the farmer training survey.

C. Findings

1. Were the various ADP components implemented in a cohesive way?

Delays and logistical issues complicated the sequencing and coordination of farmer training and marketing assistance. According to the initial project design, farmers who completed training in agricultural production would shortly thereafter be trained in post-harvest agricultural processing, which would position them to add value to their new production at post-harvest. However, according to program implementers, in practice this did not often occur. Rather, projects were implemented along their own individual timelines. The implementers generally cited bureaucracy and the involvement of multiple actors as reasons that most farmers who completed training in production did not receive post-harvest assistance, or did not receive post-harvest assistance soon after training in production was complete.

> **"Everything [in the DA Activity] was coordinated so that it could be sequenced ... so that we should go from one point A to a point B and know that if A ended, then B, and as soon as B is going to finish, it is C who starts. ... All this could not be done really ... mainly because the procurements dragged on a lot at some level, the non-objections, the misunderstandings and many changes of personnel at a higher level—notably at the level of the heads of projects ... at times when they should not have."**
>
> ***Former MCA staff***

Although not all households received every benefit, many households in the farmer training sample reported receiving multiple benefits through the ADP. As noted, the ADP planned to relieve constraints for farmers all along the agricultural value chain, from cheaper inputs through new linkages with input providers to training in production and post-harvest agricultural processing techniques and to better commercial access through markets and the MIS. A survey of ADP-trained farmers reveals that about half of farming households reported being put in contact with input providers, particularly in the Comoé Basin. Furthermore, around two-thirds of trained farmers also participated in training in post-harvest agricultural processing, and about 40 percent of trained farmers indicated that they were part of a cooperative that also received ADP training (Table VII.3). This suggests that APD-assisted farmers did indeed receive assistance at the points of input, planting, harvesting, and post-harvesting in the value chain, thus increasing their chance of adding value during production and commercialization. However, only a small proportion of trained farmers reported that they received training on the use of the MIS, which points to potentially missed opportunities in helping farmers commercialize their production.

Table VII.3. Receipt of other ADP project benefits, by region

ADP project benefit	Total	Sourou	Comoé
Received training in post-harvest agricultural processing	64	53	79
Was put in contact with input providers	48	37	66
Was a member of a producer association that received ADP training	39	35	44
Received training on MIS	11	12	11
Received training on raising chickens	15	17	13
Received training on rearing cows	13	20	4
Had access to Di plot	N/A	29	N/A
Sample size (Farmer training)	**612**	**365**	**247**

Source: Interim survey (2018).

A substantial proportion of farmer training beneficiaries have access to the Di perimeter. Twenty-nine percent of farmers in Sourou who received farmer training technical assistance currently have access to land in the Di perimeter. This finding is interesting, given that there was no explicit target for access to Di perimeter land among ADP-trained farmers. This is a positive development, as it illustrates that a sizable portion of trained farmers in Sourou currently have access to irrigated land, thus allowing them to apply the techniques they learned in training.

2a. Are the rural markets functioning and being used by ADP-assisted farmers?

By the end of the compact, new markets were in good condition and well equipped. Three firms, GERBA-AT, VMAP-B, and S.ART.DECOR, had rehabilitated the four rural markets and set up market management committees by the end of the compact. During site visits in 2018, all markets had good infrastructure, including small booths, designated buildings for women, functioning toilets for men and women, and designated parking areas (Table VII.4). The Di and Gassan markets have the additional advantage of being fully electrified, with the exception of toilet blocks.

Table VII.4. State of rural markets in the post-compact period

Condition of markets	Di	Gassan	Gouran	Soubakaniedougou
Market buildings				
Infrastructure is in good condition	X	X	X	X
Small booths for individual merchants	X	X	X	X
Large structures for shops	X	X	X	
Market is electrified	X	X	X	
Toilets				
Toilet blocks in good condition	X	X	X	X
Toilet blocks are electrified				
Toilets have working hand-washing stations	X	X	X	
Parking				
Designated parking for trucks	X	X	X	X

The rural markets at Di, Gassan, and Gouran are largely functioning as intended. Data collators' site visits to each location on market day indicate that both small and large producers—who sell onions, tomatoes, rice, maize, and beans, among other crops—frequent the markets in the Sourou Valley (Di, Gassan, and Gouran). Although the site visit was conducted at the end of the dry season, observers reported that the majority of the buildings were occupied and being used according to plan, including small booths, large structures, and toilets. The main buildings tended to be occupied mostly by men, who comprise the majority of farmers and merchants. The round buildings, in accordance with the original design, are reserved and used by women.

However, some parking areas are used for sales and some butcher blocks are unoccupied. Although there is designated parking for trucks at all four markets, parking areas are not well respected and merchants can be found selling goods alongside trucks. In addition,

some butcher blocks remain empty while butchers grill and sell meat in other spaces around the market, given the restriction on grilling meat indoors and the price of renting butcher blocks.

The Di market is the most popular market, whereas the Soubakaniedougou market is only partially utilized. The Di market in particular has a geographical advantage: Its proximity to the Di perimeter and the Niassan perimeters, and its location on the major road in the region, make it strategic not just for regional farmers but also for large merchants from distant areas. Although all the markets are about the same physical size, program implementers and site visits reported Di to be the busiest of the four markets, with more people present and more crops and merchandise for sale. In contrast, the Soubakaniedougou market is still not well used by farmers in the region. The market buildings are in good condition, but the majority are empty. Implementers who were interviewed attributed the market's lower usage rates to its lack of electricity or working hand-washing stations, as well as to the local population's reluctance to use the market because it was not inaugurated with animal sacrifices when it first opened.

ADP-assisted farmers do not appear to be using the rehabbed markets as envisioned. Rehabilitated markets had greater potential to affect the behavior of farmers in Sourou Valley relative to Comoé Basin, who before the compact had few venues for selling their products commercially. However, farmers in Sourou Valley continued to sell most of their cash crops at their house or field in 2018, thus forgoing the chance to get a higher price at rehabilitated local markets (Table VII.5).[31]

Table VII.5. Place of sale of ADP-assisted farmers' crops, by region (percent)

	Total	Sourou	Comoé
Sells onions at house or field during dry season (if cultivated)	87	92	49
Sells onions at local market during dry season (if cultivated)	11	5	51
Sells cowpeas at house or field during rainy season (if cultivated)	35	50	30
Sells cowpeas at local market during rainy season (if cultivated)	40	27	44
Sold any processed crops during the rainy season	0	0	0
Sold any processed crops during the dry season	1	0	1
Sample size (Farmer training)	**612**	**365**	**247**

Source: Interim survey (2018).

Note: MIS usage asked only of PAP households, not farmer training households.

2b. Is the MIS functioning and being used by ADP-assisted farmers?

The MIS was rolled out in 2012, and continues to operate with a sizable support staff. In 2012, the MIS provided price information on 28 agricultural goods (crops and livestock) for 19 regional and provincial markets, including the 9 markets that the ADP supported as part of the Rural Markets Sub-Activity. In July 2014, the MIS was transferred to a private operator called

[31] Although the majority of farmers in the Comoé basin reported selling their cash crops in the Bafora market, this was likely already happening before the project because the market in Banfora was active before rehabilitation activities began.

EcoData. EcoData employs 15 supervisors and 50 interviewers, who are stationed in 10 regions of Burkina and cover 37 markets. They are charged with collecting and updating price information on a variety of products on market days.

As of 2018, the MIS was not fully functional for the project areas. EcoData is not collecting price information for the Soubakaniedougou and Gouran markets. However, EcoData attempts to gather and share updated price information for crops sold in the four markets in or close to project areas: Tougan, Gassan, Di, and Banfora. Data collectors could not test Di because of issues with phone connectivity.[32] To test the other three markets, data collectors called or sent SMS requests on four separate occasions during market days to get prices for each of the 14 different crops covered by the system. Out of 168 separate requests, or 56 requests for each market, STAT DEV received price information only 54 times—a fulfilment rate of one out of every three attempts (Table VII.6). This low fulfillment rate across all three markets suggests that the MIS is not very dependable or useful, even among farmers who can make requests via SMS or phone calls.

Table VII.6. MIS performance, 2018

	Banfora	Tougan	Gassan
Number of requests placed	56	56	56
Number of times prices were received	20	16	18
Response rate (percentage)	36	29	32

SMS requests for weather information are far more common than requests for prices. According to administrative records, EcoData received nearly 50,000 weather forecast requests by SMS—86 percent of all requests—from across Burkina Faso in 2017. Phone calls related to weather forecasts and prices made up 12 percent of all requests. The nearly 1400 SMS requests for prices were only 2 percent of EcoData requests for the year.

DA-assisted farmers in project areas do not generally use the MIS, but farmers in the Comoé who do use it appreciate its benefits. According to interim surveys with trained farmers, only around one in 10 APD-assisted families in the Comoé Basin used the MIS (Table VII.7). These farmers appreciated having advance information on pricing via the MIS. Participants in focus group discussions in the Comoé Basin who did not use the MIS pointed to their illiteracy as the main constraint to its use. Participants in focus group discussions in Sourou were simply unaware of the existence of the MIS.

" [The MIS] gives you an idea of the prices at which you could sell. So you know how best to keep [the crop] to make a profit when you do sell."

Farmer training participant, Comoé

[32] Only Onatel and Télecel networks could be used for MIS testing, as there were technical difficulties with the Orange network.

Table VII.7. Trained farmers' use of MIS by PAPs

	Sourou
Use of MIS in last two years (percentage)	11
Sample size (PAP households)	**273**

Source: Interim survey (2018).

Note: MIS usage asked only of PAP households, not farmer training households.

D. Summary of findings

Our key findings on rural markets, MIS, and integration of DA activities are summarized in Table VII.8.

Table VII.8. Key findings for the evaluation of rural markets, MIS, and integration of DA activities

Key finding	Discussion
To what extent were the various ADP components implemented in a cohesive way?	**The project achieved good overlap in benefits for farmer training participants.** Although not all households received every benefit, many households in the farmer training sample reported that they received a variety of benefits through the ADP, including being put in touch with input providers, participating in training modules on post-harvest agricultural processing, and—for almost 30 percent of trained farmers—access to land on the Di perimeter.
Are the rural markets functioning and being used by farmers who received ADP benefits?	**Three of the four rehabilitated markets are functioning as intended, but few trained farmers in Sourou sell their cash crops at the markets.** New markets are in good condition, well equipped and well lit. The rural markets at Di, Gassan, and Gouran are largely functioning as intended, whereas the Soubakaniedougou market is only partially used because it lacks electricity, has non-functional hand-washing stations, and farmers are reluctant to use the market because it was not inaugurated with a traditional inauguration ceremony when it first opened. Farmers in Sourou mainly continue to sell cash crops like onions and tomatoes directly from their plots.
Is the MIS functioning and being used by farmers who received ADP benefits?	**The MIS is only partially functional, and it is rarely being used in project areas.** As of May 2018, requests to the MIS for prices were generally unfulfilled in the two project areas, and the MIS only had pricing information on a portion of MCC-supported markets. Moreover, the MIS is not widely known or used by farmers in the two regions.

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APPENDIX A

DI LOTTERY ADDITIONAL MATERIALS

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Table A.1. Di Lottery scoring sheet

Criterion		Points	Maximum in category
Documented number of adults or adolescents age 15 and older available to work on the land, in addition to applicant			20
If first choice is to receive plot for growing rice (2 hectares)			
	At least 4 per hectare (8 total)	20	
	At least 3 per hectare (6 total)	15	
	At least 2 per hectare (4 total)	10	
	Fewer than 2 per hectare	0	
If first choice is to receive polyculture plot (1 hectare)			
	At least 6 per hectare	20	
	At least 5 per hectare	15	
	At least 4 per hectare	10	
	Fewer than 4 per hectare	0	
Ownership of agricultural tools and draft animals			10
	None	0	
	Animal-drawn cart	5	
	Animal-drawn cart and plow	10	
Technical trainings on agricultural production attended by the applicant			5
	None	0	
	Attended at least one	5	
Applicant's technical experience in irrigated agriculture			15
	None	5	
	Less than 2 years	10	
	More than 2 years	15	
Gender			5
	Female	5	
	Male	0	
Age			5
	Between 18 and 30	5	
	Between 31 and 55	3	
	Age 56 and older	1	
Level of debt			10
	No arrears	10	
	Arrears less than or equal to 100,000 FCFA	6	
	Arrears of more than 100,000 FCFA	0	
Current residence			15
	Village in the rural commune of Di	15	
	Sourou Province	10	
	Mouhoun Region	5	
	Rest of the country	0	
Has a title to a plot in another AMVS perimeter			15
	Yes, at least one	0	
	No	15	
Total/maximum			100

Table A.2. Main and robustness specifications for the Di Lottery analysis

Specification	Covariates
Basic	Treatment indicator Preference strata
Main	Treatment indicator Preference strata Number of household members listed on the application, gender Access to land • Number of plots the applicant owns, rents, or has communal access to • Applicant rents any plots • Number of irrigated plots rented by applicant • Hired labor on rented land Household members have property rights • Number of household members with property rights • Number of plots household members own Income source: Sales of agricultural production in rainy season (FCFA) Income source: Sales of agricultural production in dry season (FCFA)
Including eligibility criteria	Covariates in the main specification, as well as the eligibility criteria for the lottery (listed in Appendix Table A.1).

