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Niger Irrigation and Market Access: Evaluation Design Report

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Anthony Louis D'Agostino, Christopher Ksoll, Patricia Costa, Galina Lapadatova, Matt Sloan

Submitted to:

Millennium Challenge Corporation
1099 Fourteenth Street, NW, Suite 700
Washington, DC 20005

Project Officer: Hamissou Samari
Contract Number: 95332418F0225

Submitted by:

Mathematica
1100 1st Street, NE
12th Floor
Washington, DC 20002-4221
Telephone: (202) 484-9220
Facsimile: (202) 863-1763
Project Director: Matt Sloan
Reference Number: 50542.01.110.031.000

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LIST OF ACRONYMS

CAIMA	*Centrale d'Approvisionnement en Intrants et Matériels Agricoles* (Supply Center for Agricultural Inputs and Materials)
CAPI	Computer-assisted personal interviewing
COFOCOM	*Commissions Foncieres Communales* (Communal Land Commissions)
DAC/SOR	*Direction des Actions de Coopération et de Soutien aux Organisations Rurales (*Directorate of Cooperative Actions and Support to Rural Organizations)
EDR	Evaluation design report
ERR	Economic rate of return
FFS	Farmer field school
FGD	Focus group discussion
GDP	Gross domestic product
GoN	Government of Niger
IMAP	Irrigation and Market Access Project
IPD	Irrigation Perimeter Development Activity
IRB	Institutional review board
IWUA	Irrigation water user association
KII	Key informant interview
M&E	Monitoring and evaluation
MCA-N	Millennium Challenge Account-Niger
MCC	Millennium Challenge Corporation
MDD	Minimum detectable differences
MOJEDEC	*Mouvement des Jeunes pour le Développement et l'Éducation Citoyenne* (Youth Movement for the Citizenship Development and Education)
MSMF	Management Services and Market Facilitation
NASA	National Aeronautics and Space Administration

NPK	Nitrogren, phosphate, and potassium
O&M	Operations and maintenance
ONAHA	*l'Office Nationale des Aménagements Hydro-agricoles* (National Office for Irrigation Schemes)
PAP	Project affected person
RAP	Resettlement Action Plan
PR	Policy Reform Activity
RCT	Randomized control trial
RN7	Route Nationale 7
SISM	Sustainable Irrigation System Management
SSA	Agricultural Support Services
TBD	To be determined.
T&V	Training and Visit
UNOPS	United Nations Office for Project Services

I. INTRODUCTION AND BACKGROUND

A. Country context

The agricultural sector in Niger is the source of the livelihoods of more than 80 percent of the population and contributes to approximately one-fourth of the country's gross domestic product (GDP) (CIA 2018). However, agricultural production in Niger is much lower than in most countries. The majority of Niger's agricultural production is rainfed; in 2011, irrigated farmland only accounted for slightly more than one-half of one percent of the total agricultural land in the country (FAO 2016).[1] Without access to irrigation, crop production is vulnerable to droughts, which are frequent and can cause severe crop losses. Inadequate irrigation infrastructure also constrains dry season production growth (World Bank 2013). Productivity gains are further hampered by farmers' lack of market access to improved seeds, low adoption of new technologies, and inadequate extension services (World Bank 2017). As a result, Niger has one of the lowest agricultural yields in the world, and the yields of female farmers are lower than those of male farmers. Agricultural land managed by women produce 19 percent less per hectare than land managed by men (Backiny-Yetna and McGee 2015). More than 1.5 million people in Niger experienced food insecurity in 2017, and nearly 20 percent of the Nigerien population is food insecure and unable to meet food needs (WFP 2017). In 2017, Niger was ranked last on the United Nations Human Development Index (UN 2017).

To improve Niger's agricultural productivity and increase the incomes of rural farmers, the Millennium Challenge Corporation (MCC) is partnering with the Government of Niger through the $426 million Niger Sustainable Water and Agriculture Compact. The Compact, which will be implemented from 2017 to 2022, includes the (1) Climate-Resilient Communities Project, which aims to improve agricultural productivity for small-scale farmers, preserve natural resources, and improve market sales of certain goods and the (2) Irrigation and Market Access Project (IMAP), which aims to increase agricultural productivity and agricultural sales through complementary activities. The activities of the IMAP include constructing new irrigated perimeter(s) in the Dosso-Gaya area that serve the Ouna-Kouanza and Sia areas, rehabilitating irrigation infrastructure land in the Konni area, training farmers, promoting policy reform, and upgrading rural and highway roads to connect the Dosso-Gaya perimeters and facilitate trade.

B. Objectives of this report

In September 2017, MCC contracted with Mathematica to evaluate most of the activities of the IMAP.[2] A separate evaluator will evaluate the Roads for Market Access Activity.

[1] In all of Niger, about 100,000 hectares are equipped for irrigation, and cultivated area is estimated as 16.9 million hectares.

[2] Mathematica 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.

This evaluation design report (EDR) focuses on the Konni Perimeter. Project implementation in the Konni perimeter is progressing; the plans for the Dosso-Gaya areas (Sia and Ouna-Kouanza perimeter construction) are still under review. Due to the delays in Dosso-Gaya, MCC, and Mathematica have agreed to develop evaluation designs for activities in Konni as delays in collecting baseline information would undermine the planned evaluation design. Because MCC is still reviewing the plans for the Sia and Ouna-Kouanza, the present EDR does not include designs for the Sia and Ouna-Kouanza perimeter construction. As MCC finalizes implementation designs for the Sia and Ouna-Kouanza perimeter, Mathematica, in consultation with MCC, could either write a second, separate EDR or amend this EDR to incorporate all evaluation activities.

In this report, we present the design for the evaluations of IMAP activities in the Konni perimeter, including policy reform and land rights formalization activities. Below, we briefly discuss the planned evaluation activities.

- **Konni perimeter implementation and outcomes analysis.** We propose a mixed methods implementation and outcomes analysis to evaluate the implementation, results, and sustainability of the rehabilitation of the Konni perimeter and such complementary IMAP activities as farmer training and policy reforms. To address questions related to program implementation and sustainability of the activities under IMAP, we propose conducting a qualitative analysis through document review, targeted key informant interviews (KIIs), and discussions with focus groups. To assess changes in outcomes, we propose a quantitative performance evaluation (pre-post analysis) to estimates changes in outcomes spanning the intervention's duration. The pre-post analysis will be based on survey data collected at baseline, midline, and endline. In addition, Mathematica is collaborating with RTI International and NASA on using analyses of drone and satellite images to complement household survey data collection. The scope of this collaboration and the information that can be used to enhance the evaluation are still to be determined. In this report, we therefore reference possible uses of remote sensing without a final decision on the extent to which remote sensing will be used. We will complement our quantitative outcomes analysis with a qualitative analysis to provide more in-depth perspectives on program outcomes, drawing information from KIIs with stakeholders and focus groups with beneficiaries.

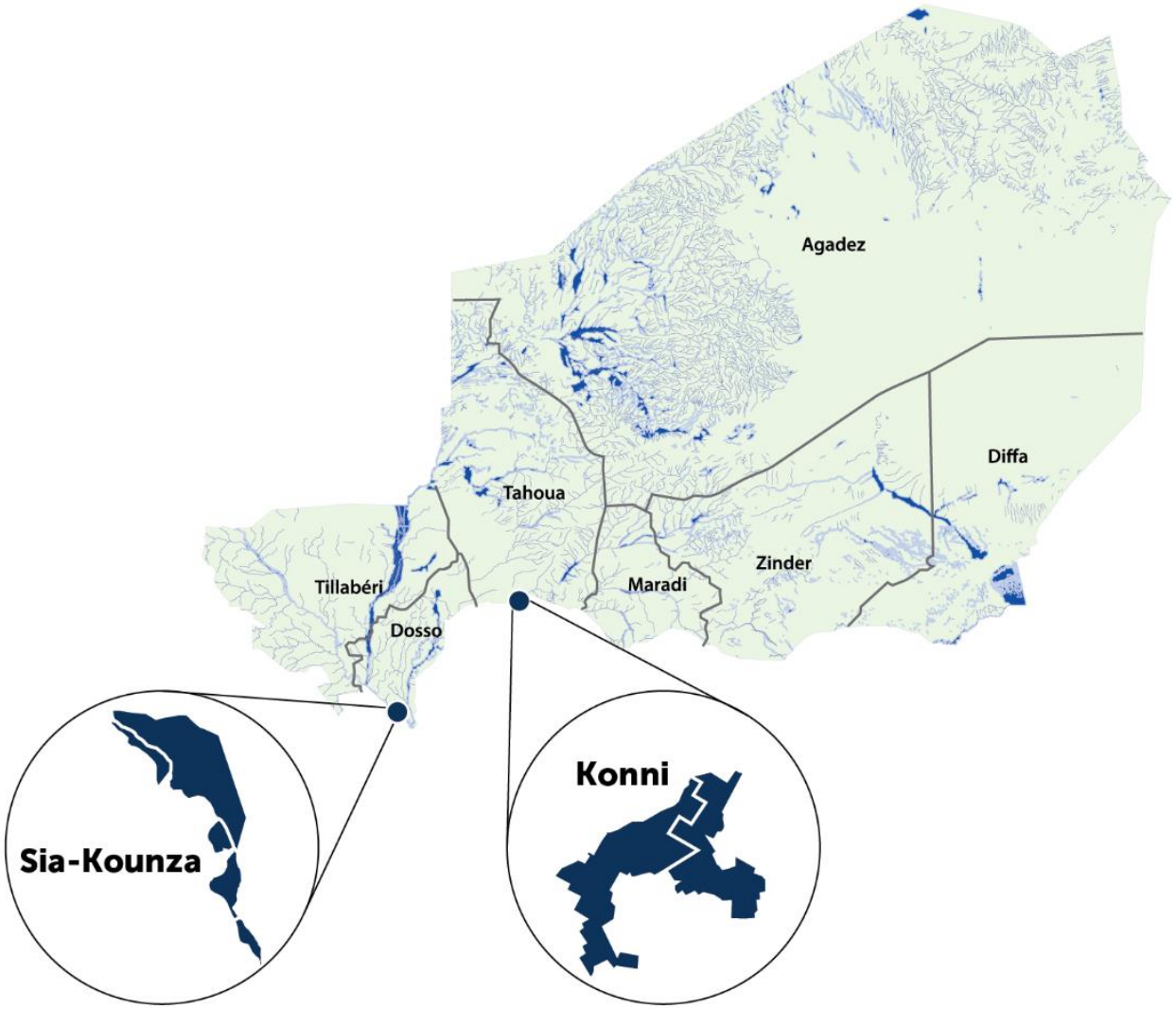
In upcoming chapters, we provide context for the evaluations and describe the planned evaluation designs in greater detail. In Chapter II, we provide an overview of the Compact and the interventions we will evaluate. In Chapter III, we summarize the existing evidence and gaps in the literature. In Chapter IV, we discuss the research questions that our evaluation seeks to answer, and provide an overview of our evaluation design. In Chapter V, we describe the mixed methods outcomes analysis of the Konni perimeter implementation and data sources that we will use to conduct the analysis. In Chapter VI, we summarize all data sources and describe our approach to data collection. We conclude in Chapter VII with a discussion of administrative details related to the evaluation.