Table A.3. Impact on survey response (percentage)

Outcome	Treatment group mean	Control group mean	Difference	*p*-value of difference
Survey response	98	92	6	<0.01***
Sample size (Di Lottery participants)	**476**	**983**		

Source: Interim Survey (2018); Sampling frame for Interim Survey.

Note: Survey response of at least one household originating from Di Lottery participant household.

*Significantly different from zero at the .1 level, two-tailed test.

**Significantly different from zero at the .05 level, two-tailed test.

***Significantly different from zero at the .01 level, two-tailed test.

Table A.4. Land access, crop cultivation, and agricultural practices for Di Lottery applicants and their households (rainy season)

Outcome	Treatment group mean	Control group mean	Estimated Difference	*p*-value of difference
Total area cultivated: Rainy season (ha)	2.8	2.1	0.6	<0.01***
Crop cultivated during rainy season (percent)				
Tomatoes	0	0	0	0.10*
Onions	1	0	1	0.25
Corn	86	74	12	<0.01***
Millet	13	20	-7	<0.01***
Sorghum	9	16	-7	<0.01***
Rice	38	22	16	<0.01***

Outcome	Treatment group mean	Control group mean	Estimated Difference	*p*-value of difference
Beans	13	22	-9	<0.01***
Cowpeas	3	6	-3	0.05*
Peanuts	11	18	-7	<0.01***
Hired labor (any plot): Rainy season	56	40	16	<0.01***
Use of agricultural inputs during rainy season (percentage)				
Chemical fertilizer	96	76	20	<0.01***
Organic fertilizer	48	55	-7	0.02**
Phytosanitary products	83	64	20	<0.01***
Improved seeds	29	18	12	<0.01***
Number of different types of modern agricultural equipment used in the rainy season	2.51	1.66	0.85	<0.01***
Sample size (Di Lottery participants)	**489**	**923**		

Source: Interim survey (2018).

*Significantly different from zero at the .1 level, two-tailed test.

**Significantly different from zero at the .05 level, two-tailed test.

***Significantly different from zero at the .01 level, two-tailed test.

Table A.5. Impact on main outcomes by gender (in 1,000 FCFA)

	Female				Male			
Outcome	Treatment group mean	Control group mean	Estimated Difference	*p*-value	Treatment group mean	Control group mean	Estimated Difference	*p*-value
Revenue from agricultural sales	1824	874	950	<0.01***	1353	586	767	<0.01***
Agricultural profits	872	516	356	<0.01***	614	327	287	<0.01***
Agricultural income	947	586	360	0.01**	641	361	280	<0.01***
Total household income	1166	853	313	0.06*	809	553	257	<0.01***
Sample size (Di Lottery participants)	**105**	**142**			**369**	**676**		

Source: Interim Survey (2018).

Note: Agricultural income includes agricultural profit, income from agricultural land rental, income from agricultural employment and from transformation of agricultural products.

*Significantly different from zero at the .1 level, two-tailed test.

**Significantly different from zero at the .05 level, two-tailed test.

***Significantly different from zero at the .01 level, two-tailed test.

Table A.6. Robustness checks for the Di Lottery analysis (1,000 FCFA)

Outcome	Main specification (*q*-value)	No covariates (*p*-value)	With eligibility criteria as covariates (*p*-value)	Without multiple applicant households (*p*-value)	Alternative treatment variable (*p*-value)	Inverse hyperbolic sine transformation (*p*-value)
Agricultural sales revenue	800***	787***	813***	765***	753***	3.95***
	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
Agricultural profits	296***	270***	316***	278***	274***	2.89***
	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
Agricultural income	292***	270***	307***	275***	270***	2.28***
	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
Total household income	260***	221***	273***	216***	250***	0.84
	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.21)
Number of observations	**1294**	**1405**	**1192**	**1266**	**1294**	**1294**

Source: Interim Survey (2018)

Note: Column 2 presents estimated impacts for the main specification and q-values based on standard errors corrected for multiple hypothesis testing as outlined in the design report. Column 3 presents estimates from a regression includes preference strata as only set of covariates. Column 4 includes eligibility criteria in addition to the covariates from the main specification. Column 5 presents estimates excluding multiple applicant households. Column 6 provides estimates using an alternative treatment variable: this considers applicants on the waiting list as treated if they were added to the waiting list because their preferred type of plot was not available. Column 7 estimates the impact on the inverse hyperbolic sine transformation of the key outcomes.

Table A.7. Impact heterogeneity by eligibility criteria (in 1,000 FCFA)

Scoring criteria	Revenue from agricultural sales	Agricultural profits	Agricultural income	Total household income
Di Lottery	581	74	222	88
	(<0.01***)	(0.65)	(0.24)	(0.71)
Number HH members	-18	-14	-3	-22
	(0.54)	(0.54)	(0.90)	(0.50)
Number HH members * Di Lottery	53	54	17	41
	(0.29)	(0.15)	(0.70)	(0.44)
Di Lottery	766	236	302	335
	(<0.01***)	(0.01**)	(<0.01***)	(0.02**)
Owns at least two ag tools	-74	-77	-85	-3
	(0.41)	(0.26)	(0.28)	(0.98)
Owns at least two ag tools * Di Lottery	42	79	-15	-102
	(0.77)	(0.48)	(0.91)	(0.53)
Di Lottery	973	413	428	449
	(<0.01***)	(<0.01***)	(<0.01***)	(<0.01***)
Any previous ag training	304	198	221	262
	(<0.01***)	(<0.01***)	(<0.01***)	(<0.01***)
Any previous ag training * Di Lottery	-444	-298	-347	-505
	(<0.01***)	(<0.01***)	(<0.01***)	(<0.01***)
Di Lottery	1111	536	549	450
	(<0.01***)	(<0.01***)	(<0.01***)	(<0.01***)
Experience in irrigated agriculture (two years or more)	408	299	334	259
	(<0.01***)	(<0.01***)	(<0.01***)	(<0.01***)
Experience in irrigated agriculture * Di Lottery	-475	-364	-392	-292
	(<0.01***)	(<0.01***)	(<0.01***)	(0.05**)
Di Lottery	1111	536	549	450
	(<0.01***)	(<0.01***)	(<0.01***)	(<0.01***)
Female	408	299	334	259
	(<0.01***)	(<0.01***)	(<0.01***)	(<0.01***)
Female * Di Lottery	-475	-364	-392	-292
	(<0.01***)	(<0.01***)	(<0.01***)	(0.05**)
Di Lottery	870	358	322	252
	(<0.01***)	(<0.01***)	(<0.01***)	(<0.01***)
Age 30 or younger	217	180	177	154
	(<0.01***)	(<0.01***)	(<0.01***)	(0.07*)
Age 30 or younger * Di Lottery	-154	-138	-58	32
	(0.23)	(0.15)	(0.61)	(0.82)
Di Lottery	950	405	433	424
	(<0.01***)	(<0.01***)	(<0.01***)	(<0.01***)
Applicant from Di commune	424	226	228	58
	(<0.01***)	(<0.01***)	(<0.01***)	(0.50)

Scoring criteria	Revenue from agricultural sales	Agricultural profits	Agricultural income	Total household income
Applicant from Di commune * Di Lottery	-311	-218	-274	-281
	(0.01**)	(0.02**)	(0.01**)	(0.04**)
Di Lottery	1156	257	1045	1057
	(0.04**)	(0.55)	(0.04**)	(0.09*)
Total applicant eligibility score	12	7	8	4
	(<0.01***)	(0.05*)	(0.05**)	(0.49)
Total applicant eligibility score * Di Lottery	-5	1	-11	-11
	(0.52)	(0.93)	(0.13)	(0.19)
Number of observations	**1186**	**1186**	**1187**	**1187**

Source: Di Lottery applicant eligibility data (2013-14); Interim Survey (2018)

*Significantly different from zero at the .1 level, two-tailed test.

**Significantly different from zero at the .05 level, two-tailed test.

***Significantly different from zero at the .01 level, two-tailed test.

APPENDIX B

LOCAL STAKEHOLDER COMMENTS

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Table B.1. Local stakeholder comment tracker

Stakeholder	Page	Stakeholder comment translated to English	MPR Response
Prime Minister's office		General observations: absence of acronyms and abbreviations absence of bibliography	These are included in the final version of the report.
Prime Minister's office	xi	The program logic of the Di perimeter predicted that PAPs could increase cropping intensity and diversify crops, generate higher yields and increase net farm income through improved access to irrigated land, formalized land tenure and increased technical capacity gained following training Since the project did not achieve all these objectives above can we say that the project was successful? Please revisit the elements of judging performance.	We have not made any changes, as the executive summary is a space to provide an overall appreciation of the project. Overall, the project succeeded in making all of the mentioned changes along the program logic. It is in that sense that the project was successful.
Prime Minister's office	Xii	Table ES 2nd, column, before last line: Please report percentages for the following: The PAPs reported to be better off than prior to perimeter development, at least in terms of food security Most PAPs consider that the security of their land tenure has increased on the perimeter, but there is confusion over land transfer rights.	In order not to overburden the Executive Summary, we do not include the percentages. Nearly all PAPs (95%) feel their food security has increased, and 90 percent feel secure about their land tenure.
Prime Minister's office	Xii	The context/background to the Di Lottery specifies: The PDA developed selection criteria for the lottery - for example by favoring candidates with experience in irrigated agriculture. This contrasts with what is said on page XIII table ES where it says this at the level of the results line 3, second column: - The lottery has selected a large number of rice plot beneficiaries of with no experience in rice cultivation. Please explain why the experience criteria was not respected. In the same column 4th line, you say: "The beneficiaries of the Dî Lottery are significantly more likely to use improved farming techniques." Since you have pointed out above that there is a relatively small proportion who cultivate the parcels, is it not necessary to review this conclusion? Should this not be: the Di Lottery beneficiaries who cultivate their plot ...	The comment raises two separate issues. The first question asks the evaluator to address perceived inconsistencies between the baseline report summary and the interim report. We have not made any changes as these are not inconsistencies. The first statement was based on the baseline Di Lottery baseline information prior to us having access to the interim data. Overall, applications of persons with experience in irrigated agriculture were favored because they received higher points. However, applicants did not have to have experience in rice cultivation. In the interim report, we found that beneficiaries of rice plots performed worse which we hypothesize may be due to the selection process not selecting beneficiaries specifically for rice plots. As a result, there were beneficiaries who did not have experience in rice culture. Regarding the second statement, we clarify that these are Di Lottery beneficiaries who cultivate their plot.
Prime Minister's office	XVii	Last line of table ES6: Drought is too strong of a word. The country did not experience a drought. I suggest replacing this by "the bad pluviometry suffered by [Burkina Faso during this interim evaluation]"	We now refer to below-average rainfall.

Stakeholder	Page	Stakeholder comment translated to English	MPR Response
Prime Minister's office	xviii	Drought is too strong of a word. I suggest "The profits of both zones are lower, probably because of the bad pluviometry suffered by Burkina Faso during this interim evaluation"	We now refer to below-average rainfall.
Prime Minister's office	XIX	Second paragraph, last line: Review the word "drought". Replace by "bad pluviometry"	We now refer to below-average rainfall.
Prime Minister's office	2	Failure to take into account the rehabilitation of the Léry dam in the assessment was not explained	The evaluation of the Lery dam was not part of the scope of work for the evaluation.
Prime Minister's office	37, 50,51, 61,86	Please use FCFA as currency in the following Tables Table II.8. Profit and PAP income, by sex of PAP (in thousands of CFA) Table III.6. Impact on the agricultural results (in thousands of CFA) Chart III.2. Farm Sales Revenue for Winners and Control Group, by Season (in thousands of CFA) Table III.7. Impact on the main results by type of parcel received (in thousands of CFA)	This has been included in the revised report.
Prime Minister's office	37, 50,51, 61,86	Some amounts are USD and others in FCFA which does not facilitate understanding	We choose to provide some amounts in USD and others in FCFA because the evaluation report addresses multiple stakeholders and has different objectives. Yields, incomes, etc. are always in FCFA with a translation only for a key profit outcome. Amounts related to project funding are in USD as a key objective is to provide information on MCC investment which is naturally in USD.
Prime Minister's office	39	What has been done to resolve the land dispute between husbands and wives?	Respondents noted that there were meetings to resolve these disputes, with some resulting in restitution of land. This information was already contained in the report.
Prime Minister's office	62	A poorly worded phrase: "On the Dî and Niassan perimeters, recovery rates have fallen significantly during the rainy season and the 2016-17 dry season." Replace with during the rainy season and dry season of 2016/2017.	This has been changed in the report.

Stakeholder	Page	Stakeholder comment translated to English	MPR Response
BATIONO Modeste/ Expert de l'Ex-APD Burkina		Generally : point C is titled "discussion of results", but it is actually more of a simple presentation of these observed or collected results, not discussed (at this stage?) regarding the results, it would be good to give an idea of the relative values (%) or absolute (number) that correspond with the estimation "some", "certain", "most", ...	We have renamed this section: summary [of evaluation findings]. We have keep numeric values for the main body of the text to not overburden the Executive Summary.
BATIONO Modeste/ Expert de l'Ex-APD Burkina	6	This should be 2,240 ha irrigated. It should be noted that the initial target was 2,033 ha. "The long-term outlook for returns is not optimistic." In addition to the factor of the low natural soil fertility and the current rate of contribution of organic fertilization (50%?), you need to include the factor of access to a remunerative market in the analysis. Decisions to invest in soil fertility maintenance will depend on the profitability of crops and the profits earned by producers. These questions of marketing and pricing of the products should be put at the heart of the analysis.	In the revised report, we note the increase from 2,033 to 2,240 hectares. Beyond respondents' perceptions of difficulties of selling their production, we plan to assess price changes as part of the final evaluation.
BATIONO Modeste/ Expert de l'Ex-APD Burkina	6	"The authorities do not allow such sales." In order to assess the PAPs understanding of the various land rights they enjoy, it is important to specify here the types of properties on the lands in question. Indeed, the PAPs can only sell (in the strict sense of the term) the land received individually in compensation and land for which they have a Land Title (TF). Land allocated to PAP households and secured by an Emphyteutic Lease cannot be sold. They can only be subleased. It would also be interesting to know the proportion or number of people surveyed who reported having faced a rejection from the administration in their land sales procedures. It is indeed interesting to know that PAPs understand that they can no longer sell their land according to the old practices before the intervention of the project.	We cannot answer this question with interim evaluation data. The interim evaluation asked respondents about land security on plots identified by the respondent. Since land for which PAPs received titles and land held as leases was usually contiguous, PAPs considered them to be a single plot, so land tenure questions were asked for the entire plot. We plan to ask about land tenure for titled and leased land separately in the final data collection.
BATIONO Modeste/ Expert de l'Ex-APD Burkina	8	"..., notably the transfer of AMVS to the Ministry of Agriculture". It must be pointed out that the transfer was more exactly made from the AMVS to the Regional Directorate in charge of Agriculture in the Boucle du Mouhoun, which remains a different entity from the AMVS regardless of the institutional changes or reorganisations known up to this point.	This has been corrected in the report.

Stakeholder	Page	Stakeholder comment translated to English	MPR Response
BATIONO Modeste/ Expert de l'Ex-APD Burkina	9	"... .. The logic of the program did not anticipate the creation of the CATG, because it supposed that the OUEA would be in full capacity before the end of the program". The creation of the CATG was conceived within the framework of the PDA as a support option (for professionalization) of the OUEA in the long term, not only as a measure of mitigation for the effects of project delays or to catch up on the services not provided during the Compact (see the baseline study on the organization of OM, deliverable 3.3 of the AD7 market). The CATG was designed by the MCC / MCA-BF to work with operational OUEAs, which are able to understand and manage contractual relationships. However, its implementation has experienced the same delays as the establishment of the OUEA, since it should be set up to support them. The issue of delays has been addressed through the Water Operator's contract (AECOM) extended until May 2015. However, the initial CATG team (based on the original design) was reinforced at the very end of Compact to integrate a dimension of close and permanent assistance in the field. This has raised the cost of CATG services costs from 13,000 FCFA / ha / year (deliverable 3.3) to 50,000 FCFA / ha / year.	In the revised version of the report, we drop the assertion that the CATG had not been anticipated in the program logic. We were unable to obtain the document referred to in the comment to provide support for a report revision.
BATIONO Modeste/ Expert de l'Ex-APD Burkina	9	"The AMVS does not fulfill its responsibilities .... major repairs to irrigation infrastructure ". It should say upkeep and maintenance of structured infrastructure instead of major repairs of irrigation infrastructure.	We have revised our discussion of AMVS responsibilities in the report.
BATIONO Modeste/ Expert de l'Ex-APD Burkina	9	"The WUA fees may not be set at a level that can be paid by the rice producers." Is it not possible for the evaluation to assess the reasonableness of the water fees charged by these OUEAs on the basis of actual costs of the l'OM at the level of these perimeters (the OUEAs with financial statements)? Also, MCC and MCA-BF conducted a study on the capacity to pay those exploiting the rice-growing and polyculture zones (deliverable 3.4 of the AD7 market). It determines OM load levels that be supported by producers in both cases. A comparison can also be done using the estimations of this study.	We were unable to obtain these documents, so we were unable to include this information.
BATIONO Modeste/ Expert de l'Ex-APD Burkina	9	In addition to the analysis of farmers' ability to pay, other factors such as planting rates of these perimeters must be analyzed.	In Table II.7 we present the amount of land cultivated by PAPs. In the final report, we will present the cultivation rates for all beneficiary groups.

Stakeholder	Page	Stakeholder comment translated to English	MPR Response
BATIONO Modeste/ Expert de l'Ex-APD Burkina	9	"CATG services are appreciated ... cost recovery". On OM cost recovery, the results of the diagnosis commissioned by Burkina Faso-APD, through the consultants in charge of Post-Compact Technical Assistance to OUEAs, CATG and AMVS, revealed a dissatisfaction of the OUEA with old perimeters and of rice-growing areas in the irrigated area of Di. This led all these OUEA to make prerequisites for the continuation of their collaboration with the CATG in year 3, despite a 70% subsidy rate provided by the APD-Burkina. The main condition was the improvement of recovery rates. Realistically, these problems of low recovery rates far exceeded the competences of the CATG, which led to the involvement, through a royalties recovery support committee, of the local authorities (administrative and traditional) in accordance with the organizational schema of OM defined by MCC and MCA-BF. The functioning and added value of this multi-stakeholder committee in improving royalty collection can be assessed among sustainability measures. In order to respond to the immediate concerns of the OUEAs and to avoid a dynamic of indebtedness (accumulation of two years of non-payment vis-à-vis the CATG), adjustments were found in order to reduce the contributions of the OUEAs through recruitment and direct management of key staff.	We did not revise the report as we were unable to obtain documents related to this issue from previous APD staff and this assessment did not come out of the responses to our qualitative interviews.
BATIONO Modeste/ Expert de l'Ex-APD Burkina	9	In line with the research question posed on the OM,it may be interesting in the future to assess the value-added of CATG services (or its contribution) in the operation and maintenance of the facilities on the basis of functional OUEA criteria, beyond the perceptions of the members of the offices of the OUEA. These criteria are in the M & E Post-Compact Plan. There are also criteria for assessing the performance of the AMVS in the implementation of OM activities.	This is outside the scope of the evaluation.
BATIONO Modeste/ Expert de l'Ex-APD Burkina	9	"... the OUEA have increasingly faced the total cost of these services". In 2015, 2016 and 2017, the subsidy rates were 90%, 80% and 70% respectively. Obviously, we were still far from the total cost of CATG services. The problem is in the level of fee recoveries, because OUEAs with high recovery rates (4 in Di and 1 in Niassan) were up to date on their payments to CATG. Those that were unpaid, experienced real cash-flow stresses related to low recovery rates. Also, certainly because there was a subsidy, the CATG operator did not know or want to adjust its pricing as the MCA-BF approach intended. In fact, as the OUEAs became more capable and able to carry out certain tasks, the CATG should re-adjust its services offer in order to reduce its services costs for the OUEAs. In view of the study on the farmers' ability to pay, it was not feasible to increase CATG expenses from CFAF 13,000 to CFAF 50,000 / ha / year, should the subsidy come to an end. A survival plan for the CATG at the end of the subsidies could not be established by the operator.	We have received additional information on recovery rates from AMVS with which we have updated the report.

Stakeholder	Page	Stakeholder comment translated to English	MPR Response
BATIONO Modeste/ Expert de l'Ex-APD Burkina	12, 13	Integration of the project. It seems that the main purpose is to assess the extent to which the market construction and MIS development activities have achieved their objectives. It is a question of really assessing the overall coherence of the project, the analysis can be based on the description of the project and on the perception of this integration by the stakeholders in the design and the implementation. The endline report of the Compact gives some elements (see detailed description of this consistency sought in the report): securing access to water to ensure the development of intensive irrigated cultivation with water control: (i) support to Integrated Water Resources Management (IWRM), (ii) rehabilitation of the structure of Léry, (iii) development of a new perimeter in Di and finally, (iv) development and implementation of a strategy of Operation and Maintenance (O & M); intensification of production, diversification, valorization; Access to medium-term and long-term credit to encourage investment.	To clarify the limited scope of the evaluation, we rename the chapter: "Rural markets, MIS and overlap of diversified agriculture activities"
AMVS		General observations Reading this assessment, we are under the impression that AMVS has been circumvented by design. As proof, the conclusions on the AMVS are contrary to reality on the ground. We have the impression that it is a judgment of the AMVS, since no other stakeholder has failed, while we only had a supervisory role in this part of the project.	The evaluation was designed to provide perspectives from all stakeholders. Despite multiple cancelled interviews and unsuccesful visits, we were able to conduct two interviews with staff from AMV as a key stakeholder for the O&M evaluation. We incorporated information from the limited set of documents provided by AMVS in mid-January 2019.
AMVS	58	"These subsidies provided by the government were in large part eliminated in 2018". The subsidies come from reimbursement funds of granted loans in the frame of the Rural Finance Facility of the MCA-BF. The initial CATG contract expected a decrease in subsidies each year and by the fifth year, the OUEAs should take over all services from the CATG. The OUEAs were well informed from the beginning regarding the conditions of the contract [with CATG]. "With the decrease of subsidies from the funds available under the MCA-BF Rural Finance Facility, all OUEAs stopped paying CATG benefits from 2017 on because they could not afford it." During the Compact, studies had already reviewed the capacity of OUEA [to pay for CATG services]. [The project] insisted on maintaining a structure (CATG) that does not serve much.	In the revised report we indicate the change in subsidy over time as well as to highlight the source of funding. We have not been able to obtain the studies mentioned in the comment.

Stakeholder	Page	Stakeholder comment translated to English	MPR Response
AMVS	62	"AMVS has not assumed its main responsibilities for water management nor transferred its existing responsibilities for agricultural development to the Niassan perimeters" The evaluation was limited to interviews without worrying about what is done and visible on the perimeters and administrative data of the AMVS. Restoration work on the perimeters has been carried out and verifiable on the sites, work contracts and reception reports are available at AMVS. AMVS has transferred water management and maintenance of irrigation works and equipment to the WUAss through a transfer contract in accordance with the joint ministerial decree N ° 2012-090 / MAH / MATDS / MEF based on the set-up and functioning of the WUAs. For the perimeters not concerned with rehabilitation and already rehabilitated perimeters, the joint decree is clear: «the WUAs exploit the irrigation infrastructure and equipment located in their service areas to distribute the water to their members, collect the water royalties for the maintenance and repair of irrigation infrastructure, water management and renewal of equipment. The AMVS maintains structural works (dams, channel from the water supply to the pumping station, access lines to perimeters, guard ditches), advises and supervises the activities of the WUAs in the implementation of the O & M irrigation infrastructure and equipment transferred to them. Rehabilitation work on the former perimeters are underway since 2013 and more than 2000 ha have been rehabilitated and 1600 ha are currently underway. The AMVS has signed transfer contracts for the management of the installations with the WUAs of former perimeters. For the perimeter of 2240 ha, the contracts are not signed because the perimeter has not yet been transferred to the AMVS after its retrocession to the Ministry of Agriculture and Hydraulic Development in 2016 by the APD –Burkina. Proposal: Send a field team to verify the work done by AMVS to benchmark what stakeholders said and what was done when the teams passed. -Consult the joint decree establishing and operating the EUOA and the contract for the transfer of irrigated areas by the AMVS to the OUEA attached to clearly understand the responsibilities of the UUEA and those of the AMVS in the maintenance of the perimeters and the Water Management. At the end of the audits we propose a reformulation that takes into account the results in the field in place of the impressions of actors.	We draw on the documents provided to us by AMVS in January 2019 on AMVS's rehabilitation activities to complement stakeholder perceptions and to update the report. Additional field visits to verify AMVS activities are outside the scope of the evaluation. In the revised version of the report we highlight the difference between views of beneficiaries and AMVS .