II. OVERVIEW OF THE COMPACT AND THE INTERVENTIONS TO EVALUATE

A. Overview of the Konni perimeter investments and policy support implementation plan

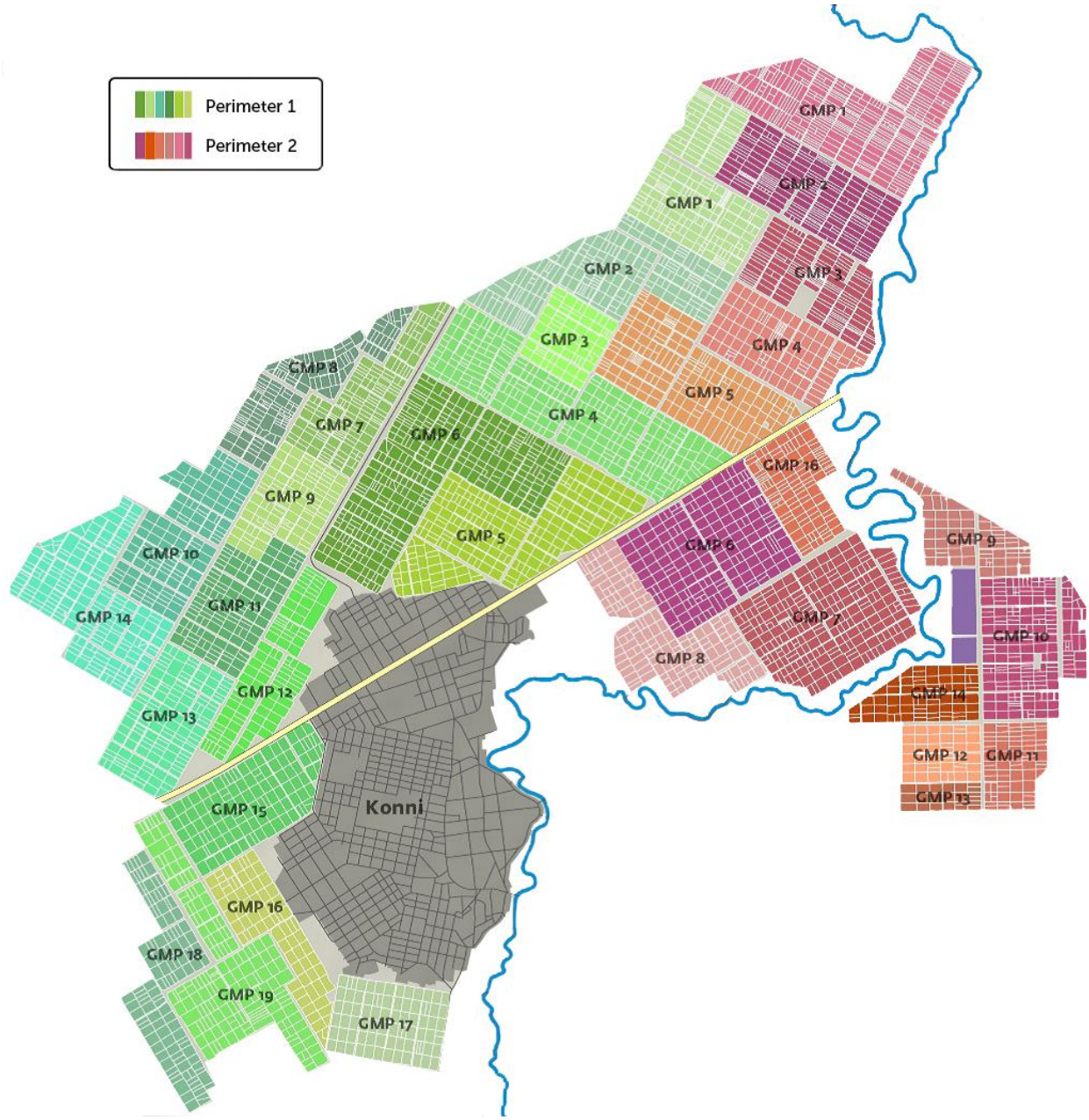
Four overlapping activities make up the $250 million IMAP. They are the Irrigation Perimeter Development Activity, the Management Services and Market Facilitation Activity, the Roads for Market Access Activity, and the Policy Reform Activity. The first two activities are in two regions of Niger: Konni and Dosso-Gaya, shown in Figure II.1. The Roads for Market Access Activity is taking place only in the Dosso-Gaya region, and the Policy Reform Activity is national. Because activities in Konni will likely begin in 2019 while activities in the Dosso-Gaya region are still under development, we focus in this report on the Konni perimeter, although we describe planned activities for both regions. To provide a more comprehensive picture of the IMAP, we describe below each of the activities, noting the geographic differences when relevant.

Figure II.1. Map of implementation areas in Niger



1. The Irrigation Perimeter Development Activity ($113.3 million) is a plan to rehabilitate the Konni irrigation system and develop new irrigated perimeters in the Dosso-Gaya area.
    a. In Konni, this activity will rehabilitate two surface runoff dams, a reservoir, and a supply channel for approximately 2,452 hectares of irrigated perimeter (MCA 2018). Many of these systems were built in 1976 and 1982, and now require rehabilitation and upgrades (MCC 2016). In addition, the activity will include training in soil conservation to limit the current siltation problem, as well as the repair and rehabilitation of the irrigation system to limit water loss. Figure II.2 provides a detailed view of the two Konni perimeters.

Figure II.2. Konni perimeter implementation area



b. In the Dosso-Gaya area—composed of the Ouna-Kouanza perimeter and the adjacent, smaller Sia perimeter—MCC plans to construct flood protection dikes and access roads, level parcels, and install water control gates and pumps. Unlike Konni, which had existing irrigation infrastructure in need of upgrading, this area will benefit from a completely new irrigation perimeter. In addition, for Sia and Ouna-Kouanza, MCC will install pumping and water distribution networks for mixed-crop irrigated agriculture. After these investments, the Dosso-Gaya area will have approximately 2,618 hectares of new irrigated perimeter.

2. The Management Services and Market Facilitation Activity ($9.1 million) consists of three sub-activities: (1) Agricultural Support Services (SSA), (2) Sustainable Irrigation System Management (SISM), and (3) Land Tenure Security. The SISM Sub-Activity targets only perimeter beneficiaries; the SSA Sub-Activity and Land Tenure Security Sub-Activity will also include beneficiaries located outside the perimeters. This evaluation focuses only on the group of investments made within the irrigated perimeter.

   a. The SSA Sub-Activity will employ a community-based approach to provide services and training that address every step of the agricultural production chain, including the supply of agricultural inputs (fertilizer and seeds, for example), access to finance, good agricultural practices, marketing, and sustainable use of natural resources. This sub-activity will also include investments in infrastructure for storage, value addition, and processing. To supplement the agricultural training, the SSA Sub-Activity will build the capacity of beneficiaries in functional literacy and numeracy and will also support the creation of savings groups for women and youth.

   b. The SISM Sub-Activity envisions establishing irrigation water user associations (IWUAs) that are self-financed and self-governing to better manage the upgraded and newly built irrigation infrastructure. Once established, the IWUAs will manage irrigation functions in the intervention areas. The sub-activity will support the IWUAs through preparatory studies, technical assistance, and capacity building.

   c. The Land Tenure Security Sub-Activity includes steps to improve land-tenure security through participatory development of local land allocation standards, as well as establishing a transparent process to allocate land. As part of the land allocation investments, MCC will also build capacity for such local land governance entities as *Commissions Foncières Communales* (COFOCOMs) by incorporating integrated land use planning and training local officials in land tenure and conflict.

3. The Roads for Market Access Activity ($113.4 million) aims to reduce trade barriers and increase market access through targeted improvements of the road networks that serve the Dosso-Gaya area and link these perimeters to the rest of the country. Specifically, MCC will rehabilitate and upgrade 83 kilometers (km) of the main north-south international trunk road (RN7). MCC will also rehabilitate an additional 187 km of the RN35 road serving the Dosso-Gaya area and 37 km of the Sambera Rural Road linking the Ouna-Kouanza and Sia irrigation perimeters. This activity is part of our evaluation only to the extent that the improved roads affect the farmers who are in our evaluation. Because this activity will likely benefit only the region of Dosso-Gaya, we do not provide an evaluation design for it in this report.

4. The Policy Reform Activity ($18.8 million) will develop and implement management plans for water, natural resources, and land use. It also involves reforming the fertilizer distribution market to increase the availability and affordability of fertilizer as part of an effort to ensure the success and sustainability of the project program. Specifically, the reform targets reducing the price of fertilizer by 30 percent. Another aspect of the activity is to build the capacities of the National Institute of Statistics, as well as relevant ministries (water and sanitation, agriculture and livestock, and environment) to generate more accurate agriculture data, analyze the impacts of policies, measure economic growth, and develop internal monitoring and evaluation skills.

As of early 2019, the IMAP has begun preliminary implementation, and activities around the Konni perimeter are scheduled to commence in earnest in fall 2019.

B. Theory of change

This project's theory of change stipulates that investing in large-scale irrigation infrastructure will result in increased water availability for project beneficiaries during the wet and dry seasons (MCC 2018). The project will supplement the large-scale irrigation infrastructure with technical assistance and training in water management, savings, improved production practices, agricultural marketing, and other complementary skills. Figure II.3 shows the pathway from anticipated activities to short-, medium-, and long-term outcomes. Through this investment in capacity-building, program beneficiaries in the irrigated perimeters will be able to use the water more productively and more efficiently produce higher-value crops, leading to increased sales. Land tenure security is expected to increase as a result of the provision of formal land use rights and a more robust land governance system. In addition, to facilitate the transportation of agricultural products to markets, MCC will invest in roads that link to the irrigation perimeter. Through road upgrades, project beneficiaries will be able to more quickly and seamlessly access inputs, services, and markets, and sell their increased production. The combined investments in infrastructure, human capacity, land tenure strengthening, and market access will enable Niger's farmers to move from subsistence farming to higher-value commercial/cash crop agriculture, leading to growth in rural incomes as well as food security. Turiansky et al. (2018) provide an in-depth discussion of the assumptions underlying the project's theory of change.

MCC anticipates reaching 447,501 beneficiaries who, as a result of the intervention, will realize higher real incomes (MCC 2016). The majority are from the Roads for Market Access Activity. More than 37,500[3] people will directly benefit from the Irrigation Perimeter Development Activity and the Management Services and Market Facilitation Activity. These beneficiaries are defined as individuals (and members of their household) who will have access to irrigated land on the perimeter, or stand to experience an increase in yields, sales, or profits as a result of having at least one member participating in trainings (in addition to receiving access to irrigation and land tenure documentation). Because of the complementary nature of the Irrigation Perimeter Development Activity and the Management Services and Market Facilitation Activity – eligibility for receiving training through the Management Services and Market Facilitation

[3] The Niger Compact calculates a total of 37,656 beneficiaries of the Irrigation Perimeter Development Activity and the Management Services and Market Facilitation Activity. This number does not appear in the M&E Plan.

Activity is primarily granted to project affected persons (PAPs) who previously cultivated land on the perimeter - households are likely to participate in both activities. Where this is the case, participants will be counted as beneficiaries only once. For the Roads for Market Access Activity, beneficiaries are households around Dosso-Gaya residing within 5 kilometers of the road. MCC has not yet identified the beneficiaries of the Policy Reform Activity, but beneficiaries could be at the household or the enterprise level. The table below (Table II.1) summarizes some key targets for each of the activities as published in the MCC Monitoring and Evaluation (M&E) Plan of the Niger Compact.