Stakeholder	Page	Stakeholder comment translated to English	MPR Response
AMVS	64	"Assistance to AMVS. Due to the low level of interest of AMVS officials and the Government of Burkina Faso and its limited funding, the AMVS has not implemented its action plan at the end of the Compact, thus failing in its task of creating a maintenance fund for the Sourou Valley. At the time of the interviews in April 2018, the action plan was still suspended. " The action plan of the AMVS was implemented and the funds intended for feeding the upkeep and maintenance account of the structured infrastructure of the Sourou Valley were transferred to the AMVS budget because the AMVS's status did not allow it to have a separate specific account. The investigators are really not interested in what is happening in the field because in April 2018 work was taking place on the perimeter of 2240 ha of Di and that of Guiedougou on behalf of CEMIS 2018 "Maintenance Account and Maintenance of Structured infrastructure) of the Sourou Valley. " Proposal: Verify the AMVS activities in the field, consult the AMVS administrative data, the joint decree N ° 2012-090 / MAH / MATDS / MEF on modality of setting up and functioning of the OUEAs and the contracts of transfer of irrigated perimeters to OUEA to understand the responsibilities of OUEA and those of the State (AMVS) in the management of the facilities.	In the revised report we clarify what the action plan entailed and which components were achieved, based on the documents available to us and stakeholder interviews.
AMVS	64	"In response to these cost pressures, OUEAs on the old perimeters have stopped paying for CATG services, while the OUEAs on the new perimeter of DI have directly hired staff to reduce costs." The OUEAs of Di have not hired staff to reduce the costs of CATG services. CATG's benefits are expensive compared to the services and staff it offers to OUEA. Since 2017 all OUEA (Di and Niassan) have stopped paying CATG services. They have signed certain contracts with the CATG but the services are fully covered by the APD-Burkina through the loan repayment funds granted under the MCA-BF Rural Finance Facility. Since 2017, CATG staff in the field is composed of a single accountant and an electromechanic (two to three weeks in the Valley per campaign). Consult the contracts of the WUAs with the CATG and the CATG contracts with the APD Burkina (2017) and those of 2018 with UCF or the Department of Agriculture, Water and Sanitation Prime Ministry (DAEA-PM).	We have not made changes to the report, since your statement contradicts statements from OUEA board members who said that they contracted some services directly that had previously been provided by CATG.

Stakeholder	Page	Stakeholder comment translated to English	MPR Response
AMVS	64	"AMVS operations. AMVS oversees OUEA and main canal maintenance in the new perimeter but does not seem to be taking on these responsibilities. In addition, the failure to create the Sourou Valley Maintenance Fund has limited AMVS 'ability to rehabilitate parts of the former non-functional perimeters. " All OUEA activities are supervised by AMVS. There is a confusion between supervising the work and the on-site control of the activity. AMVS has trained more than 1000 elected OUEA and their contractual staff in governance, financial and accounting management, perimeter maintenance and water management in 2017. The AMVS not only supervises the maintenance of the primary canal but also the programming, budgeting and implementation of O & M activities which concerns the entire irrigation network (primary, secondary, tertiary, works channels), the network drainage (primary, secondary and tertiary ditches), the network of tracks (primary, secondary and tertiary tracks), related works and equipment. Despite the presence of the CATG, we were often obliged to question the OUEA on the quality of the maintenance of the works under their jurisdiction. This is why the AMVS decided to maintain the primary channels of the Di perimeter, from the funds of the CEMIS (Maintenance Fund set up by the State). This Fund was also used for maintenance at the old perimeters.	We clarify in the report that there is confusion about the responsibilities for maintenance. We have revised the report to include AMVS' point of view on the responsibilities.
AMVS	63 and 64	"Cost recovery. OUEA royalty collection rates in four sectors are above 90%, but three sectors with rice plots have declining recovery rates " The rate of 90% is incorrect. The way in which the recovery rate was calculated does not make it possible to perceive the collection difficulties. Furthermore, the charts as designed do not allow a good interpretation of reality. The proof is that Di's OUEA do not have resources to cover all their expenses. In the operating principles of the OUEA, water charges are paid before the start of the campaign. It turns out that in the current calculation the rate is based on a recovery outside of the stated campaign, see two campaigns. The proof is that in our follow-up, no OUEA reached a recovery rate of 75% at the end of its fiscal year except that of the South 1). For a better interpretation of the recovery rate of WUA payments, the actual rate of recovery must be considered at the beginning of each campaign in accordance with the regulations in force.	In the revision of the report, we now make a distinction between on-time payment of WUA fees and the recovery rate after several seasons.

Stakeholder	Page	Stakeholder comment translated to English	MPR Response
AMVS	16	"AMVS remains responsible for agricultural development on all the perimeters of the Sourou with the exception of the perimeter of Dî, but has trouble to assume all its responsibilities... Its agricultural development staff is too small to provide adequate advice and technical assistance to farmers of the old perimeters. " This conclusion is incorrect because: 1. AMVS is responsible for agricultural development in all areas including Di, 2. The AMVS undertakes major repairs on the infrastructures: the rehabilitation of the channels, the pumping stations, the channels ..., 3. In terms of personnel, the AMVS has the highest rate of supervision in the country, with an agricultural advisor for every 300 ha, the rest, the State assigned to the AMVS in 2017 (agronomists) , Senior Technicians ...)	This statement touches upon three separate issues: 1) The first statement seems to directly contradict the statement in line 47 that the AMVS action plan was fully implemented. 2) In the revised report we provide information on AMVS's activities and contrast this with beneficiary perceptions. 3) We have been unable to obtain AMVS's annual reports from AMVS to document this high rate of supervision.

APPENDIX C

MCC AND REFEREE COMMENTS

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Table C.1. MCC and referee comment tracker

Number	Reviewer name, division, and/or institution	Page Number	Comment	Evaluator Responses
1	TM, consultant (ex DCO/SO/AgLand	xi	AMVS appears as Authority for the Development of the Sourou Valley. “Sourou Valley Development Authority” would be simpler. However in numerous places in the document it appears as Sourou Valley Water Authority. The distinction is important. One of the aspirations of ADP was to transform AMVS from a development authority into a water authority.	We have corrected this to be Sourou Valley Development Authority, based on the French translation (and their own understanding of their work).
2	TM, consultant (ex DCO/SO/AgLand	xv	Do large farmers who complain of insufficient compensation have any notion of the cost of the assets they received? Di perimeter cost almost $40,000/ha	We did not collect information on whether they are aware of the value of the perimeter. In this report, we describe their self-reported assessment that compares their profits with and without the perimeter.
3	TM, consultant (ex DCO/SO/AgLand	xvi	Outcomes/yields: for context it would be helpful to know the basis on which targets were established.	We are not sure how targets were determined for all crops. The post-compact M&E plan includes the following two statements regarding the rainy season rice yield and dry season corn yield target. 1) For rainy season rice productivity in the Di perimeter: "Di targets were set slightly lower than Sourou targets due to expected differences in experience of the new farmers on the Di perimeter." 2) "[The dry season corn] target [of compact year 5] of 5 based on what was produced during rainy season. This is first campaign for corn in dry season."
4	TM, consultant (ex DCO/SO/AgLand	xvii	If this is first reference to APD, it would be helpful give its complete title.	We have corrected this.
5	TM, consultant (ex DCO/SO/AgLand	xxi	Table ES.6 Implementation: “high teacher-to-trainee ratios . .” Don’t you mean low teacher-to-trainee ratios or high trainee-to-teacher ratios?	We have corrected this.
6	TM, consultant (ex DCO/SO/AgLand	xxi	AD10 is a contract number. I believe that AECOM was the contractor. (See also P. 66, 72)	We have corrected this.

Number	Reviewer name, division, and/or institution	Page Number	Comment	Evaluator Responses
7	TM, consultant (ex DCO/SO/AgLand	15	What was tenure of land expropriated?	Land tenure pre-compact was based on customary land tenure systems. We include a description in the text.
8	TM, consultant (ex DCO/SO/AgLand	20	“Nearly all PAPs are farmers and most are men . .” This appears to be a reference to the heads of PAPs households, which include women and children.	We clarify this in the text. The sampled baseline respondents were PAP individuals, not PAP households, so this statistic reflects individual PAPs. In the terminology of the ADP, PAPs are only the persons who were registered as land rights holders, not their spouses or children. If spouses were not considered cultivators in their own right, they would not be considered PAPs.
8 follow-up	M&E		MCC Comment on Revised Report: Please clarify if anyone other than one land rights holder was placed on the title. MPR raises that women may have lost land rights as husbands took parcel that documented in the name of the household. When women and men both had parcels, were both names listed on the title? What about if just man listed? Did women hold rights prior? Trying to understand the nuance of potential land loss. Also, in relation to the descriptions about men having consolidated land parcels given to PAP women, did the documents to those parcels include women's names on them? If MPR doesn't know or if this wasn't examined, then MPR should add language or a footnote indicating they don't have answers to these questions	We collected information in the survey on the names that are listed on the land documentation but did not analyze this information. If MCC wants us to conduct this analysis, we propose to present this information in the final evaluation report.
9	TM, consultant (ex DCO/SO/AgLand	21	Shouldn’t PAPs have been compensated for lost profits (revenue minus expenses) not lost revenue? Distinction between revenue and profit is fuzzy throughout the document.	We clarify that compensation was for profits lost. We mention sales to provide some context because we do not have survey data on profits.
10	TM, consultant (ex DCO/SO/AgLand	24	. . almost all PAPs confirmed receiving a starter kit . .” Don’t you mean PAP households? It’s important to distinguish between the universe of PAPs and PAP households.	We have corrected this.

Number	Reviewer name, division, and/or institution	Page Number	Comment	Evaluator Responses
11	TM, consultant (ex DCO/SO/AgLand	25	Table II.5 compensation amount: “type of irrigation used.” Please explain. I thought PAPs were compensated for rights to unirrigated land that was expropriated to make way for the Di perimeter.	Some of the land (often near the Sourou river) was irrigated using motor pumps, which is also where the existing dry season vegetable production came from. Unfortunately, the baseline data does not include a variable that indicates whether land was irrigated or not. However, we know that 22.4% of PAPs lost land to farm rice which would have been irrigated, or at least flooded.
12	TM, consultant (ex DCO/SO/AgLand	30	Table II.8 What is difference between agricultural profit and agricultural income?	We have now defined these terms in the text. Agricultural income includes income from employment on other person's fields, as well as transformation of production that was purchased. We define profits to only related to the own field.
13	TM, consultant (ex DCO/SO/AgLand	33	Table II.10 “Profits net of agricultural costs” – aren’t profits always net of costs?	Yes. We drop "net of agricultural costs"
14	TM, consultant (ex DCO/SO/AgLand	43	Table III.6 What is difference between agricultural profits and agricultural income?	We have defined these terms in the table note.
15	TM, consultant (ex DCO/SO/AgLand	48	2nd para under C.1 “. .MCC and MCA funded the creation of and capacity building for CATG to continue to provide TA to the WUAs post-compact.” Please verify. My understanding is that compact funds may not be used to pay for work performed after the compact end date.	We rephrase this sentence.
16	TM, consultant (ex DCO/SO/AgLand	57	There is no such thing as the IWRM support project. The IWRM effort was a sub-activity under the WMI Activity of ADP.	This has been corrected.
17	TM, consultant (ex DCO/SO/AgLand	75	“. . soy was no longer grown in the perimeter due to runoff.” To what does runoff refer?	That was an incorrect translation. We have corrected this in the text.
18	TM, consultant (ex DCO/SO/AgLand	76	Tables VI.6 and 7 Is this for irrigated land or non-irrigated land?	This is across both irrigated and non-irrigated plots since the farmer training program did not itself increase irrigated land.
19	TM, consultant (ex DCO/SO/AgLand	84	First full para, second sentence: Di market.	This has been corrected.