Figure II.3. IMAP Logic Model

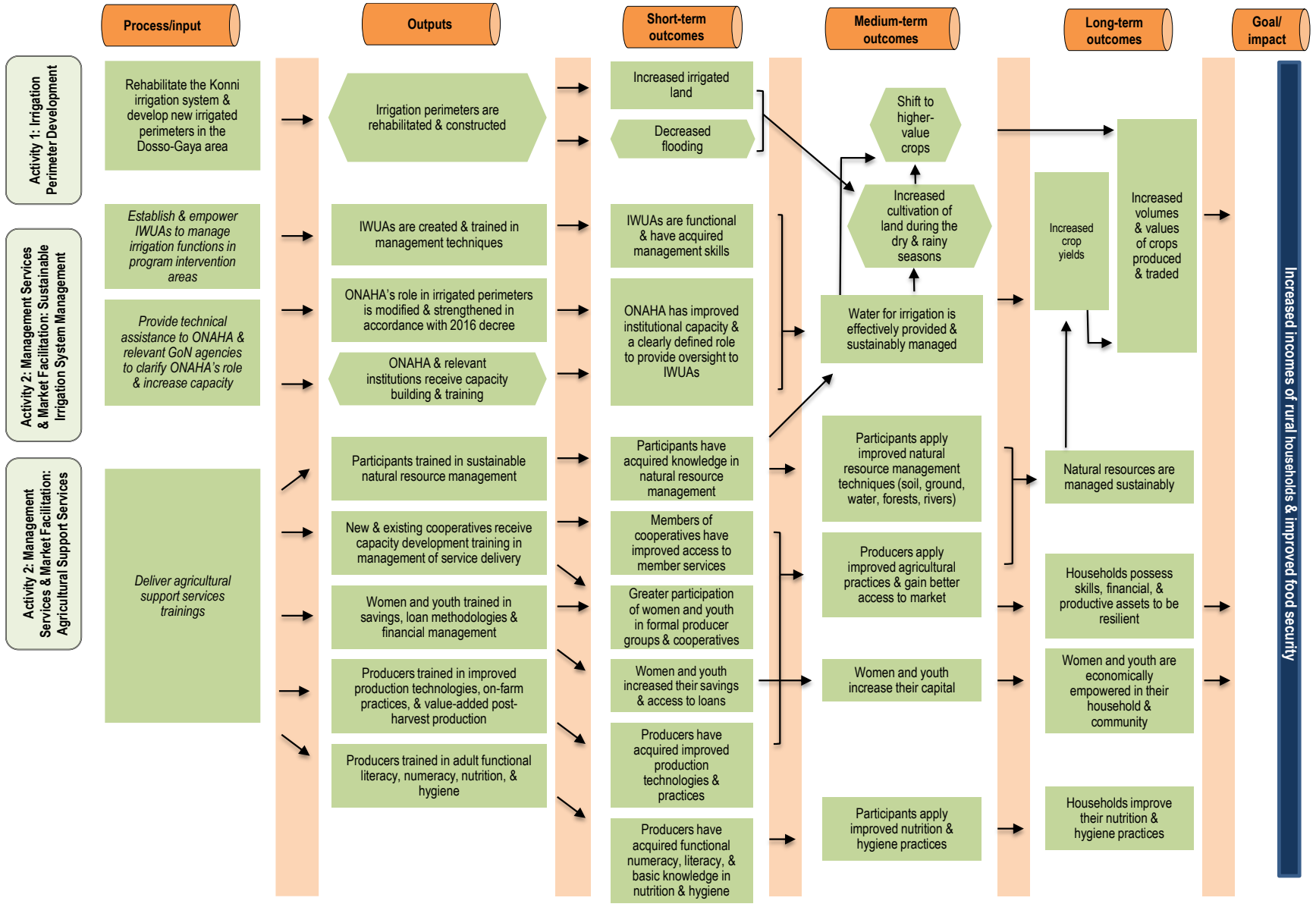
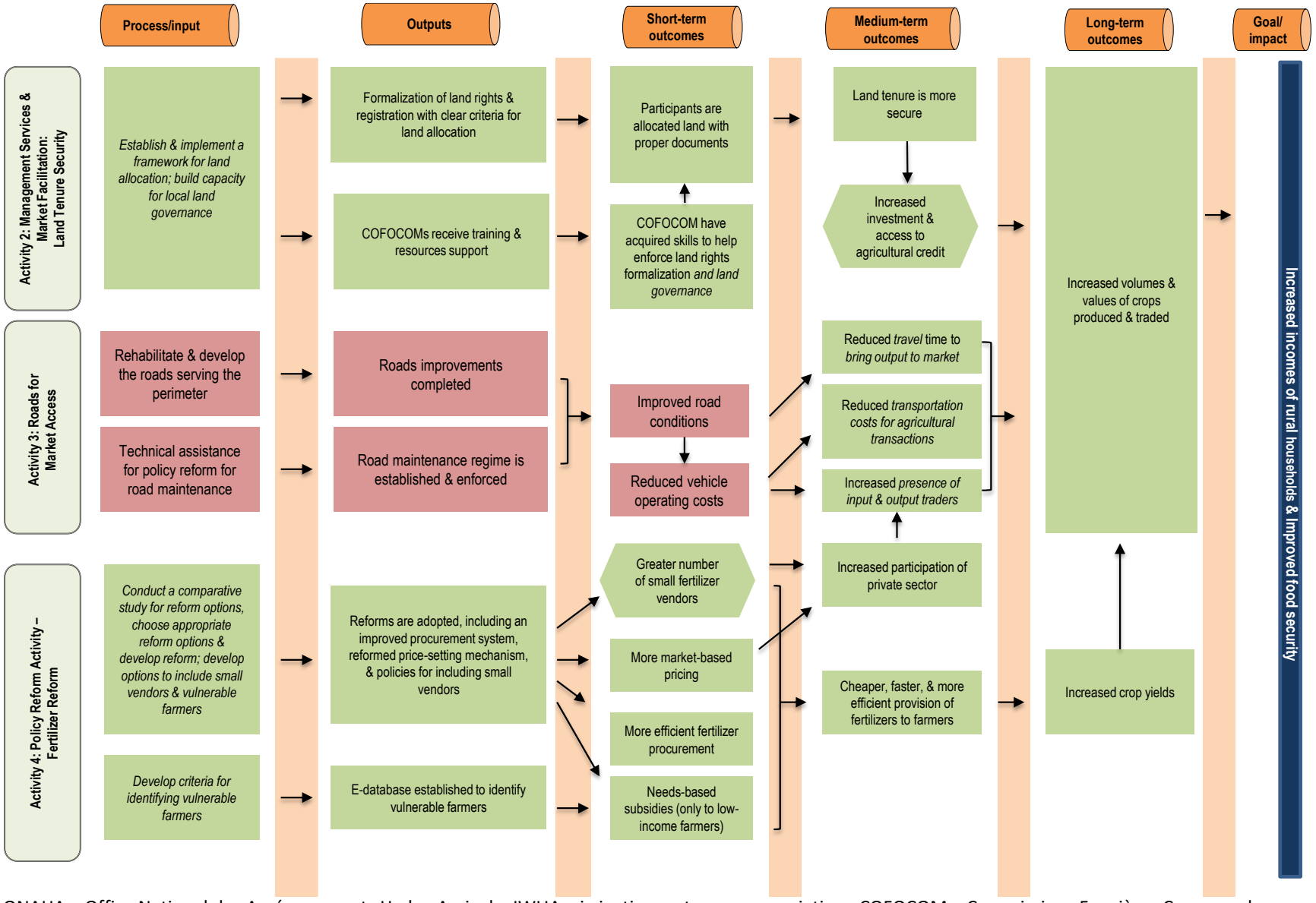


Figure II.3 (*continued*)



ONAHA = Office National des Aménagements Hydro-Agricole IWUA = irrigation water user association COFOCOM = Commissions Foncières Communales

Table II.1. IMAP targets by activity and geographic area

Indicator Name	Geographic area	Target
Management Services and Market Facilitation Activity: Irrigation Perimeter Development Activity		
Hectares under improved irrigation	Konni	2,452
	Dosso-Gaya	2,573
	Total	*5,025*
Management Services and Market Facilitation Activity: Land Tenure Security Activity		
Land rights formalized	Konni	3,400
	Dosso-Gaya	*
	Total	*3,400*
Management Services and Market Facilitation Activity Sub-Activity: Sustainable Management of Irrigation Systems		
IWUAs that self-finance with fees covering assigned operations, maintenance, and rehabilitation	Konni	1
	Dosso-Gaya	4
	Total	5
Management Services and Market Facilitation Activity Sub-Activity: Agricultural Support Services		
Farmers trained	Konni	4,834
	Dosso-Gaya	6,000
	Total	*10,834*
Farmers who have applied improved practices as a result of training	Konni	1,450
	Dosso-Gaya	1,800
	Total	*3,250*

Source: M&E Plan of the Niger Compact, March 2018.

*The M&E Plan included a target of 784 for Dosso-Gaya. However, according to that same document, the MCC land team does not know from where this number came and suggested the number should be much higher.

C. Economic rate of return and beneficiary analysis on the Konni perimeter

Households with land on the Konni perimeter are expected to benefit from MCC's investments in the IMAP through improvements in irrigation access, training in improved agricultural practices, skills development in such capacities as functional literacy and financial management, and strengthened land tenure security that encourages on-farm investment and reduces conflicts that arise from competing land claims.

To determine whether these benefits exceed project costs, MCC calculates the economic rate of return (ERR) of its projects. The ERR is a summary statistic that reflects the economic merits of an investment. Conceptually, the ERR represents the discount rate at which an intervention's benefits exactly offset costs. Larger ERR estimates imply a greater ratio of discounted benefits relative to discounted costs. The ERR is computed using the estimated economic value of the total costs and benefits of each project activity, with benefits aggregated across all beneficiaries. The timing of cost and benefit accrual is accounted for. To ensure that estimated returns are due to MCC investments, ERR values are constructed using scenarios of with and without the project to establish a counterfactual.

When developing the Compact, MCC calculated an estimated ERR of the IMAP for the Konni perimeter of 10.79 percent. MCC's current ERR model assumes that benefits arise from expansion of dry season cultivation area, a shift from staples such as sorghum to higher-value crops such as onions and cabbage, and increased unit area yields in both rainy and dry seasons. In the ERR, crop prices are fixed over the 24-year horizon. Fertilizer unit costs are also assumed constant, despite the Policy Reform Activity's objective of reducing fertilizer prices by 30

percent. There are also costs that do not appear to enter into model calculations. For example, the model does not reflect the user fees paid by IWUA members, or any system maintenance costs not covered by user fees. Turiansky et al. (2018) provide a more complete discussion of the assumptions underlying the ERR. MCC has noted it is developing a revised ERR model to address some of these concerns. Mathematica's baseline data collection can be used to update the Konni perimeter ERR model with estimates of crop yields, crop prices, cropping patterns, and project costs.

The IMAP project identifies beneficiaries as all households potentially benefiting from the project and, excluding impacts from the Roads for Market Access Activity, estimates this total to be more than 37,500 people across all project irrigation perimeters (MCC 2016). Without more information about how ERR assumptions or parameter values might vary by different beneficiary subgroups, the current ERR model does not support a beneficiary analysis.

As part of the evaluation, we will compute the ex-post ERR of the Konni perimeter using updated estimates of benefits and costs across the IMAP's activities, drawing primarily on data collected for the pre-post analysis we will describe in Chapter V. This ex-post ERR can be compared to that of other investments, and can also enable MCC and other stakeholders to determine the soundness of this project based on whether it surpasses MCC's hurdle rate of 10 percent.

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III. LITERATURE REVIEW

Most Nigeriens derive their livelihood from agriculture. They face significant income risks from the multiple threats associated with predominantly low-productivity, rain-fed agriculture. Recurring droughts and pest outbreaks are the largest among them (World Bank 2013), and MCC's investments are geared toward giving farmers the infrastructure and the skills to reduce their vulnerability. Although yields for important crops such as cowpeas and sorghum have been steadily increasing over the past decade, they still lag those of neighboring Burkina Faso and Nigeria (according to authors' calculations using Food and Agriculture Organization of the United Nations [FAOSTAT] 2019 data). IMAP activities in irrigation development, farmer training, and formalization of land use rights will address many of the urgent constraints that block rural productivity growth. To situate the IMAP evaluation in a broader context of empirical and theoretical work related to the types of rural development activities, this literature review summarizes the current state of knowledge about the effectiveness of such interventions and identifies key research gaps that the IMAP evaluation may be able to address.