Number	Reviewer name, division, and/or institution	Page Number	Comment	Evaluator Responses
20	Kari Nelson	Overall	For the Di Lottery- were non-winners at least not harmed in the longer term? Given the potential drop in prices for production, are non-winners worse off?	We are conducting an analysis of price changes in the Sourou Valley as part of the final report. That would allow us to determine if control group members (non-winners) who live close to the Di perimeter were negatively affected.
21	Kari Nelson	Overall	I would defer to MCC in terms of their preferred format. But personally, I would find it helpful if the report could provide a sense of the extent to which different views were expressed in the interviews and focus groups. Currently, the report uses language like, “many,” “most,” etc. But, “5 of 10 interviews” or similar would be helpful for gauging the extent to which perspectives are common or not among respondents.	For a limited number of qualitative findings, we've inserted statements that quantify the number of focus groups or interviews in which a key theme was mentioned--using the formulation "In X of Y focus groups…X theme was mentioned." Specifically, we indicate how many PAPs stated that the land received in compensation was insufficient, and the number of board members of Niassan WUAs who state that AMVS was not fulfilling its responsibilities.
22	Kari Nelson	Overall	Using the colloquial names for the ADP contractors is useful (AD10, etc.). However, it would be useful to include the actual names of the companies as well- this is done in some places, but not all.	We now use the contractor name in the main body of the text throughout the report.
23	Kari Nelson	Overall	Regarding implementation evaluation questions, does MPR have any feedback regarding the breadth of activities implemented under the project? In the past, it’s been criticized for having been overly ambitious, including too many subactivities and not being focused enough. Anything to add to that debate?	Yes, this is a good line of questioning. But because this falls outside of the scope of this evaluation, we did not ask explicit questions about this topic of complexity/range of activities.
24	Kari Nelson	Overall	There is certainly a lot of ground to cover in this set of evaluations. So, understood that there is a tradeoff between depth and breadth. But, many of the findings are touched on but not discussed in depth/lack a lot of nuance. Additional examples and/or nuance could be helpful.	We have added additional nuance to the following topics: land tenure security and related investments and perceptions of AMVS fulfilling its responsibilities.
24 follow-up	M&E		MCC Response to Evaluator Response on Revised Report: Land tenure security nuances need clarity. It seems there is a lack of understanding of land efforts by MPR that could be aided by having a land expert added to the team for any future work.	We have added a land expert onto the evaluation team.

Number	Reviewer name, division, and/or institution	Page Number	Comment	Evaluator Responses
25	Kari Nelson	Exec Summary	For the Di Lottery, it's noted that lottery winners have significantly higher incomes and sales than non-winners. But, even if that's true, was the same drop in the prices received for crops experienced by the PAPs also experienced by the lottery winners (and maybe even non-winners)?	We will conduct the analysis of price changes as part of the final evaluation.
26	Kari Nelson	xvii	Typo at end of the second paragraph about Implementation- "couldcouldcould"	This has been corrected.
27	Kari Nelson	xxii	The "Integration Evaluation" at least as described in the Exec Summary doesn't really seem to be about the integration of the project, but more so about the market-based activities. There is just one paragraph in the middle that says, "in addition to findings about the markets…" that talks about integration. In general, it seems odd to combine the market-specific components with a discussion of the integration of all activities together.	To address this issue, we rename the chapter: "Rural markets, MIS and integration of DA activities"
28	Kari Nelson	17	The "Di Perimeter Evaluation" really just focuses on the PAPs, not on the perimeter as a whole. Thus, the naming of this evaluation is a bit confusing.	In terms of perimeter *construction*, the evaluation does focus on the perimeter as a whole. In terms of agricultural outcomes, the chapter focusses on PAPs. We explain this in the intro paragraph to the Di perimeter chapter.
28 follow-up	M&E		MCC Response to Evaluator Response on Revised Report: Agree with initial comment by MCC that the naming is confusing throughout. It would be helpful to clarify in the title/naming of the evaluation covering PAPs that the focus is solely PAPs. For example "Di Perimeter PAP Evaluation". You would then have "Di Perimeter PAP Evaluation" and "Di Perimeter Lottery/RCT Evaluation". The Di Perimeter and Di Lottery Evaluations both cover land, ag and irrigation construction. MPR's response does not seem to realize this--namely that the evaluation does not cover the perimeter as a whole but rather a subset of irrigated land provided to PAPs.	We changed the name from Di PAP evaluation to Di perimeter evaluation since that chapter also includes overarching information on the construction of the perimeter. The name "Di Lottery evaluation" is the name of the evaluation as specified in the RFP.
29	Kari Nelson	23- Table II.4	Would be helpful if the table appeared all on one page.	This has been corrected.

Number	Reviewer name, division, and/or institution	Page Number	Comment	Evaluator Responses
30	Kari Nelson	40- III.4	What do the numbers in this table represent? Percentages? Raw numbers? The male plus female columns don't equal the total column except in the very bottom row for the total.	This has been corrected. The All column is a weighted average of the other two columns with weights corresponding to number of female and male Di Lottery beneficiaries.
31	Kari Nelson	49	If WUAs are stopping their service agreements with the CATG, does the CATG have enough work to continue maintaining themselves as a service provider? Or have they lost so much business as to become financially unviable?	The respondents in our qualitative interviews did not provide information to determine whether CATG would be able to maintain themselves as service provider.
32	Kari Nelson	52	Regarding the difference between how the WUAs reported water payments vs plot owners self-reported payments, how were the WUA payment records verified (if at all)? Was it based on interviews? Copies of bank statements or payment registers?	The water payments were based on payment reports submitted by WUAs to AMVS. We did not verify payment records.
33	Kari Nelson	55	Regarding the comment that, "Recovery rates on the Di perimeter are generally sustainable," is this based just on the percentage of fees recovered? Or does it also take into account the amount of the fees collected as compared to the actual costs? If the latter, it would be interesting to hear more about this analysis. If not, even a high recovery rate might not be sustainable if the fees aren't high enough.	This finding is based on the percentage of fees recovered, based on information received from AMVS. We did not collect information on the actual costs expended by WUAs.
34	Kari Nelson	60- Table V.2	Is the title to this table correct? Farmer training?	This has been corrected.
35	Kari Nelson	65	In terms of the key findings, here in the report, they look largely positive regarding the IWM components. But the executive summary seemed more critical, focusing more on the challenges faced and the ability to really fulfill their intended function. Which is more accurate?	We have revised the report so that the ES and main body of the report are consistent. In particular we also now reference our finding that IWRM has had effects on strategic planning in the ES.
36	Kari Nelson	82- VII.3	Do you have data on the reach of any of the other project components? The items in the table mostly relate to farmer/animal husbandry training and Di. But what about the access to credit components? Animal health investments? Value chain investments, etc.? Also, this focuses on the overlap of farmer training with other components. But, what about the overlap/integration between other components (access to credit and the Di perimeter, for example).	We have renamed the chapter to more closely focus on the activities that are part of the evaluation scope.

Number	Reviewer name, division, and/or institution	Page Number	Comment	Evaluator Responses
37	Kari Nelson	83	Regarding the finding that the markets are largely occupied, do you have any evidence for how/why this has improved over time? By about a year post-compact, there were notable sections of several of the markets that were not being used, in particular the round pavilions that were intended for women vendors. If this has changed, I'm curious what has led to this change.	Our design called for an assessment of occupancy at the time of the interim data collection. We did not ask how the occupancy changed over time in the post-Compact period.
38	Kari Nelson	85 (first full paragraph)	It would be helpful to know how many of the 37 originally served markets were originally in project areas. The two noted are no longer being covered. But, is that 2 of 37 in project areas? Or some other number?	We will conduct the analysis of price changes as part of the final evaluation.
39	Kari Nelson	85	Do you have any data on the number of MIS requests for price data EcoData receives? It's noted regarding the weather data, but not for price data.	We have included this information.
40	Kari Nelson	85	If people aren't really using the MIS for the price data, how is the private company continuing to pay to collect and provide the data?	This falls outside of the scope of the evaluation. We do know that EcoData uses the same platform to disseminate price and weather information so demand for weather data could drive continued service.
41	M&E	xvl	Quantify "substantially higher" and "do not meet project targets". For instance: Yields per hectare are XX % higher than at baseline but are XX% below project targets on average.	We now provide a quantitative comparison of yields and targets. However in the absence of a meaningful baseline, we cannot provide this type of comparison.
42	M&E	xviii	Perhaps mention that APD is no longer operational.	We now mention this in the ES.
43	M&E	xx	You need to explain what "AD10" is. Provide contractor name.	We now refer to the contractor name throughout.
44	M&E	Page 11	Provide specific months of data collection instead of saying data collection was conducted in fall 2017.	We have added this information.
45	M&E	Page 16	For all of the summary tables, does "activities and assistance" refer to what was planned or what was done?	This refers to assistance provided. We rename this row in the table to clarify this.
46	M&E	Page 21	Quote is attributed to ADP. It should be APD.	This has been corrected.

Number	Reviewer name, division, and/or institution	Page Number	Comment	Evaluator Responses
47	M&E	*Page 29*	*Did the baseline survey have data on agricultural income? Why aren't there comparisons with pre- and post-project agricultural outcomes of PAPs?*	There is limited baseline data on agricultural income that is of poor quality, which we have opted not to use. Specifically, the baseline survey did ask one question on average agricultural sales revenue PAPs received in the last five years. However, this included years in which the household did not harvest as the perimeter was under construction, and is therefore a poor measure.
48	M&E	Page 52, Table IV.5.	Include unit for amount paid. Second row of table.	This has been corrected.
49	M&E	Page 63	"Fees are distributed according to a clearly defined formula." – Unclear sentence.	We have clarified that revenues from the Water User fees are divided up between recipients according to fixed shares
50	M&E	General comment	Need to edit document. Example page 89 "Water user fees being collected from large users, but due do lengthy legal enforcement, users —including mining companies—but enforcement is difficult so many companies pay fees voluntarily."	The final version has been re-edited.
51	M&E	General comment	You should spell out acronyms at first use and then use the acronym.	We spell out the acronym at first use in the ES, the main body of the report.
52	M&E	General comment	The length and structure of sentences make this report difficult to read.	We have reviewed sentence length and structure and made revisions.
53	M&E	General comment	Reduce wordiness. Example: Di Lottery beneficiaries are significantly more likely to use improved agricultural techniques. Farmers selected to receive plots through the lottery are significantly more likely to use improved agricultural techniques—including fertilizer, pest control, and improved seeds.	We have reviewed the report to minimize excess wordiness.
54	M&E	General comment	Re-consider use of quote text boxes. Many of the quotes are long and do not add to what is already included in the body of the report. Example: the first quote could easily be summarized in one or two sentences in the report.	We have shortened some of the quotes. We retain quotes to provide beneficiary/stakeholder perspectives in their own words.

Number	Reviewer name, division, and/or institution	Page Number	Comment	Evaluator Responses
55	M&E	Page 71	What's the point of Figure VI.2.? Were 100% of farmers supposed to receive each topic?	This primarily highlights the focus of the training activities in the two areas. Since trainers had leeway in what they covered, we don't know what the expected number should have been. We clarify that in the text.
56	M&E	Page 72	Did the project meet its target with regards to gender distribution?	We include information on gender specific targets in the report.
57	M&E	Page 73	Before the project, were farmers using chemical fertilizers, organic fertilizers, Insecticides/pesticides, and improved seeds? This would influence what those farmers using today.	We reference baseline use of inputs in the text.
58	M&E	Page 74, Table VI.4.	Include unit.	This is included.
59	M&E	Page 75-76, Figure VI.4– VI.5	Consider revising presentation. The zeros are confusing.	This has been corrected.
60	EA	Di Lottery RCT	Can you give more technical detail describing how balanced the treatment and control groups were, and how this was ensured? Of how many variables tested were there imbalances, is there an F-test, etc.? What were the procedures followed to ensure the fairness of the lottery?	We have provided more information on the balance tests.
61	EA	Di Lottery RCT	Can you add units as relevant to Table III.5 and III.6?	We added units in Table III.5. The table title for III.6 clarifies that all indicators are in percent.
62	EA	Di Lottery RCT	Are there direct measures of input costs? If so, do these include the rental or other costs of obtaining land?	Yes, there are direct measures of input costs. Whenever land is rented, the measure of agricultural profits subtracts the rental cost of land. Agricultural income includes the income from renting out land.

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63	EA	Di Lottery RCT	This compares people who received land to people who did not. It's somewhat unsurprising that people who received land had better outcomes than those who did not. I would think that the relevant comparison would be moving land from collective management to individual ownership. Is there a plan to measure cropping or yields using satellite data or something like that, perhaps as part of the Di Perimeter evaluation?	This falls outside the scope of this evaluation.
64	EA	Di Lottery RCT	The rice plots are located differently from the polyculture plots – how sure are we that the differences in outcomes are due to the crop designation and not the distance to settlements or some other factor?	If we look at the location of plots of lottery beneficiaries, we observe that almost all rice and polyculture plots are located in the same sectors (See Figures A.1 and A.2 in the design report). We are confident that the small differences in distance to settlements do not drive the results.
65	World Bank Gender Innovation Lab		Do the impacts of winning the Di Lottery vary by participant's gender? It would be useful to provide this evidence (and an accompanying discussion) -- as originally planned in the ADP Design Report and discussed in Section I.B.4 of the Interim Report.	We include the analysis separately by gender in the appendix.
66	World Bank Gender Innovation Lab		The positive impacts of winning the Di Lottery on agricultural sales, profits, income, and household income are very encouraging. But these variables are notoriously noisy. It would thus be important to check whether the results are robust to different transformations of these variables to correct for outliers and the skewed nature of their distributions (e.g. winsorization, inverse hyperbolic sine transformation).	Our analysis is makes use of winsorized values for costs, revenues and profits. As a robustness check we now use the inverse hyperbolic sine transformation of winsorized values.
67	World Bank Gender Innovation Lab		The discussion is silent about survey attrition. What was the fraction of respondents originally surveyed at baseline that were successfully tracked and interviewed during the interim survey? In the presence of attrition, does the attrition rate vary between treatment and control groups? Do the characteristics of those who attrit differ from those who don't attrit? These questions are important because differential treatment-control attrition patterns can undermine the internal validity of the results -- if not appropriately dealt with.	We provide information on overall attrition rates, and a disaggregation by treatment and control group. Overall, when we exclude multiple applicant households, we survey at least one household member in 94% of households. Attrition is different for households of control (7.5%) and treatment (1.9%) applicants.

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68	World Bank Gender Innovation Lab		The eligibility criteria for the Di Lottery focused on identifying farmers with high potential to put the land to good use (pg. 38). At baseline potential beneficiaries were ranked on a score proxying for that potential. It would be interesting to examine whether the Di Lottery impacts vary with respect to such score. That would help (ex-post) validate the eligibility criteria, as well as inform the design/targeting of future similar interventions.	In the appendix table B.X we provide estimates of interactions between the treatment variable and eligibility criteria.
69	World Bank Gender Innovation Lab		The estimated impacts on agricultural inputs are mostly focused on the extensive margins (e.g. whether any fertilizer or hired labor is used). It would be useful to also report impacts on the intensive margins (e.g. total amount of fertilizer and labor used).	We have updated the report to include information on amount spent on fertilizer, hired labor and other inputs.
70	World Bank Gender Innovation Lab		Pg. 40 says that “nearly all Di Lottery winners received leases”. This statement seems to be at odds with Table III.3, which appears to indicate that that happened for only 60% of the cases. Maybe the statement is referring to both leases and land titles? Sorry if I’m missing something here.	We clarify this in the text. Di Lottery beneficiaries were not eligible to receive titles with full ownership over the land. However in the survey, a significant proportion of respondents state that they received a title. When beneficiaries state they received a title they mean a formal document that proves their land right. We separately present both variables as indication of confusion over land rights. Together, close to 90% reported they received formal documentation.

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70 follow-up	M&E		MCC Response to Evaluator Response on Revised Report: Can you clarify what the 60% represents? All Di Lottery participants should have received leases. All PAPs should have received titles. It is common that people would refer to leases as titles in surveys. We suggest revising the report language to include clarifying language stating something such as "Survey respondents may have confused leases with titles, which contributes to the figures reported. Such confusion over the nuances of documentation is not uncommon in survey responses to this type of question"	Our footnote had provided the following information: "Di Lottery beneficiaries were not eligible to receive titles granting them full ownership of the land. When beneficiaries say they received a title, they mean a formal document that proves their land right. We separately present both variables to show beneficiaries' confusion over land rights." We slightly reformulate this in light of your suggestion to: The 28 percent of beneficiaries who say they received a title, likely mean a formal document that proves their land right. We separately present both variables to show beneficiaries' confusion over their land rights documentation."
71	World Bank Gender Innovation Lab		The report mentions that Di Lottery treatment impacts are measured using a regression framework (pg. 37), yet the report seems to only present t-tests from simple (unconditional) treatment-control differences. Appendix Table A.4 with robustness checks is missing!	All estimates rely on regression analysis, as outlined in the methodological section. We rename the table columns to clarify that this is an "estimated difference", and add text to the notes to clarify this. We have updated the report to include Appendix Table A.4.
72	ESP MCC	Overall	Rarely does this reviewer receive reports as well written as this one with proper spelling and grammar and clarity of expression. Thanks to the authors.	Thank you for this comment.
73	ESP MCC	Pg. xiv, Exec Sum	Pg. xv, Section C.1. The findings (or in some cases inability to have findings) regarding gender should be included here, because the methodology for census of PAPS initially was biased against women and subsequent adjustments were made, but this reviewer was never convinced they were adequate.	We now summarize the finding related to women's compensation in the ES as well.
74	ESP MCC	Pg. xvi, Table ES 2	Is the longer-term pessimistic outlook for sustainability of yields the same for PAPS as non PAPs?	Yes, this is a perimeter wide conclusion as WUAs regroup beneficiaries regardless of the channel through which they acquired land.

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75	ESP MCC	Pg. xvi, Figure ES 2	The Di Lottery program logic shows s*ecure* land tenure as part of the program logic, but Figure ES 1 for Di Perimeter shows *Improved* land tenure. What is the difference between the two terms and if there is supposed to be one, please explain. One could note that Di PAPS received titles, but lottery winners received long-term leases.	We now change this so that both refer to "improved" land tenure.
76	ESP MCC	Pg. xvii, Table ES 3	Were outcomes similar regarding rice for the Di PAPs regarding rice or perhaps they did not cultivate rice only or if they did there are too few for statistical comparison. Please note such differences.	There are only 3 PAPs who received solely rice plots and 36 who received rice and polyculture plots. As such, the comparison with Di Lottery beneficiaries would be underpowered. PAPs with both types of plots are among the largest PAP landholders. As a result, a comparison with Di Lottery beneficiaries would also not be meaningful.
77	ESP MCC	Pg. xviii, Table ES 4	Is it possible to know how the PAPs are doing in terms of paying their WUA fees?	The O&M chapter provides this information and a comparison with Di Lottery beneficiaries.
78	ESP MCC	Pg. xxi, Table ES 6	Is it possible to know how women fared with respect to receiving training and the outcomes thereof?	We now mention whether the target of balanced male-female participation was met. In terms of benefits there are so few female headed households that we don't know.
79	ESP MCC	Pg.xxii	Can the evaluators hypothesize as to why Soubakaniedougou market is only partially utilized? Was it rehabilitated less well than the others? Were there resettlement problems?	We add the reason for non-use into the ES.
80	ESP MCC	Overall Executive Summary	A conclusion this reviewer would draw from the Executive Summary is that a focus on “hardware” (the irrigation infrastructure) detracted from an appropriate focus on and delayed the implementation of the “software” (the services related to people using the infrastructure). This has occurred on other MCC irrigation projects, because the infrastructure works are typically delayed. Is this a legitimate conclusion to be drawn? If so, would the authors being willing to make this explicit?	It is safe to say that the delay in investments in infrastructure delayed the "software". But we cannot conclude that this had any implications for the functioning of the perimeter, because APD coordinated the completion of many of the outstanding activities in the post-Compact period.

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81	ESP MCC	Overall Executive Summary	There were many problems with contractors, especially resettlement, on the Di project, but the project has produced positive results, although perhaps not sustainable. Is it a leap of this reviewer's imagination that initial problems were overcome by good oversight from MCA (and MCC)? For example, changes and rectifications were made, including paying for crops in years where farmers could not farm because of delays. This is not a good resettlement practice at all, but a remediation that is frowned upon because it can cause dependence; the results provided seem to indicate that this did not occur. Can the authors document that? Do the authors have any observations that would allow hypotheses on how/why things turned out better than expected?	The reviewer raises three distinct questions. 1) Respondents in our interviews did not highlight this particular phase in the RAP process or the course corrections that were done, so we are not able to include further analysis on this issue. 2) Respondents did not comment on the issue of dependence. 3) We already note in the ES that APD completed activities that were planned under the compact but were delayed.
82	ESP MCC	Overall – carry over from ES to Main Report	Please note that the above comments, as appropriate, could be applied to and addressed in the main report. For example, the distinction, if any, between improved land tenure and secure tenure.	We apply relevant corrections in the main body as well.
83	ESP MCC	II.B, pg. 17	Please make clear why the report does not address women's gardens and the Di non-PAPS.	We include a footnote to illuminate the chapter's focus on PAPs.

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84	ESP MCC	II.B, pg. 18	Last paragraph says BERD took plot censuses in 2010 and 2013. Specify that this was February 2013, because this was not done in the survey of October 2013. Clarify the household surveys in 2013. Figure II. 2 says the February 2013 was a "survey" but in October 2012 there was a retrospective baseline survey to a representative sample of PAPs. Does the text mean to reference the February survey or both? In any case, should the reader infer that the Feb 2013 survey was not representative or was it a full census? Was the October 2013 survey actually representative in Mathematica's view? Did you detect biases?	In our baseline survey we describe the data and the poor quality in detail. The 2010 census data was copied from appendix tables to the BERD report by the then MCC program officer Kari Nelson, as BERD had never submitted the database. It only contained a handful of variables on land lost. This is in contrast to the 2013 census which collected substantially more information, but really is of limited use as it covers less than 10 percent of land lost. For the October 2013 survey, we do not know how representative the survey is as there is about a quarter of sample attrition but the initial sample stratification is not documented. The previous evaluator (who would have had access to more timely information) also could not replicate the sampling strategy. As such we have no idea of the extent of biases. (This is also discussed in more detail in our baseline report.)
85	ESP MCC	II.B, pg. 18	The fundamental question here concerns the adequacy of the data. At the time, there were many questions about the methodology and its application. Just one example of many: it was stated that the first resettlement specialist quit the team because inadequate funds had been provided to the team (although allocated in the contract budget that was paid for) to do the work and thus the census of plots was badly done.	See the response to comment 84.
86	ESP MCC	II.B, pg. 19 Footnote 6	Which sample was not retained, February 2013 or October 2013? Explain more fully why the baseline respondents are not a representative sample of Di PAP households. This raises the question as to why the October baseline survey is called a representative sample. Was there ever a full baseline census and if so, why not, which is what PS 5 requires (the resettlement standard for MCC).	We have updated the report to clarify that it is the baseline survey of October 2013 that is not representative.

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87	ESP MCC	II C. pg. 20	How adequate was the baseline survey of respondents to show that 22% is a representative number for females? This seems confusing in light of footnote 6 and especially in light of the many complaints and problems with identifying female farmers starting in 2010 that were never fully resolved.	This is representative of females identified as PAPs in the RAP as approximately one quarter of PAPs were female. We include this number in the text.
88	ESP MCC	II D. 1. b, pg. 21	Which baseline survey is this? Which date and who did it? Any reason why records of MCA payouts of compensation and or MCC payments to MCA for compensation were not used?	We clarify the distinction between the baseline survey and the census. We make use of the payment information from the census database. We also refer the reader to the baseline report for more information.
89	ESP MCC	II. D. 1. b, pg. 22	The complaints about the complexity of the formula are well-justified in this reviewer's opinion, who has never seen such a complicated (and convoluted) formula. It is good that the results worked out well for most PAPs, but the lack of transparency and difficulties to understand the formula, including the double forms of land tenure documents, because some was deemed to be non-compensation land (the land based on ratio of adult household members exceeding a threshold). Typically good resettlement practice is to keep compensation simple and standardized.	There is a tradeoff between achieving a larger set of objectives with the RAP process and simplicity of the formula Former MCA staff were still convinced of their use of this complex formula. Regarding the second comment: In this paragraph we reference stakeholder perceptions of accuracy of the databases.
90	ESP MCC	II. D. 1. b, pg. 22	The last paragraph on pg. 22 indicates the problems with the data and the quality of record keeping diplomatically, but perhaps the evaluation needs to be more frank about the situation. Does Mathematica believe that the data they had is trustworthy enough? This reassurance would be helpful.	We use the data in this section primarily to triangulate our qualitative analysis. We think this data is adequate for that purpose. Our baseline report provides an in-depth assessment of the quality of the baseline data sources.
91	ESP MCC	II. D. 1. b, pg. 22, Table II.3	Footnote *a* is not contained in the table. Provide the line item to which it is a reference. Source does not contain date reference to baseline 2013 survey – is this October? Note that the plot census of 2011 is not shown in Figure II.3. That should be added.	We have now clarified that the baseline survey is October 2013 and the census (without survey) February 2013.
92	ESP MCC	II. D. 1. b pg. 23	The paragraph concerning the adverse effect on women is important. Hence the suggestion that this finding be part of the Executive Summary. Is it possible to add more data and any findings regarding the women's groups' agricultural activities? This seemed to be a productive and useful effort.	We have added some information on adverse effects on women in the ES.