A. Effects of irrigation access

Irrigation is an important input to agriculture that enables farmers to increase crop yields; level out crop water consumption over the agricultural calendar; cultivate water-intensive, higher-value crops; engage in more intensive cropping; and reduce vulnerability to weather shocks (Hussain and Hanjra 2004; Burney et al. 2013). The large yield gains that accrued from the Green Revolution's introduction of high-yielding variety seeds in the 1960s was largely the result of irrigation, with yield performance highest in areas that were either irrigated or rainfed with adequate water-control measures (Evenson and Gollin 2013).

In spite of several historical efforts to increase irrigation availability in the country, Niger's water resources remain underutilized. The World Bank (2018) estimates that less than 30 percent of the country's potentially irrigable land is currently irrigated. Similarly, You et al. (2010) estimate that nearly 200,000 additional hectares could be irrigated through projects with positive internal rates of return. Of the parts of the country with managed irrigation, dry season irrigation schemes account for the majority by area and were developed by the state to cope with routine droughts (Merrey and Sally 2014). Medium- and large-scale irrigation schemes account for about 14,000 hectares and were largely developed in the 1970s and 1980s. While they led to increases in cropping intensity and gains in rice yields for some time, by the 1990s those gains declined. Merrey and Sally (2014) cite the handoff of scheme management from the state to users who were insufficiently trained in system maintenance as a possible factor for the productivity drop-off. A common theme discussed by them and by Illiassou (2005) is the role of financial shortfalls leading to irrigation scheme failures and deterioration. Non-payment and low collection rates of irrigation fees often deprive collectives of the capital funds needed to finance a scheme's technical maintenance. To cover the shortfall of collected user fees, cooperatives exhausted their reserves and then became indebted (World Bank 2009). Cost recovery is hampered by farmers growing low margin crops on small plots and experiencing gradual yield declines (World Bank 2009). The World Bank advised that improvements in the sector should prioritize rehabilitation over new development, and the latter only when coupled with institutional reforms.

Given the importance of agriculture to developing countries' rural economies, such substantial increases in agricultural productivity from irrigation can generate widespread

improvements in welfare through reduced poverty and conflict over natural resources. In their review of empirical studies, Hussain and Hanjra (2004) claim a relatively unambiguous relationship between irrigated areas and lower poverty rates. Duflo and Pande (2007) observed reductions in poverty rates for districts in Andhra Pradesh, India that are downstream from dams. Using a fuzzy regression discontinuity design, Sekhri (2014) found lower poverty head counts and fewer water-related disputes in villages with comparatively more accessible groundwater. A similar result arises in urban Morocco, where new in-home piped water connections drastically reduced conflicts and disagreements over water-related matters among household members and neighbors (Devoto et al. 2012).

The reported income and crop yield gains from irrigation in several studies are economically meaningful. Abric et al. (2011) find that households participating in a public-private partnership irrigation program which deployed tube wells, pumps, and low-pressure distribution systems in Niger had incomes that were 1.5 to three times the country's average. Aw and Diemer (2005) observe average paddy yield increases of more than 300 percent over 20 years after development of the Office du Niger, a major irrigation scheme located in the middle of Mali. Burney et al. (2010) estimate per capita consumption expenditure growth exceeding 80 percent among women's group members participating in a solar-powered drip irrigation randomized control trial (RCT) in Benin. For some of those participating women, sales of surplus vegetables gave them their first-ever source of personal income (Burney and Naylor 2012). Dillon (2011) found in his evaluation of irrigation in northern Mali that households with irrigation are more likely to share food with non-irrigators, which means the consumption impacts from irrigation are likely to be underestimated.

Several studies suggest that irrigation may positively contribute to improved food and nutritional security. In the Benin experiment mentioned earlier, women's group participants in treatment villages increased their household consumption of grown vegetables and were more able to meet their household food needs (Burney et al. 2010). Domenech's (2015) review of the literature on the linkages between irrigation, food security, and improved nutrition and health showed generally stronger food security levels and improved nutrition when irrigation is introduced. In many examples, irrigation led to growing fruits and vegetables, though irrigation may also lead to monocropping (Hossain et al. 2005 cited in Domenech 2015).

Much of the research examining the food security effects from receiving irrigation examines only a small number of irrigated parcels. The evaluation of IMAP will be one of the few instances in which these outcomes are measured across an entire perimeter. A novel contribution that this evaluation can make to the literature is to provide evidence on the effects of irrigation perimeter rehabilitation, in comparison to other papers that analyze the effects of greenfield irrigation projects. In this evaluation, we will be able to generate new insights on the economic returns to irrigation, using data collected to revise the IMAP ERR, and to compare the return to new irrigation projects. Lastly, although most regard crop diversification and crop shifting as key outcomes of receiving irrigation, researchers have largely focused on total agricultural production. This evaluation will offer evidence on the extent to which irrigation combined with other relevant IMAP investments in training and land reform supports switching into high value crops.

B. Effects of extension services and farmer training programs

Extension services, also called advisory services, have been an important means of disseminating improved technologies and practices to farmers for many decades. Services usually consist of sharing access to and training farmers in the proper usage of new seed varieties, crops, and inputs, or providing information for combating pest and disease outbreaks. Extension efforts have largely concentrated on technology transfer, but extension agents also support product marketing and help farmers establish market relations for goods that might not yet have a regional presence.

Two of the most common extension services models are training and visit (T&V) and farmer field schools (FFSs). The World Bank instituted the T&V program in the 1970s in response to extension agents providing inadequate support to farmers (Birkhaueser et al. 1989). Under the T&V model, extension agents interact directly with contact farmers—farmers from a village who serve as intermediaries between their village and the extension program so the extension officer need not train all of the farmers in that village. Contact farmers receive from the extension agents both training and access to new agricultural technologies (such as seed varieties) and inputs with the expectation that the contact farmer will share her/his knowledge about improved practices to neighboring farmers who face similar production conditions in input costs and accessibility, soil type, climate, and pest and disease stresses. When these practices increase the contact farmer's yields, other farmers would be incentivized to replicate those successes. Because they reside in their home villages, contact farmers were viewed as a vehicle for making agricultural support more accessible than extension agents, each of whom might be responsible for serving several hundred or several thousand farmers. This delivery approach was widely criticized as excessively top down and inattentive to locally varying needs and circumstances.

The FFS model arose in 1989 partly in response to these deficits. It emphasizes participatory and experiential learning approaches, where the role of the contact farmer is more as facilitator than instructor (Davis et al. 2012). The FFS model frequently uses demonstration plots, where field school participants experiment with new cultivation practices and varieties. In contrast to T&V's focus on technology transfer of innovations developed through national and international research efforts, FFS programs have historically emphasized reducing pesticide use (the defining objective for the first FFS in Indonesia in 1989), increasing farmers' empowerment and self-confidence, and improving environmental outcomes (Waddington et al. 2014).

Given the magnitude of public expenditure on extension services, such as the 1 percent of GDP the Ethiopian government has spent annually in recent years (Krishnan and Patnam 2013), there has been widespread interest in quantifying the impact of extension services on such outcomes as farm productivity, adoption of new practices, and agricultural revenue (Hussain et al. 1994; Aker 2011). The empirical review of Birkhaeuser (1989) highlights the mixed results of extension services on agricultural adoption across a range of practices and technologies (for example, usage of fertilizer, herbicide, and pesticide; high-yielding variety seeds; and wheat cultivation) and agricultural productivity, emphasizing that any gains must be balanced against extension's costs. In an evaluation of FFSs in East Africa that was supported by the International Food Policy Research Institute, Davis et al. (2012) observed 21 and 104 percent increases in per capita household income in Kenya and Tanzania, respectively. Waddington et al. (2014) performed a meta-analysis using estimates from studies that satisfied selection criteria and found positive effects on intermediate outcomes, such as knowledge gains and adoption behavior, as

well as final outcomes of agricultural production and household income. They found no evidence for diffusion of practices or gains to nonparticipants. In their meta-regression from those studies, Waddington et al. (2014) found yield and profit increases of 13 and 19 percent respectively for FFS farmers against their comparison farmer counterparts, but note the absence of evidence for long-term impacts more than two years after FFS implementation.

The value that extension services can offer is time-dependent, and it diminishes as new technologies become widespread. Extension services might be crucial to jump-start initial adoption, but as adoption rates in an area increase, social learning may dominate (Krishnan and Patnam 2013). Because extension services aim to reduce the yield gap between farmers' actual performance and what is achievable through best practices, they are most valuable at the start when this gap is largest (Byerlee 1998 cited in Anderson and Feder 2004).

Several factors complicate unbiased estimates of the impacts of extension services. Selection bias arises from the likelihood that farmers who seek out agents' recommendations are more motivated than those who do not seek their advice; extension services may target high (or low) productivity areas, which is likely to negatively (or positively) bias impact magnitudes; and informational spillover to areas that are not receiving extension services contaminates control groups (Birkhaueser et al. 1989; Evenson 2000). Extension agents face severe time constraints, are unable to meet all farmers in their catchment area, and have tended to focus in-person visits on large-scale farmers who can provide them in-kind compensation and are more likely to show promising results for newly introduced practices (Anderson and Feder 2004). This would positively bias the true effect of extension services.

The paucity of impact analyses in extension service evaluations (Glendenning et al. 2010) should prompt cautious interpretation of findings. However, experiments conducted in the past few years have shed more light on what appears to work in improving extension effectiveness, though the treatment in such studies is rarely the provision of extension services, but rather adjustments to the status quo model. The control group in many experiments is the standard extension agent model, not the complete absence of extension, which would support causal estimates of the impacts of extension. Regardless, these experiments illustrate where potential gains in improving farmer training might be. BenYishay and Mobarak (2018) found that providing "peer farmers"—farmers who are representative of the villages they come from—with a small monetary incentive increases village adoption rates of a new technology more than when training is given by relatively richer "lead farmers" or extension agents. They note that agricultural policy would benefit from additional research in cost-effective ways to identify individuals who are most effective at disseminating knowledge and practices so as to leverage pre-existing social networks. Because a major concern with using contact farmers to disseminate practices is their own insufficient training, Kondylis et al. (2017) ran an experiment in Mozambique that extends the same in-person training attended by extension agents to a random selection of contact farmers.[4] If contact farmers' limited knowledge has been a binding constraint inhibiting broader adoption, improved training should relieve that. Although direct training did

[4] Kondylis et al. (2017) carry out a pre-harvest and post-harvest midline survey one year after the "demonstration season" which was the first rainy season following the initial training of extension agents and contact farmers. Their endline survey was conducted one year after the midline. BenYishay and Mobarak (2018) conduct a midline household survey one year after training, and the endline household survey two years after training.

result in contact farmers adopting a larger number of the taught sustainable land management practices and increased their maize productivity in dry years by 37 percent, these contact farmers had no greater success in increasing the knowledge levels or adoption patterns of their neighbors than did contact farmers who did not receive the training.

There is a substantial gender aspect in the provision of extension services: the vast majority of trainers are men. If male extension workers are more likely to provide outreach to male farmers, women farmers are less likely to receive training and information. Kondylis et al. (2016) tested whether the gender of an extension officer matters, and found that women's awareness of and adoption of pit planting techniques was higher in villages that had randomly been assigned a woman training messenger. Other researchers suggest, however, that the trainer's sex may be less influential in increasing women farmers' outcomes. In their pooled sample of three East African countries, Davis et al. (2012) estimate that female-headed households in villages participating in FFS experienced a 188 percent increase in agricultural income compared to no change in male-headed households, suggesting that women benefited relatively more from FFS. As mentioned earlier, differences in access between men and women to extension agents is a commonly cited explanation if women do not benefit from extension services. Buehren et al. (2017) found no difference in access between male headed and female headed households in Ethiopia's Rural Capacity Building Program, but noted that the program did not close the gender gap in wealth, consumption, labor, or capital endowment. Aside from supply-side interventions, there is also the possibility for such demand-side activities as developing women's agricultural groups to collaborate in plot management, as in research by Burney and Naylor (2012), who observed such groups securing property rights and establishing group revolving credit funds. Organizing women farmers may also lead to additional sharing of information about nutrition, hygiene, and health (Swanson 2009).

While the literature does not provide explicit guidance over the exposure period needed to observe effects, experimental and quasi-experimental papers reporting positive results have tended to span two to three years between baseline and endline survey rounds (e.g., Davis et al. 2012, Kondylis et al. 2017, BenYishay and Mobarak 2018). However, the focus of such papers has not been in identifying the optimal exposure period, and so it is possible that reported effect sizes are underestimates of what would have been recorded had the endline survey been postponed.

Our evaluation will contribute to the literature on agricultural training if the drone imagery collected by RTI International can accurately capture whether practices promoted in the training can be observed when implemented on a plot. Whereas farmer training studies usually rely on farmer self-reports collected through household surveys, which may be subject to various biases and inaccuracies, drone-derived images could generate real-time information on whether visible planting practices like intercropping, mulching or recommended spacing have been adopted for the entire perimeter. This will likely be the only contribution possible for this portion of the evaluation, since the proposed pre-post design does not provide impact estimates for the effectiveness of receiving agricultural training on adoption patterns or farm productivity.

C. Effects of land tenure strengthening

Formalizing land tenure has widely been considered a precondition for farmers to make productivity-enhancing land investments. If they face a strong threat of land expropriation or

confiscation without legal recourse, which formalized land rights would insulate against, such investments are no longer rational decisions and the long-term approach tends to be to safeguard one's land. For example, fallowing can increase future yields, but under traditional tenure systems this could lead to land confiscation in areas where rights are exercised through expending effort on the land (Place and Otsuka 2002, Gottlieb and Grobovsek 2019). For similar reasons, perennial crops with longer maturation times may not be cultivated due to expropriation threats. Such tenure systems often reward farmers who make defensive investments, like planting trees or building fences, to solidify their tenure claims in the face of uncertainty (Deininger and Jin 2006), even if such investments do not yield on-farm productivity gains.

While contemporary land tenure strengthening programs have largely focused on issuing individual titles, several sub-Saharan African countries have enacted policies and programs that either formalize usage rights or provide certificates with limited transferability. Delineating land boundaries has been an important component. A Benin-based RCT of a program that demarcated parcel boundaries and involved publicly settling land disputes resulted in sharp increases in long-term investments of tree planting and growing perennial cash crops (Goldstein et al. 2015). The authors do not observe an immediate increase in crop yields or farm income, likely because their survey timing allowed for an exposure period of about one year.

While Goldstein et al. (2015) represents one of the few instances of randomized certificate issuance, land reforms in Ethiopia were comprehensive and rapid and have provided much evidence of the effects of certification at scale. Deininger et al. (2008) use country-wide survey data following the registration of 20 million plots in 7 years, which adopted a public process in which neighbors could contest purported land claims. They find that households were 5 percent more likely to invest in their land if issued a certificate. Certificate holders also indicated higher perceptions of tenure security, and were less likely to believe that redistribution or reallocation would affect their land holdings in the subsequent five years (Deininger et al. 2011).

Certification programs that stop short of individual titling may be temporary solutions, as land markets face fluxes from population growth and evolving demands from a variety of user groups. The Certificate of Right instrument rolled out to Botswana's urban poor was seen as a starting point upon which titling programs might eventually be built (Nkwae and Dumba 2010). In Ethiopia, land registration was available in two stages. The first stage employed relatively rudimentary methods to demarcate boundaries, using ropes, tape, and recall from neighbors. This procedure was completed at an average cost of $1 per plot, and people were mostly satisfied with this approach (Bezu and Holden 2014). The authors find limited demand for the more expensive second-stage certification that would georeference boundaries using GPS readings. A key difference between certification and titling programs lies in land ownership, with the former typically provided under a state ownership model. Certification is often coupled with transfer restrictions on sales and leases, under the premise of promoting equality by preventing elites from buying up large tracts of land (Ho and Spoor 2006, Crewett and Korf 2008). Such restrictions may have the perverse effect of locking youth out of land access and pushing them into off-farm employment (Yami and Snyder 2015).

Empirical work has primarily examined the effect of tenure formalization on intermediate farm-level outcomes, such as access to credit, perceptions of tenure security, and incidents of social conflict, with land productivity and household consumption as final outcomes of interest

(Lawry et al. 2017). Sitko et al. (2014) drew on a nationally representative household survey in Zambia, and found suggestive evidence of land titling increasing investment in irrigation equipment, inorganic fertilizer application, and erosion control management each by about two to four percentage points. A land regularization pilot program in Rwanda had no effect on increased credit access, but did increase the use of improved seeds in select econometric specifications (Ali et al. 2014). Lawry et al. (2017) found that tenure recognition increases the monetary value of land productivity on average by 40 percent, but found much smaller effects among programs in Sub-Saharan Africa. They observed no evidence that the connection between tenure recognition and productivity gains operates through a credit mechanism. Their finding agrees with Place and Otsuka (2002), whose study of three Ugandan tenure systems reported no association between tenure setup and farm profits, suggestive of formalization not promoting increased credit access.

That land reform programs have not triggered credit supply increases does not rule out the existence of a credit mechanism linking tenure and borrowing. Lenders may opt out of markets when verifying a borrower's land rights is costly. Deininger and Goyal (2012) tested whether digitizing land title records sufficiently reduces banks' transaction costs to trigger credit expansion in Andhra Pradesh, India. They found that access to credit in urban and semi-urban districts rose more than 15 percent two years after digitization, but rural areas experienced no improvement in credit access. Lending may be unresponsive to changes in tenure status for unrelated reasons, such as the under-developed or under-capitalized status of local financial institutions (Migot-Adholla et al. 1991).

Recent interventions and research have focused on the effect of reforms on gender equity in access to and security of land. Although Niger's Rural Code stipulates that men and women have equal land access, women's access is through husbands and male relatives (Hughes 2014). Ali et al. (2014) found that legally married women's tenure security increased from a pilot of a land regularization program that would eventually be rolled out throughout Rwanda. Land under ownership of a married woman was more likely to have received soil conservation efforts. Demand for land titling might be depressed if women must be included on the title, which Ali et al. (2016) examined in a clever experiment in unplanned settlements in Dar es Salaam. They offered households a small discount toward the title application fee if a woman was included on the application and found this significantly increased women's inclusion on title documents with no adverse effects on title demand. The researchers concluded that even small financial nudges can increase women's economic empowerment.

A major limitation when synthesizing results across contexts is inconsistent definitions of tenure security. Researchers must proxy for the elusive concept of security, which consists of a bundle of rights that vary in their certainty and duration. In his interpretation of the evidence over the previous 15 years of studies on land tenure effects in Sub-Saharan Africa, Place (2009) stated that mixed results may be driven by differences in proxies used. He cautioned that although empirical research has foregrounded the heterogeneity of tenure systems, policy formulation has not yet been as attentive and often generates generic prescriptions that may be locally inappropriate. Arnot et al. (2011) raised similar concerns and propose that tenure security emphasize the dimension of "assurance," which is often proxied by the probability of an event like eviction, or change in government policy, which would overturn rights claims. In their review of the literature, they found that in the absence of good data on rights assurance,

researchers often rely on the length of time over which rights have enjoyed, which may be a poor indication of future rights certainty. Prindex (2019) compiles tenure security perceptions from random samples across multiple countries, and finds that 28% of Nigerians perceive their tenure to be insecure.[5] Nearly half of the Nigerien respondents report having no land documentation, but the authors find no significant difference in the perceived security levels between respondents with and without formal documentation. Among those claiming to be insecure, disagreement with family or relatives was the largest source of insecurity.

Our overall evaluation of the Land Tenure Security Sub-Activity will not offer rigorous evidence on the impacts from farmers receiving formalized use rights because there is no comparison group whose plots will not be formalized; all perimeter cultivators will benefit from secure land rights.

[5] While the Prindex sample includes both urban and rural residents, 84% of surveyed respondents in Niger reported living in rural areas.

IV. EVALUATION DESIGN

We introduce in this chapter our overall evaluation design, and we describe the evaluation method and data sources we propose to address each research question.

We structure the evaluation around the theory of change in Figure II.3, which we described in Chapter II, Section B. The research questions for the evaluation flow directly from the project's theory of change, and they aim to test whether the project has had the anticipated effects on the intended outcomes. We have categorized the evaluation questions into four groups corresponding to the question's position in the logic model and/or the area over which we anticipate the outcomes might take effect: (1) overarching questions related to implementation and sustainability, (2) questions about outcomes as measured at the level of individual beneficiaries, (3) questions related to the entire Konni perimeter, and (4) questions corresponding to changes affecting much or all of Niger. Table IV.1 provides the proposed evaluation method and the type of data we will use to address each of the evaluation questions. (Appendix Table A.1 provides a link of evaluation questions and a link to the program logic model of each question.)

We have designed a comprehensive set of mixed methods evaluations to answer the research questions. Specifically, we will use a combination of quantitative and qualitative performance evaluations. We will use a quantitative performance evaluation (a pre-post analysis) to estimate changes in agricultural outcomes for beneficiary households on the Konni perimeter. If available, we will use estimates derived from drone imagery and satellite imagery to complement household survey responses on agricultural outcomes, to understand changes in agricultural practices and yields in non-survey years. To value agricultural inputs and outputs, we will collect seasonal price data from markets near Konni.

Mathematica will supplement the quantitative performance evaluation with implementation and outcomes analyses that will rely on qualitative information from focus groups and KIIs. To answer some of the questions around sustainability, we will conduct a sustainability analysis using both qualitative information and quantitative data such as budget outlays. We will supplement our primary data collection efforts with a review of project information, as well as monitoring data the implementers collect. Our qualitative work will allow us to provide a more in-depth understanding of implementation issues that may have arisen, as well as perspectives on program outcomes. In addition, where it is possible to construct qualitative and quantitative indicators for outcomes, the qualitative information will serve as a way to triangulate or complement the quantitative findings.

This evaluation design applies MCC's Gender Integration Guidelines and includes critical components that support a gender assessment of all project activities. We have calculated sample sizes with sufficient power to present sex- and age-disaggregated results, and we plan to conduct surveys with male and female household heads. Additionally, in our qualitative evaluation, we will interview and hold focus group discussions (FGDs) with women and younger beneficiaries to learn how they have benefited from improved access to irrigation; gained relevant knowledge from farmer training; benefited from new land parcels; and been affected by national policy reforms, such as those that affect fertilizer prices.