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93	ESP MCC	II D. 1. c pg. 24	Please confirm that pesticides and herbicides were actually part of the starter kit and the generic or brand names of the products. To this reviewer's knowledge, no special assessment of the "cides" was prepared and that is not in accord with MCC Environmental Guidelines. Very few "cides" would pass the tests required by MCC Environmental Guidelines. Thus there is a potential compliance concern. Very few "cides" would pass the tests except those found acceptable by a USAID Pesticide Evaluation Report (PER) and Safe Use Action Plan (SUAP) for Burkina Faso, because the requirements are similar. MCC has a prohibition on funding if: (b) the project involves or will involve the production, procurement, or intentional release of any pesticide, industrial or consumer chemical or other product (including an emission or effluent) (i) that is listed for elimination or restriction under the Stockholm Convention on Persistent Organic Pollutants; (ii) that is banned or severely restricted under the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade; (iii) that is listed or nominated for inclusion under the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade; (iv) that includes an active ingredient that is classified as "extremely hazardous" (Class Ia) or "highly hazardous" (Class Ib) in "The WHO Recommended Classification of Pesticides by Hazard," as revised from time to time; or	We did not inquire about brand or generic names of any products included in the starter kits during the qualitative interviews. A verification of whether the products would have been allowable is outside the scope of our evaluation.

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93 (cont'd)	ESP MCC	II D. 1. c pg. 24	(v) that is a pesticide that includes an agent that the United States Environmental Protection Agency has classified in Toxicity Class I, has classified as a Restricted Use Pesticide, or has not registered for use in the United States; ……. unless MCC has made a final determination, taking into consideration an appropriate environmental and social review in accordance with the criteria in the "Environmental and Social Review" section of these guidelines, that the project is not likely to cause a significant environmental, health, or safety hazard	We did not inquire about brand or generic names of any products included in the starter kits during the qualitative interviews. A verification of whether the products would have been allowable is outside the scope of our evaluation.
94	ESP MCC	II D. 1. c , Table II.5 pg. 25	Row 2, column 2. Comment is made that the second round of compensation did not materialize. Please clarify if this was because the PAPs had an inaccurate perception of a second round but did not receive it because they were allowed to farm land that season or that they actually should have received it but did not. The first issue is one of lack of communication and transparency. The second is a lack of compliance with resettlement policy as applied to this project.	Our qualitative interviews do not allow us to distinguish between these two alternative explanations.
95	ESP MCC	II D 2, pg. 27	Table II. 6 reports that reported practice was 41% for appropriate use of pesticides/pest management. Who determined the criteria for appropriate use and who evaluated this? Were the MCC Environmental Guidelines followed? For example, if farmers used Restricted Use Pesticides per USEPA, they were not following appropriate use per MCC requirements. This is a very tricky subject, so unless specific information is available to evaluate appropriate use according to MCC requirements, it is better to footnote and say this was reported but this does NOT necessarily mean MCC requirements were followed (unless of course that can be documented). However, one cannot document this without knowing the specific generic or brand names and much more information on how label directions were or were not followed.	As mentioned above in our response to comment 93, we do not have this information.
96	ESP MCC	II D 4, pg. 31	Text says "most understand that renting out their plots is an option". Use of the adjective "most" may be somewhat misleading as the statement about renting in the Executive Summary reports 55%, which just barely qualifies as "most".	We clarify that beyond those who believe they have a legal right to lease out land, the majority of the remainder also think that *in practice* they can do so.

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97	ESP MCC	III	This is a fascinating section and reinforces the importance of randomized control, which is hard to achieve in many resettlement situations.	Thank you for this comment.
98	ESP MCC	III D. 2 pg. 40	Please note if there were similar problems with PAPs – i.e., not cultivating land they were awarded.	We have included this information in Chapter 2.
99	ESP MCC	III D. 2, pg. 40	Please report on the names of phytosanitary products. See earlier comment about potential lack of compliance with MCC prohibitions on pesticides and herbicides.	As mentioned above in our response to comment 93, we do not have this information.
100	ESP MCC	III D. 2, pg. 40	Can the authors provide any hypotheses about the reasons that so few participated in training?	We propose asking this question in the final data collection since we currently do not have information on this issue.
101	ESP MCC	IV overall	The analysis of O&M tends to reinforce the general conclusion that software such as TA suffers when infrastructure construction is delayed and training or other assistance is not available in a timely fashion. To the extent this conclusion can be reached by this evaluation, it will be helpful, because it appears to be a recurring one in MCC irrigation projects.	We know it was delayed, but we cannot state that the training implemented by the post-compact entity was worse than planned.
102	ESP MCC	IV overall	The reinforcement of the conclusion of the Di lottery analysis that rice only plots diminish recovery rates and could lead to a declining spiral with nonpayment of fees leading to reduced harvest and inability to pay WUA fees.	Yes. We also reference the lottery chapter in this context.
103	ESP MCC	V overall	Integrated Water Resource Management suffered delays in establishing CLEs and did not receive all the training planned. Can the authors hypothesize as to why? The report suggests that this may have been the result of insufficient stakeholder engagement. Can the lack of expertise and the disincentives to pay water user fees be overcome and how?	Our qualitative interviews do not provide information on the reasons for the delays and lack of training. We did not ask about whether the lack of expertise and the disincentives to pay water user fees can be overcome.

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104			The document states that "Members of CLE Banfora conducted campaigns to convince the public to use approved pesticides." Unless it can be documented that these were approved according to the requirements of MCC Environmental Guidelines (and the approved ones named), a caveat should be inserted to indicate that there is no information to indicate that these were approved under the strict MCC Environmental Guidelines for pesticides, no RUPs were used, etc., etc. See also pg. 64 which showed that there was pesticide contamination of water (which may have had nothing to do with the project, however).	Based on our understanding this targeted the reduction of the inappropriate use of non-approved pesticides. In untangling the double-negat. We have reformulated the section to clarify that it is not the case that the CLEs distributed any phytosanitary products with MCC funding.
105	ESP MCC	VI overall	Please make clear how the training evaluated under the Farmer Training included the Di perimeter. This is not explicitly stated. It would be helpful to provide a list or map of the 30 villages involved. Figure VI.1 indicates that in 2011 TA was conducted for beneficiary farmers in ADP intervention zones, which suggests Di was included. Page 23 under Section II reports that PAP households reported receiving training from AD 10 or MCA. Was this the same type of training or different? Is it possible to know if results differed by the institution who delivered it?	The reviewer raised three questions. 1) Training for PAPs and Di perimeter farmers was conducted by the same contractor, but this chapter only deals with the non-Di perimeter farmer training activities. We update the report to include this information. 2) We provide information on the number of villages in each area, but do not provide a list. A list would reduce the effort needed for respondent identification. 3) The implementer for the training was AD10 funded through MCA. We have included a note to clarify that both names were used to designate the training.
106	ESP MCC	VI, Table VI.3, pg. 74 and text on pg. 73	This section that indicates over 50% of the households in the 2018 interim survey used insecticides and pesticides (not clear why this terminology is used, because earlier terminology was pesticides and herbicides). See earlier comments about this related to the Di perimeter. There, the percentages of those recollecting use of "cides" was much smaller. Can this be explained? Please be explicit about which "cides" are cited.	The question on use encompasses all phytosanitary products, so we do not know which ones were specifically used. Because we do not have this granular level of detail we cannot provide the comparison you suggested.

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107	ESP MCC	VII overall	More information about the coordination (or lack thereof) among activities and the "silo" mentality of the multiple contractors would be useful to include.	Respondents blamed delays for the breakdown in coordination. Since a single contract covered the activities for which we are assessing overlap (AD10) a silo mentality between contractors could not be the explanation.
108	M&E	II overall	Is there information available for baseline production from monitoring data.	MCC has agreed to look for baseline monitoring data. If these baseline data are not available or usable, we will reference the information contained in the ITT and the ERR.
109	M&E	III overall	There is no information on land tenure outcomes for Di Lottery beneficiaries.	We updated the interim report to include information on land tenure outcomes for Di Lottery beneficiaries in the Appendix. These indicators we present are the same as for the Di PAP analysis (Table II.9).
109 follow-up	M&E		MCC Response to Evaluator Response on Revised Report: It would be helpful to include this data not only as part of the appendix but also better analyzed within the report itself. See other comments.	This descriptive analysis was included in the main body of the report as Table III.8, but mistakenly noted in the response tracker that it is part of the appendix. We address the other comments below.
110	M&E	III overall	There is no analysis of the impact of the Di Lottery on land tenure outcomes for the Di Lottery evaluation.	Due to a programming error the questions on land tenure security and conflict were not collected for off-perimeter plots. This precludes an analysis of the lottery's impact on land tenure outcomes.

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110 follow-up	M&E		MCC Response to Evaluator Responses on Revised Report: This was not a simple programming error. MPR did not realize the land data was not collected until MCC raised the issue upon review of MPR's draft interim report. In fact MPR first responded that they were not supposed to collect the land data and could not recall what data was/wasn't collected. MCC had to provide emails showing the agreement of data to be collected, which had followed multiple rounds of discussions during finalization of the questionnaire over the importance of collecting land tenure data in the interim. We suggest MPR explicitly state in the report their failure to obtain data as it was part of the evaluation's key research questions, approved evaluation design, and approved questionnaire, yet was not completed. The results/methodology no longer align with the evaluation design/logic and cannot be fixed at a later date by simply collecting endline data. Reason being, recall data on land tenure perceptions and tenure is not good so endline data will only provide longer-term results and perhaps recall data on land transfers. It would be helpful for MPR to onboard a land expert in the future as the current team does not seem to understand the land aspects.	We are fielding a survey to collect this information and will include this analysis in the final evaluation report. We include a footnote that the interim report did not include this information due to a programming error.
111	M&E	III overall	There is no analysis of the effect of land tenure on investment.	In the revised interim report we analyze the effect of winning the lottery on land investment. In the final evaluation, we will implement a mediation analysis to analyze which part of the effect of Di Lottery on land investment operates through the mechanism of an increase in land tenure security.

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111 follow-up	M&E		MCC Responses to Evaluator Responses on Revised Report: The link of land tenure (long-term leases and titles and related perception changes) on investment was a key research question of this evaluation. It was a founding element of the project logic and evaluation design. Almost all lottery participants received leases for Di. Similarly all PAPs received titles. Having 14% of beneficiaries make investments could be considered relatively large considering the short exposure period once beneficiaries received leases. Similarly 8% of PAPs making investments after receiving titles could be significant depending on control group/pre project scenario--was this data compared with the resettlement data for PAPs on existing investments? Do we know the amounts of the investment and related change in investment which would provide an understanding of evaluation power? Per phone discussion between MPR and MCC following the draft interim report did MPR analyze this data? For Di lottery beneficiaries, this was provision of a brand new parcel so investment was 0 prior on that parcel (also have some Di lottery application data). For perception of land tenure, please clarify what questions were used for perception of tenure and investment and include correlation analysis in report-even if none, it is key to note since research question . Namely, even if can't show effects since did not collect required land data, per discussions, we would still like to understand if those who invested were those who had higher perceived tenure (keeping in mind timeline of receipt of land tenure documentation, parcel receipt, related trainings/planting seasons/starter kits, and transfers).	We agree that the effect of land tenure security on investments, loans and land transactions is an important mechanism through which benefits of the project may operate. However, the evaluation design report approved by the EMC did not include these research questions. The percentages actually refer to the percent households who report having made investments in the last three years, since the construction of the perimeter. We now include this time reference in the report. In terms of benchmarking, we do not have baseline information so we cannot provide information on changes in investments on the land that became the Di perimeter. In terms of other benchmarks, Bambio and Agha (2018) show that only 40 percent of plots in project regions have ever received any investments, but most of these investments are not applicable to land on an irrigated perimeter (well, dikes,...), so the comparison is not really meaningful. We also reviewed the M&E plan and ERR model and could not find anticipated levels of land investment nor the type of investment the program logic had hoped to facilitate. We also have information from the Di Lottery controls: Di Lottery beneficiary households are 6.9 percentage points more likely than Di Lottery control households to make any investment in their plots. We note the caveat that the type of land and the type of land tenure differ.