Table IV.1. Evaluation design overview

Activity	Question group	Evaluation method	Data source and type
Overarching questions			
RQ1	Did the project components interact as envisioned during project design to reach a common objective? If yes, what facilitated the interaction and if not, why not?	• Implementation analysis	• KIIs with program implementers and key stakeholders • FGDs with beneficiaries
RQ1a	Was there close coordination and planning among the different contractors designing and implementing the activity (land allocation, infrastructure, IWUA, and agricultural services)? Did UNOPS in the role of project management consultant facilitate the rollout and coordination of activities?	• Implementation analysis	• KIIs with program implementers and key stakeholders • FGDs with beneficiaries
RQ2	To what extent did the project interact with the grant facility of the Climate-Resilient Communities Project? What facilitated the interaction and what didn't?	• Implementation analysis	• KIIs with program implementers and key stakeholders • FGDs with beneficiaries • Project documentation
RQ3	Did PAP households experience changes in their household incomes, volumes, and value of agricultural products sold and traded, food and nutritional security, and production of cash crops?	• Pre-post analysis • Qualitative outcomes analysis	• Surveys of households • Mobile price data collection • FGDs with beneficiaries • Monitoring data
RQ4	Do stakeholders believe the project was well designed to achieve the project objective? What changes occurred and why?	• Qualitative outcomes analysis	• KIIs with stakeholders
RQ5	If the project produced results, are they expected to be sustained? If the project did not meet its expected results, why not?	• Sustainability analysis	• KIIs with stakeholders • Budget outlays
RQ6	What lessons can be drawn to inform future projects?	• Synthesis of evaluation analyses	• Mathematica evaluation analyses • Compact closeout documents • KIIs
RQ7	What is the post Compact ERR of the project (except for the Roads for Market Access Activity)?	• Quantitative descriptive analysis • Pre-post analysis	• Surveys of households • Mobile price data collection • Project documentation • Cost information
Irrigation Perimeter Development Activity			
RQ8	Were project activities implemented as planned? If not, what changes occurred?	• Implementation analysis	• Project documents • KIIs and FGDs
RQ9	Were the expected outputs produced by the activity?	• Qualitative outcomes analysis • Infrastructure assessment	• KIIs and FGDs • Perimeter visits • Project documentation
RQ10	Is the new/improved infrastructure functioning properly in terms of water flow?	• Infrastructure assessment	• Perimeter visits • KIIs

Table IV.2 (*continued*)

Activity	Question group		Evaluation method	Data source and type
	RQ11	Is water for irrigation in farmers' plots available as expected from the irrigation system, including frequency, timing, and amount as per planned irrigation schedules? If no, why not?	• Quantitative descriptive analysis • Qualitative outcomes analysis	• Surveys of households • ONAHA water user surveys • Project documentation • Monitoring data • KIIs and FGDs
	RQ12	Did irrigated land increase as expected (as a whole and per family)? If not, why not?	• Pre-post analysis • Qualitative outcomes analysis	• Surveys of households • ONAHA water user surveys • Administrative data • KIIs • Project documentation
	RQ13	Did the cost of irrigation water change? If no, why not?	• Pre-post analysis • Qualitative outcomes analysis	• Surveys of households • KIIs and FGDs
Management Services and Market Facilitation Activity				
	RQ14	Were project activities implemented as planned? If not, what changes occurred?	• Implementation analysis	• KIIs and FGDs • Project documentation
	RQ15	Were the expected outputs produced by the activity?	• Qualitative outcomes analysis	• KIIs and FGDs • Monitoring data • Project documentation
SISM	**RQ16**	Were IWUAs set up? How many were set up?	• Quantitative descriptive analysis	• Monitoring data • Project documentation
	RQ17	What was the profile of the participants (total number of participants disaggregated by sex and age)?	• Quantitative descriptive analysis	• Monitoring data
	RQ18	What percentage of IWUA leadership committee members at the end of the Compact were women?	• Quantitative descriptive analysis	• Administrative data
	RQ19	Are IWUAs functioning as expected? Is the irrigation infrastructure being maintained properly?	• Qualitative outcomes analysis • Infrastructure assessment	• Administrative data • FGDs and KIIs • Site visit • IWUA annual reports
LTS	**RQ20**	Is a land tenure registry functioning according to plan? Is the land registry used as a tool by local authorities to continually record changes in land holdings? Do land holders have access to the correct documentation (*contrats d'occupation* or long-term leases for farmers, publicly held property titles of overall perimeters) according to the project plan? Were land use plans at the commune level successfully completed?	• Implementation analysis • Qualitative outcomes analysis • Quantitative descriptive analysis	• KIIs • Project documentation • Site visits • Surveys of households
	RQ21	Are the local land commissions in the project zone better equipped to ensure sustainable management of land rights in/around the perimeter?	• Sustainability analysis	• Project documentation • Budget outlays • KIIs

Table IV.2 (*continued*)

Activity		Question group	Evaluation method	Data source and type
LTS	**RQ22**	Was the level and risk of land conflict reduced? Did land tenure security increase?	• Pre-post analysis	• Surveys of households • Conflict monitoring system/land administrative data
	RQ23	Did participants perceive that they learned new skills/knowledge? Did this vary by subgroup? If they didn't perceive learning/acquire new knowledge, why or why not?	• Quantitative descriptive analysis • Qualitative outcomes analysis	• Surveys of households • Administrative data collected by SAA consultant • Monitoring data • FGDs
	RQ24	What percentage of participants of adult functional literacy and numeracy report improvement in their skills (basic reading and writing) after the training? What percentage of them indicate improved knowledge of nutrition and hygiene, and budgeting and record keeping (inasmuch as these concepts were introduced as part of the literacy and numeracy training)?	• Quantitative descriptive analysis • Qualitative outcomes analysis	• Surveys of households • Monitoring data • FGDs
	RQ25	What percentage of participants' self-report increased knowledge of sustainable land and water resources management?	• Quantitative descriptive analysis	• Surveys of households
	RQ26	What percentage of participants can name and explain at least two or three new or improved agricultural practices that they did not know before the training?	• Quantitative descriptive analysis	• Surveys of households
	RQ27	What percentage of members of *comites de gestion* within the cooperatives indicate improved knowledge of cooperative management?	• Quantitative descriptive analysis	• Surveys of households
SAA	**RQ28**	Have participants applied new practices and technologies? Was this different for women/men or youth/non-youth participants? If knowledge was not applied, why not?	• Qualitative outcomes analysis • Quantitative descriptive analysis	• Survey of households • Monitoring data • FGDs
	RQ29	Were savings and loans groups created and fostered by the project? Based on their participation, have group participants indicated they have improved access to credit?	• Implementation analysis • Qualitative outcomes analysis	• Monitoring data • Project documentation • FGDs
	RQ30	How are cooperatives applying knowledge?	• Qualitative outcomes analysis	• Monitoring data • FGDs
Policy Reform Activity				
	RQ31	Did the Fertilizer Reform Sub-Activity produce the expected outputs? What changes occurred to the original design? Did the sub-activity lead to increased private sector participation in the fertilizer sector? If not why not? Have reform activities made fertilizer more affordable and accessible?	• Implementation analysis • Pre-post analysis • Qualitative outcomes analysis	• Surveys of households • Mobile price data collection • KIIs • Monitoring data
	RQ32	Did the National Statistical Capacity Sub-Activity produce the expected outputs? What changes occurred to the original design? Have reform activities improved GoN's statistical capacities in data collection, analysis, and reporting?	• Implementation analysis • Qualitative outcomes analysis	• KIIs • FGDs

Table IV.2 (*continued*)

Notes: ERR = economic rate of return; FGD = focus group discussion; GoN = Government of Niger; IWUA = irrigation water user association; KII = key informant interview; LTS = Land Tenure Security; ONAHA = *l'Office National des Aménagements Hydroagricoles;* PAP = project affected person; SAA = Agricultural Support Services Sub-Activity; SISM = Sustainable Irrigation System Management; UNOPS = United Nations Office for Project Services

For the sake of brevity, we do not explicitly detail in subsequent tables and figures when data disaggregated by gender and social inclusion groups are collected, but instead refer to our description here as applicable to our overall evaluation process.

Our evaluation will integrate findings from the quantitative performance evaluations, the qualitative performance evaluations, and the revised ERR model to present a comprehensive view of the effects of the IMAP. We anticipate our conclusions will provide guidance to MCC and other stakeholders about the impacts of the agricultural development activities included in the IMAP. In the following chapters, we discuss our evaluation approach in more detail.

V. KONNI PERIMETER IMPLEMENTATION AND OUTCOMES ANALYSES

A. Implementation analysis

1. Evaluation overview

We will carry out an implementation analysis to evaluate whether project activities were implemented as planned, and to document instances and reasons for deviations from the original design. We will also focus on identifying barriers and facilitators to implementation, and documenting lessons learned. Because the IMAP encompasses multiple activities and sub-activities, designed with the purpose of creating complementary benefits, our implementation analysis will also explore the extent to which activities interacted and coordinated. Our implementation analysis will draw on a variety of sources, such as project documentation, quantitative administrative data, KIIs, and FGDs with beneficiaries. Table V.1 lists the research questions our implementation analysis will address, along with the data sources we will rely on and the key outcomes of interest. In addition to those questions, we will use the implementation analysis to support our analysis on why realized outcomes may have differed from targets specified during the project design phase.

Table V.1. Evaluation methods, research questions, data sources, and key outcomes for implementation analysis

Activity	Research question	Data sources	Key outcomes
All	RQ1. Did the project components interact as envisioned during project design to reach a common objective? If yes, what facilitated the interaction and if not, why not?	• Project documentation • KIIs with MCA-N • FGDs with PAPs	• Implementation fidelity • Implementation barriers and facilitators • Lessons learned
	a. Was there close coordination and planning among the different contractors designing and implementing the activity (land allocation, infrastructure, IWUA, and agricultural services)? Did UNOPS in the role of project management consultant facilitate the rollout and coordination of activities?	• Project documentation • KIIs with MCA-N, UNOPS, program implementers	• Implementation coordination and examples of cross-agency planning
	RQ2. To what extent did the project interact with the grant facility of the Climate-Resilient Communities Project? What facilitated the interaction and what didn't?	• Project documentation • KIIs with MCA-N, program implementers	• Implementation coordination • Barriers and facilitators • Lessons learned
	RQ4. Do stakeholders believe the project was well designed to achieve the project objective? What changes occurred and why?	• Project documentation • KIIs with MCA-N, program implementers, GoN stakeholders	• Design and rollout • Barriers and facilitators • Lessons learned
	RQ6. What lessons can be drawn to inform future projects?		
IPD	RQ8. Were project activities implemented as planned? If not, what changes occurred?	• Project documentation • KIIs with MCA-N, program implementers, ONAHA, Ministry of Water and Sanitation • FGDs with PAPs	• Design and rollout of irrigation activities • Barriers and facilitators for irrigation activity • Lessons learned
MSMF	RQ14. Were project activities implemented as planned? If not, what changes occurred?	• Project documentation • KIIs with MCA-N, program implementers, Ministry of Agriculture • FGDs with PAPs • Land administration data	• Design and rollout of SAA activities • Barriers and facilitators for SAA • Coordination with beneficiaries • Lessons learned
PR	RQ31b. Did the Fertilizer Reform Sub-Activity experience any changes to the original design?	• Project documentation • KIIs with MCA-N, Ministry of Agriculture, CAIMA, traders • FGDs with board members of cooperatives	• Design and rollout of fertilizer reform activities • Barriers and facilitators for fertilizer support activity • Lessons learned
	RQ32b. Did the National Statistical Capacity Sub-Activity experience any changes to the original design?	• Project documentation • KIIs with MCA-N, National Statistics Institute	• Design and rollout of national statistical capacity building activities • Implementation • Barriers and facilitators • Lessons learned

Notes: CAIMA = *Centrale d'Approvisionnement en Intrants et Matériels Agricoles*; FGD = focus group discussion; GoN = Government of Niger; IPD = Irrigation Perimeter Development Activity; IWUA = irrigation water user association; KII = key informant interview; MCA-N = Millennium Challenge Account-Niger; MSMF = Management Services and Market Facilitation Activity; ONAHA = *l'Office National des Aménagements Hydroagricoles*; PAP = project affected person; PR = Policy Reform Activity; SAA = Agricultural Support Services Sub-Activity; UNOPS = United Nations Office for Project Services

Some research questions in the table are abbreviated versions of full-text questions in Chapter IV.

2. Methods and data sources

We will draw on a variety of data sources to assess implementation fidelity and document any major lessons learned. The implementation analysis will use three primary sources: program documentation, KIIs, and FGDs.