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112	M&E	Overall Di Lottery	MPR realized well after the interim results report was drafted (and only after raised by MCC) that they forgot to include the series of key land questions. If MPR had caught this mistake during analysis and data quality control/oversight, MPR might have been able to go back and collect the land interim data required. However, by the time of the interim results report review by MCC it was too late. Instead of noting this flaw in the evaluation, MPR states in the report that land benefit streams cannot be measured. As the design, logic and questionnaires planned to collect this data and could have measured this data, MCC suggests that the text better reflect the situation. For example, the report could note that MPR planned to collect and analyze interim effects on land tenure and related impacts on land based investment per the evaluation design and logic but failed to do so due to misprogramming and weaknesses in data quality control/oversight. As such, the evaluation will be limited in its ability to detail out the contributions of land tenure in the interim and will need to rely on the collection of longer-term exposure period data.	We include a note that we are collecting land tenure information from the control group on land conflicts and land tenure security that will be included in the final report. We have collected information on land investments and include the estimate of the effect of winning the lottery on land investment in the report.
113	M&E	Overall	During Interim Report Discussions when MPR realized and agreed that they did not collect the land data, the agreement was to review and incorporate the limited land data that was collected. Although basics were included, interactions with the rest of the data does not seem to be incorporated. Specifically, MPR was supposed to look at correlations with land tenure and agricultural investment and land use/transfers. If MPR did analyze this data, it is not documented in the revised report. MPR should review correlations with land tenure, agricultural investment and land use. This should be fixed prior to finalization of the Interim report.	We did include the correlation in the answer to MCC's question given MCC's specific stated request to know about the correlation. In terms of the larger interest in land tenure outcomes, we are collecting information on land tenure outcomes in the control group to assess the project effects on land tenure at interim. We will include this analysis into the final evaluation report.

Number	Reviewer name, division, and/or institution	Page Number	Comment	Evaluator Responses
114	M&E	Di Lottery RCT	It would be helpful for MPR to review interpretation of some land data points. Some of the interpretations do not seem well founded or informed by empirical evidence. For example, MPR notes low investment using land as collateral and use of land; however, there is no information on what are normal levels of land investment and use of land as collateral for Burkina. Some would think 14% investment on land obtained in less than a year (sometimes with training and incentive kits only delivered late or post compact) is considerable. If Burkina data is unavailable, one could look to comparison at least in other similar efforts in other countries/the region. As there is no control, MCC suggests that MPR either provide an understanding of general levels in Burkina or the region that support its analysis or simply provide the data without adding a negative interpretation. On a similar note, it is unclear why the report is comparing Di lottery beneficiaries to Di PAP beneficiaries. Di PAP beneficiaries received land and farmer training well before Di lottery beneficiaries. That along with PAPs receiving full title vs Di lottery beneficiaries receiving long term leases may be what is causing some of these differences; however, MPR does not delve into any of these nuances and instead seems to treat them like a comparison group, which is not an appropriate approach. It is important to note this if going to compare two groups of beneficiaries. Again, this is where having a land expert or land evaluation expert on board would be helpful.	This comment raises two issues: 1. How low are the investment in land relative to investment in Burkina Faso/the region? We are able to benchmark this by providing an estimate of the impact of the project on land invest by using interim outcomes in the control group. 2. The comparison of PAPs and Di Lottery beneficiaries. To clarify the limits of this comparison, we include a note similar to footnote 13 in chapter III. We think it's important to point out that both comparisons complement each other: The advantage of comparing PAPs to Di Lottery beneficiaries is that any confounding factors related to land are kept constant, although background characteristics vary, not all PAP land is leased and there are some differences in when the land was received. The advantage of the comparison of Di Lottery beneficiaries and controls is that their baseline characteristics are held constant, but the characteristics of the plot that affect investment (irrigated vs. non-irrigated land; distance from homestead to plot) differ.

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115	M&E	Di Lottery RCT	There seem to be some interesting findings for women, where women actually took out more loans/invest than the men. Why were these findings not highlighted? It is quite an odd finding for land projects and key. Considering the other notes re women/land, this appears to be an area that could be better highlighted.	This is a question of sample size. Out of the 29 PAP households, 3 female headed households took out loans and of these 1 used land as collateral. So there is little we can say with such a small sample. For Di Lottery beneficiaries, about 4% of male Lottery beneficiaries have used land as collateral versus 1% for female beneficiaries. While the rate for men is a factor of 4 higher than for women, it is really the absolute numbers that stand out and that document that this is not a major mechanism for project effectiveness. The differences in land investments at 16 and 12 percent for female and male Di Lottery beneficiaries are also really small.
116	M&E	Literature Review and Di Irrigated Perimeter PAP Evaluation-pg 32	MPR's framing of the PAP and Di land/ag activities and related links would benefit from revision. PAP is not a land only investment (deals with those who were resettled) and Di lottery not only irrigation. Both evaluations are unable to separate out the effects of the three joint activities of land, ag/farmer training and irrigation/infrastructure. For example in the literature review, MPR notes that irrigation and land by gender can be analyzed via RCT but land titling cannot since no control group. This is incorrect. The distinction is we can measure effects of irrigation plus farmer training plus land certification via Di lottery RCT but not for the PAPs (same set of investments-land title, irrigation and farmer training/incentive kits). Namely, it is not effect of land titling performance vs. irrigation RCT but rather MPR can only tell the combined effects of ag/infra/land in RCT/Di lottery but not for PAPs. On pg 32, MPR notes, "...land tenure security was not enough on its own to allow investment." However, PAPs received irrigation and farmer training--not just land tenure.	We drop the qualifier "on its own" from the statement and add "even in combination with the other compact benefits...". We also make corrections to the literature review section.

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117	M&E + DCO/AgLand/Land	Literature Review	The land part of the literature review could benefit from clarification. The Burkina example MPR gives to illustrate the lack of effects of land titling is incorrectly used. MPR states, "Early interim results from the compact's Rural Land Governance Project (RLGP) suggest a positive impact of the RLGP on perceptions of land tenure security, though not [[YET]] on conflicts or agricultural outcomes (MCC 2016)." However, in RLG Burkina, there were no titles even issued at time of interim data collection (villages had only just recently been demarcated) and hence no effects on longer-term goals like agricultural outcomes were even expected at this milestone.	Regarding your comment on our citation of the interim results of the RLGP, we drop the mention that there was no effect yet on conflicts or agricultural outcomes, as the project logic did not expect them to occur by the time of the interim period.
118	DCO/AgLand/Land	xvii	"Although about one-fifth of the PAPs were women, some women who previously cultivated land were not compensated. The project considered all individuals within the households who cultivated land as PAPs. As a result, women were also registered, and they comprised 24 percent of the PAPs. Some women, however, were reportedly not registered. In addition, because all land allocated in compensation was combined into a single plot, some female PAPs reported that their husbands kept control of the entire plot." Based on the description MPR gives, it may not mean that these women were not compensated by the MCC project. The language used suggests a failure without providing detail on the basis. We suggest MPR re-state in the interim report to language such as: "Some women did not REPORT being compensated. MPR does not have further information on how this survey finding aligns with the design or actual roll-out of the land dimensions of the actual compensation process". MPR could also use the more precise wording that the report itself uses (later in the doc): "Some women, however, reported that they were never given plots on the perimeter, even though they gave up parcels of land during the perimeter construction."	The language in the summary is actually more accurate as this conclusion relies on information from focus groups, interviews with KIIs and project documentation, but not survey information. We reword the language in the report. Based on our review of project documentation we know that MCC's project design did not exclude female PAPs, so we can reject the notion that this was by project design. The language we use is pretty clear on this: "The project considered all individuals within the households who cultivated land as PAPs. As a result, women were also registered, and they comprised 24 percent of the PAPs."

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119	DCO/AgLand/Land	24	"Some PAPs received their land titles in 2015; others received them in 2016." We suggest MPR note here additionally that "this was after compact closure, thus this work was completed by the GOBF with its own resources"	We add that the titles were received after compact closure. We don't think it's accurate to state that the work was completed with GOBF funding since the post-compact entity received financing from the repayment of loans to the rural finance activity which gave out loans with MCC funding.
120	DCO/AgLand/Land	26	"Land received in compensation was given to households in one contiguous plot, and this made it easy for some household heads to claim the entire land for themselves. Some women reported that their parcels were given to their husbands and then it was up to the husbands on whether or not they gave the land back to their wives." We suggest MPR clarify if this in fact was an issue that the project did not address, or whether the project did address this in some form, but the intervention (documentation, agreements, awareness, etc.) did not "stick". Those are two different issues. We recommend if MPR does not know which it was, MPR consider adding language indicating something such as "we don't know whether X or Y was the cause"	We include a note that we do not know if this was part of program communication or not. We do add information that the project did try to remedy this (similar to language we use subsequently).
121	DCO/AgLand/Land	26	"To make matters worse, in cases in which women's land was added to parcels given to their husbands, women were told they could not register for women's groups (to gain access to perimeter land) because they had already received land compensation" We suggest MPR consider stating this more clearly, such as "women INTERVIEWED REPORTED THAT THEY were told... MPR does not know whether this was a result of the project design, implementation, communications/awareness raising, or another factor; this was outside the scope of what MPR examined"	As our land tenure analysis relies on interviews with PAPs, interviews with KIIs and project documentation, this revision would not be accurate as this information is triangulated from all three sources. For example, project documentation notes that the small vegetable plots were only for women and youth who were not themselves PAPs. We do include a footnote that the exclusion of female PAPs whose land was taken by their husbands is consistent with eligibility criteria for vegetable plots that excluded PAPs from receiving any land as part of women's or youth groups.

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122	DCO/AgLand/Land	32	"Low levels of collateralized credit and equally low investments in land suggest that any effect of land tenure security on these outcomes would be small. Only 20 percent of the 30 percent of male PAPs who applied for a loan have used their land as collateral for a loan, while female PAP households do not appear to use land for this purpose. The increased land security has had minimal effects on land investments, with only 8 percent of households reporting any investments, primarily in planting trees." Was the time of the survey consistent with the timing the investment effect was expected to have been seen? We recommend MPR to say more about this because planting trees shows tenure/long-term investment and 8% after less than a year of having a title, is not necessarily bad at all depending on what was the base/control (per earlier comment). Investment effects related to land tenure take time. We suggest MPR add a short additional statement clarifying how this 8% fits into the project's or the sector's expected timing for investment effect following receipt of land and land documents.	As we note above we now clarify that this is 8% for the three year period since completion of the perimeter, and we discuss the contextualization. In terms of project expectations, the ADP program logic in the M&E plan itself unfortunately does not specify a target level of investment (this is also absent from the ERR). The rural land governance project does specify an exposure period whereby longer-term outcomes could be expected by 2017, or 3-5 years after the project was completed. However, there was a delay in provision of titles and leases with the last groups of PAPs receiving titles in 2016 so that it is possible that these effects will only materialize by the time of the final data collection. We include a footnote that discusses the issue of exposure periods.
123	DCO/AgLand/Land	33	"According to some female focus group participants, the land allocation process generated some land disputes between husbands and wives. When the perimeter was finished, some of the land that legally had been given to female PAPs was in most cases adjacent to the land given to their husbands." In relation to prior statements related to this issue, above, HERE the language seems to suggest that the land was "legally given" to female PAPs (i.e. names on documents), compared to above which says that land was "given to husbands".	We add a subclause to this paragraph: "Land received in compensation was given to households in one contiguous plot, and this made it easy for some household heads to claim the entire land for themselves, even if it was legally allocated to the woman. Some women reported that their parcels were given to their husbands and then it was up to the husbands on whether or not they gave the land back to their wives. "

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124	DCO/AgLand/Land	33	"Most of these cases were resolved in community meetings organized by the project." This also says that MOST of these situations were resolved within the project, whereas above, the text seems to say that this was a generalized problem that remained unaddressed at the time of the survey. Dispute resolution is a standard and critical portion of any project of this type. We suggest MPR correct or clarify the language in the report to more clearly and consistently explain when respondents indicated that disputes were resolved during the project (as intended) vs. when respondents reported that they felt disputes remained or emerged after the close of the project.	This is an issue of timeframe. The first set of statements addresses the allocation of land as part of compact implementation. The second set drew on questions related to the current status of land conflicts, where respondents just noted few remaining issues. We agree however that it makes sense to reference the dispute resolution in the section on implementation and include this information.
125	DCO/AgLand/Land	35	"Although around one-fifth of PAPs were women, some women who previously cultivated land were not compensated." This language repeats same language used earlier in the report and commented above. See comments above (i.e. suggestion to MPR to clarify whether a failure of design, implementation, awareness, etc.) - and then ensure that any textual changes made in one portion of the report flow through to other portions of the report where the same topic is also discussed.	As we note in our response to comment 118, the information came from a variety of sources, individual interviews, reports and FGDs. We write: "Although around one-fifth of PAPs were women, some women who previously cultivated land were reportedly not compensated."

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