First, we will conduct a desk review to assess project implementation plans such as work plans, terms of references for consultant(s) implementing the activities, and original M&E plans. We will then review any progress reports or other project deliverables. As we conduct the review, we will document any discrepancies between project plans and project progress reports to identify issues to discuss with and receive clarification from stakeholders.

Our desk review will help inform our selection of KII participants and the guiding questions. For each activity and sub-activity, we will interview the primary point of contact at MCA-Niger (MCA-N) and MCC, the MCA-N M&E lead, key program stakeholders at the national level and those specific to the Konni perimeter area, as well as any other actors involved in program implementation, such as the external consultants. Key to the implementation analysis will be interviewing planners and engineers responsible for upgrading the irrigation infrastructure, officials involved in the land titling process, and individuals responsible for training farmers, as these activities are core to IMAP's success. Through these interviews, we will map out key decisions throughout the implementation timeline, noting the activities, key players, and rationale guiding such decisions. These interviews will also help us identify any lessons learned and perspectives on possible improvements that we might be able to recommend for future programming. We will keep abreast of new stakeholders or transitions in staff to ensure we have the perspectives of stakeholders who were engaged from the start, as well as of those who became involved later on in implementation. Finally, through FGDs, we will obtain beneficiary perspectives on how IMAP activities and sub-activities were implemented. These discussions may give us additional insights on some of the possible reasons why implementation shifted, or some the implementation facilitators or barriers that were not identified by stakeholders.

Because we expect implementation to evolve over time, our data collection efforts will not be limited to three specific times; we will collect the information on a regular basis with the support of our local research coordinator.

As mentioned, we will rely on documents, interviews, and FGDs to inform our implementation analysis. Once we collect program documents, we will organize and categorize the documents according to their source and topic to understand how they relate to the IMAP and the research questions. We will conduct a content analysis to identify themes, with a particular focus on issues related to the research questions, such as successes and challenges with project implementation. We will also document any ideas or issues that emerge from the review that should be explored further in the KIIs or FGDs.

Our analytic approach to analyzing the data collected through interviews and FGDs relies on thematic framing and triangulation and proceeds in four steps (Creswell 2009): (1) raw data review and management, (2) initial coding, (3) detailed coding, and (4) data interpretation and writing. In the first step, we will read the transcripts that the data collection firm provides and

group the transcripts according to the data method and source (for instance, FGDs with male household heads or interviews with male cooperative leaders). During this step, we will review all data and eliminate any that are incomplete or not useful for our analysis.

In the second step, we will read through the transcripts several times to get a holistic sense of the data. We will further develop the coding scheme, which is a set of themes encountered in the transcripts from the KIIs and FGDs, mapped to the research questions and theory of change (for example, initial themes might include "implementation challenges" and "changes from design"). The third step involves refining the coding scheme and using NVivo or similar qualitative data analysis software to code the transcripts according to key themes. We will review, organize, and analyze the codes produced through this software into themes that relate to the theory of change and the evaluation questions, and that are present across multiple respondents. We will then compare themes and codes by respondent type and location to identify consistent and differing themes across respondent groups.

Once we have analyzed each qualitative data source, we will triangulate findings from the KIIs, FGDs, and our other data sources. This process will facilitate the identification of new trends and relationships, confirm patterns or findings, and detect discrepancies or disparate experiences. A coding hierarchy will guide the process of triangulating findings across data sources and types. For example, when investigating if implementation went according to plan, we will triangulate information from interviews with MCA-N staff, FGDs, and our document review. If we find significant inconsistencies, we may request additional interviews to further explore the theme.

B. Performance evaluation to measure Konni perimeter outcomes

1. Irrigation Perimeter Development Activity outcomes

a. Evaluation overview

We will employ a mixed methods performance evaluation using qualitative and quantitative research methods to assess the Irrigation Perimeter Development Activity. Our evaluation is outlined in Table V.2 and will focus on measuring changes in the availability and functioning of irrigation infrastructure serving the Konni perimeter, as well as households' experiences with irrigation systems. We will assess the extent to which irrigation development activities contributed to changes in irrigation access, availability, and cost on perimeter plots. We will also answer cross-cutting research questions to understand how PAPs' agricultural production and food security status changed over the course of the project

Table V.2. Evaluation methods, research questions, data sources, and key outcomes for evaluation of Konni Irrigation Perimeter Development Activity

Evaluation method	Research questions	Data sources	Key outcomes
Infrastructure assessment	RQ9. Were the expected outputs produced by the activity? RQ10. Is the new/improved infrastructure functioning properly in terms of water flow?	• Perimeter visits • KIIs	• Irrigation water flow rates • Percent of irrigation structures functioning
Quantitative descriptive analysis	RQ11a. Is water for irrigation in farmers' plots available as expected from the irrigation system?	• Surveys of households • Monitoring data • Satellite/drone imagery	• Irrigation availability • Irrigation timing • Frequency of flooding
Pre-post analysis	RQ3. Did PAP households experience changes in their household incomes, volumes and value of agricultural products sold and traded, food and nutritional security, and production of cash crops? RQ7. What is the post-Compact ERR of the project (except for the Roads for Market Access Activity)? RQ12a. Did irrigated land increase as expected? RQ13a. Did the cost of irrigation water change?	• Surveys of households • Administrative data • Satellite/drone imagery	• Agricultural and non-agricultural income • Agricultural outcomes • Cropping pattern • Food and nutritional security • Irrigation access, costs, and usage
Qualitative outcomes analysis	RQ11b. If water for irrigation in farmers' plots is not available as expected, why not? RQ12b. If irrigated land did not increase as expected, why not? RQ13b. If the cost of irrigation water did not change, why not?	• KIIs • FGDs	• Factors affecting irrigation expansion, accessibility to households, and cost
Qualitative sustainability analysis	RQ5. If the project produced results, are they expected to be sustained? If the project did not meet its expected results, why not?	• KIIs	• Perceptions of sustainability

Notes: ERR = economic rate of return; FGD = focus group discussion; KIIs = key informant interview; PAP = project affected person;

Research questions in table are abbreviated versions of full-text questions in Chapter IV.

b. Methods, outcomes, and data sources

Our performance evaluation of the activity will use multiple evaluation methods to assess the quality of the irrigation infrastructure, the extent to which irrigation has become more affordable and accessible for PAPs on the perimeter, and to elicit the reactions and experiences of households farming on the perimeter with respect to the availability and use of irrigation. We next provide a more detailed description of the evaluation methods, outcomes of interest, and data sources.

We plan to conduct an **infrastructure assessment** which will consist of a combination of document review, expert visual inspection, and analysis of water flow measurements and stakeholder interviews.[6] Before we conduct each inspection, we will review any relevant documentation, such as the operations manual for the irrigation systems, to understand how the systems are intended to function. This, in part, will form a basis against which we will measure

[6] Although the Indicator Documentation Table of the M&E Plan (Version 1) does not explicitly describe any administrative data on water flow, we will use in our assessment any data that is available.

infrastructure quality, such as whether the materials actually used in construction were those indicated in project plans. Where appropriate, we will also apply international standards of quality, such as International Organization for Standardization, International Water Management Institute or American Society of Agricultural and Biological Engineers standards. A review of project documents and international standards will inform the creation of a checklist which we will use during each on-site infrastructure inspection. Such checklists often consist of computing performance indicators to measure various aspects of the irrigation system, as described below. Using flow meters and visual inspection, we will examine whether water is flowing as intended to secondary and tertiary canals, including being free of debris; that the pumping stations work properly, with appropriate water pressure and functional electromechanical components; that the water is stored and diverted effectively to prevent flooding; that there are clearly described maintenance and upkeep protocols; and that connections to the irrigation system are available to and working for farmers.

Some of the key indicators we plan to collect include water delivery performance (the ratio of the actual delivered water volume to intended water volume), application efficiency (the ratio of the volume of water available for use and stored in soil to the volume of irrigation water delivered during the period of interest), reliability, equity in flow rates across different segments of the irrigation scheme, and system sustainability measures encompassing drainage and flood control measures. To assess the maintenance of the irrigation system, we will review maintenance plans and records of repairs to determine if the maintenance schedule was followed and if sufficient resources were available to conduct proper maintenance of the infrastructure. We will also examine whether irrigation structures are functioning as intended and develop an infrastructure effectiveness metric based on the share of total structures that function properly (Bos et al. 1994). Maintenance issues may also be diagnosed by first identifying areas where water delivery performance is unacceptably low, for example by relying on remote sensing techniques.

We will conduct these activities in two phases. The first phase is planned for 2022 prior to the completion of the Compact and will involve meetings with construction program implementers and engineers. During the second phase in 2025, after completion of the Compact, we will conduct the engineering assessment and assessment of management practices. Any engineering assessment data MCC collects following infrastructure construction will serve as a baseline against which we will compare collected data.

We will conduct a **quantitative descriptive analysis** to assess household-level outputs and short-term outcomes when baseline values do not provide information to answer research questions. For example, we will use this method to answer questions about the availability of water on farmers' plots after perimeter construction to understand how availability compares to project targets (RQ11). We will use household survey and program monitoring data to collect information on the availability, reliability, timing, and volume of irrigation water on PAPs' plots, with a focus on comparing estimated mean values against targets. We will examine how values vary by subgroup of PAP, focusing especially on the gender of the household head or of the key decision maker for irrigation decisions. We will combine survey responses with geographic coordinates of a plot's location in the irrigation scheme to generate insights on which canals and infrastructure may be underperforming based on reported values of irrigation availability. We

will assess program effectiveness by comparing data collected at the end of the Compact against project targets, for indicators where targets are available.

We will conduct a **qualitative outcomes analysis** to better understand beneficiaries' experiences in receiving irrigation water from the new perimeter. Although the qualitative outcomes analysis does not allow us to infer causal relationships between program activities and outcomes, it provides information on beneficiary perspectives and perceptions. We will triangulate information from FGDs and KIIs that present the perspectives of a variety of people involved at all stages of the project, from planning and implementation through to end users and water user association members. We will interpret responses in the context of interviewees' incentives, experiences, and affiliations. This enables us to confirm key patterns and findings that emerge across stakeholders and stakeholder groups, as well as identify discrepancies in their perceptions and experiences. To allow for beneficiaries' responses to be fully captured, we will use open-ended FGDs to elicit factors that may be adversely affecting households' abilities to use irrigation water in cost-effective and reliable ways. In particular, we will focus our conversations on outcome indicators that fall short of project targets, which might be suggestive of material barriers to irrigation access, as well as factors supporting project successes. Because gender is likely to be a salient factor affecting beneficiaries' experiences with irrigation, we will also conduct women-only FGDs to minimize skewed information that might result from male-only FGDs. To improve our understanding of irrigation outcomes we will interview representatives from MCA-N, *l'Office National des Aménagements Hydroagricoles* (ONAHA), regional Agriculture Chambers, and the Ministry of Water and Hygiene.

Our approach to analyzing qualitative data to assess outcomes will be the same as that described in the implementation analysis section. We will first build off the document review for the implementation analysis and review reports, M&E data, and other materials that will provide insights into activity outputs. As in the implementation analysis, our review will inform our protocols for the KIIs and FGDs. Once we complete the qualitative data collection, we will code all the transcripts and organize by themes such as "access to irrigation," "cost of water," and "water flow performance." As mentioned, triangulation of qualitative information will be key to both analyzing the data and increasing the validity of our findings.

To address research questions for quantitative outcomes whose values at baseline provide a meaningful benchmark, we will conduct a **pre-post analysis** drawing on administrative data and household surveys**.** Through this analysis, we will estimate the average change in outcome values over time, using the ordinary least squares regression model in Eq. V.1,

$$\text{Eq. V.1} \quad y_{it} = \beta * Post_t + \lambda_i + \epsilon_{it}$$

where *i* is an index denoting households 1…N and *t* indicates time ranging from 1 to 3 and corresponding to baseline, midline, and endline data rounds. $Post$ indicates whether data was collected before or after the intervention, and respectively takes on the values of 0 and 1. Outcome y_{it} is specific to a household at a given time, and may be a continuous or binary variable. The key outcomes we will examine include total household income, agricultural production, cropping patterns between cash and non-cash crops, household food security levels, and outcomes related to irrigation such as total irrigated area and irrigation costs. The estimate of interest is β and measures the average difference in outcomes between pre and post periods.

Household characteristics that do not change over the time frame of the evaluation, such as the gender or educational attainment of the household head, are controlled for through the inclusion of household fixed effects, λ_i.[78] To understand how outcomes differentially respond for members of a given subgroup, we will use Eq. V.2, which includes an interaction of the post indicator with an indicator for subgroup membership.

$$Eq.V.2 \;\; y_{it} = \beta_1 * Post_t + \beta_2 * Post_t * 1(Subgroup)_i + \lambda_i + \epsilon_{it}$$

For example, if we wish to estimate whether female-headed households experienced larger gains than male-headed households, we would examine the statistical significance of β_2. We will use estimates derived from the pre-post analysis to revise the ERR, as discussed in more detail in Chapter II, Section C.

A key limitation of the pre-post method is the inability to attribute changes in outcomes as effects from project activities. Without a valid comparison group, there is no information about how treated households and their agricultural practices might have evolved in the absence of the rehabilitated Konni irrigation perimeter. As a result, we cannot isolate the share of outcome changes due to Konni investments, as opposed to other factors that affect the entire perimeter. Therefore, β, our parameter of interest, should be interpreted with caution as time-varying factors independent of the project may be partially or wholly responsible for changes in outcomes. As an example, if the baseline data were collected during a drought episode, and the endline following a robust harvest, the pre-post design would be unable to distinguish if it was weather or project activities that were the cause of improved yields between the two data collection rounds. In the absence of a credible comparison group, for which we believe none exists, given Konni's unique experience as an irrigation perimeter in a specific state of disrepair, this piece of our analysis will not support any causal claims about project impacts, or even claims that the perimeter investments contributed to observed outcomes. Instead, the data analysis will indicate whether any changes in outcomes were detected over the period of observation. Consequently, the pre-post design is limited in its ability to extrapolate findings to similar project activities that would be implemented elsewhere.

[7] If a land parcel rather than a household is the unit of analysis, changes in land holdings between baseline and endline could result in different survey respondents for the same parcel. In a two-period panel model with household fixed effects, such parcels would be dropped from the sample. We propose comparing results from the pre-post regression model both with and without household fixed effects to determine the role of compositional change of PAP households in driving results. In this case, we would include covariates to account for time-invariant characteristics of households.

[8] We exclude time-varying characteristics from the model because including them is likely to bias our estimated β parameter which encompasses all project activities. Consider the following example. Assume that land redistribution results in a large number of PAPs receiving additional acreage, so that the $Post_t$ term is correlated with landholdings. In a regression with household consumption as the dependent variable, changes in consumption between the baseline and any post-intervention period would appear as an effect from the $Post_t$ term, as well as from the time-varying $Land_{it}$ variable in the model results. Excluding the landholdings variable will assign all the time-varying effect to $Post_t$.

In Table V.3, we present our estimated minimum detectable differences (MDDs) for various outcomes of interest for the pre-post analysis.[9] MDD values are the smallest amount of change that are statistically detectable, given a sample size and a set of assumptions about the data, such as mean and variance, and the correlatedness of outcomes across individuals. The estimated MDDs assume a sample size of 600, a survey response rate of 90 percent, and standard values for all other parameters required for the calculation, as specified in the table note. For household per capita expenditure, we will be able to detect differences between baseline and endline that are larger than 11 percent of the baseline mean. Because households will gain access to irrigation and the ability to cultivate cash crops, it is very likely that the true effect is substantially larger than this threshold and will be detectable with the given sample size. For cowpea yields, sorghum market prices, nitrogen, phosphate, and potassium (NPK) prices, and NPK application levels, we would be able to detect differences that are larger than 9.5 percent, 2.6 percent, 8.4 percent, and 19.7 percent of their respective means. Given the size and extent of IMAP investments, we think it is highly likely that we are sufficiently powered to detect differences for each of these outcomes.

Table V.3. Minimum detectable differences for the evaluation of the Konni Irrigation Perimeter Development Activity, pre-post analysis

	Outcome				
	Household per capita expenditure (CFA)[a]	Cowpea yields (tons per hectare)[b]	Sorghum market price (CFA per kilogram)[c]	Market price of NPK (CFA per kilogram)[a]	NPK application (kilograms per plot)[a,d]
Estimated mean	275,494	1.6	163	359	39.1
Estimated standard deviation	206,302	1.0	27.2	197	50.5
Minimum detectable difference (MDD)	31,486	0.15	4.2	30.1	7.7
MDD as percentage of mean	11.4	9.5	2.6	8.4	19.7

Source: Authors' calculations using the following data: [a]. INS-Niger's 2014 National Survey on Household Living Conditions and Agriculture (ECVM/A-2014); [b]. Dugje et al. 2009 and author-assumed standard deviation; [c]. Authors' calculations from MCC Burkina Faso Agriculture Development Project baseline survey after winsorizing at 5 and 95 percent levels.

Notes: NPK = nitrogen, phosphate, and potassium.

MDD calculations are based on two-tailed tests at 80 percent power and 95 percent level of statistical significance. Values are based on a sample size of 600 households responding to both a baseline and follow-up survey. Individual-level controls are assumed to explain 20 percent of variance in outcomes, which is a typical value used when computing MDDs. The survey response rate is assumed to be 90 percent.

[d] Calculations are based on the conditional sample of households reporting non-zero NPK application.

To carry out the pre-post analysis, we will collect data from Resettlement Action Plan (RAP) respondents using three rounds of household surveys: a baseline round (in March 2020, before Konni perimeter physical investments begin), a midline follow-up (medium term, anticipated in 2022), and an endline that is scheduled for 2025 which will allow us to observe the

[9] We deviate from using the conventional "minimum detectable impact (MDI)" term because the pre-post analysis as a research design does not support causal claims about impacts.

long-run effects of the rehabilitated perimeter. By including the midline collection period, we will have three time spans over which we can monitor outcomes. We will implement the pre-post analysis three times, using the baseline and endline, baseline and midline, and midline and endline comparisons. Each comparison will generate a unique β which will enable us to understand whether most of the changes arise in the immediate period following new investments, or take several years to materialize. We will combine this data with administrative data to estimate changes in price, timing, reliability, and accessibility of irrigation water for Konni perimeter plots.

We are collaborating with MCC, RTI International and NASA to identify how information from drone imagery and satellite imagery can complement the agricultural production modules in our household surveys. We will work with these teams in particular to assess how data streams collected during and generated from their drone and remote sensing work can be used to provide more timely, comprehensive and accurate information for the evaluation. Such collaboration may include Mathematica sharing 'labeled' data on which crops are grown on parcels in our household survey sample. This information can serve as ground-truthed data against which RTI International or NASA can calibrate crop type mapping and yield estimation models.

While the exact outputs from their efforts are still under discussion, we anticipate their work will provide a comprehensive mapping of irrigation usage, crop choice, and crop yields across the entire perimeter.

For answering irrigation-related questions, such a map can offer clear guidance on whether irrigation water access problems are geographically concentrated, which would hint at an infrastructure or technical system quality explanation and consequently inform our infrastructure assessment. Such an output would complement our survey sampling approach which will uncover the factors that impede irrigation access or use that may be more idiosyncratic, such as non-payment of irrigation fees, which would not be discernible through aerial imagery.

Moreover, we anticipate being able to use outputs from this collaboration to revise the ERR with more frequent observations on production data than would be possible with household surveys from the interim and final survey data collection alone. One key benefit from this approach is narrowing down the exposure time necessary to observe changes in outcomes. For example, surveys separated by three years cannot differentiate between a one year exposure period and a three year exposure period for outcomes to respond. Frequent intra-annual aerial imagery can provide this level of detail. ERR parameters that would benefit from this collaboration include crop choice indicators (measuring whether farmers are shifting into higher value crops), yields, and area under cultivation. If drone imagery can be used to identify changes in farming practices, we will use the information from RTI's analysis to inform our evaluation of the IMAP's farmer training component.

2. Sustainable SISM outcomes

a. Evaluation overview

We will conduct a quantitative and qualitative performance evaluation to assess the outputs and outcomes of the SISM Sub-Activity. Key to this activity is the creation of sustainable IWUAs, including the transfer of operations and maintenance (O&M) responsibilities to these IWUAs, and clearly defining the roles and responsibilities between IWUAs and cooperatives.

Our evaluation will focus on measuring the presence and capacity of IWUAs, the status of their management of the Konni perimeter irrigation system, whether necessary maintenance is regularly performed, and the collection rate of water user fees from irrigating households. Table V.4 is a summary of the SISM Sub-Activity evaluation.

Table V.4. Evaluation methods, research questions, data sources, and key outcomes for evaluation of the SISM Sub-Activity

Evaluation method	Research questions	Data sources	Key outcomes
Quantitative descriptive analysis	• RQ16. Were IWUAs set up? How many? • RQ17. What was the profile of the IWUA training participants? • RQ18. What percentage of IWUA leadership committee members were women?	• KIIs • Monitoring data • Project documentation • Administrative data	• Number of IWUAs • Participant characteristics • Leadership characteristics
Qualitative outcomes analysis; infrastructure assessment	• RQ19. Are IWUAs functioning as expected? Is the irrigation infrastructure being maintained properly?	• Administrative data • Monitoring data • FGDs and KIIs • Site visits • IWUA annual reports	• IWUA functions and capacity (financial management and maintenance procedures) • Perceptions of IWUA capacity • IWUA sustainability • Infrastructure maintenance

Notes: IWUA = irrigation water user association; KII = key informant interview; FGD = focus group discussion
Research questions in table are abbreviated versions of full-text questions in Chapter IV.

b. Methods, outcomes, and data sources

Our evaluation of the SISM Sub-Activity will use both descriptive analysis and outcomes analysis to assess the functioning and performance of IWUAs.

We will use **descriptive analysis** to characterize some of the achievements associated with IWUA operations. This method will allow us to examine whether quantitative targets were achieved, and to assess the magnitude of any deviations from target levels. This approach will enable us to answer how many (and if) IWUAs were set up (RQ16), the profile of the training participants (RQ17) as well as the profile of IWUA leadership after the project interventions (RQ18). To answer these questions, we will first review all project documentation, such as any consultant reports, MCA-N monitoring data, training attendance sheets (as available), and IWUA administrative documentation. Once we have reviewed and analyzed the data, we will interview the leaders of IWUAs to verify that IWUAs were actually set up, and gather more qualitative data around IWUA leadership characteristics.

Although the descriptive analysis helps us explain aspects of the program, we will use a qualitative outcomes analysis to provide explanations for what outcomes were observed, the factors that contributed to such outcomes, or whether outcomes can be sustained. Our outcomes analysis will assess if IWUAs are operating as envisioned in the project documents (RQ19). Similar to the descriptive analysis, we will draw on secondary quantitative data from MCA-N, as well as administrative records from IWUA Control Committees. We will also use information

from KIIs with IWUA leadership to elicit their perceptions of IWUA functionality, and whether they have the necessary procedures in place to operate as planned, such as agreed upon bylaws, fee collection capacity, financial management, user participation, and O&M scheduling. In addition, we will interview ONAHA representatives, who will provide an external view on IWUA functionality. Our irrigation specialist will conduct the infrastructure assessment to provide additional insight into whether the IWUAs are performing the necessary physical maintenance of the upgraded infrastructure. We will triangulate data from the infrastructure assessment and the KIIs to inform our answer to RQ19. Finally, information from FGDs will offer another dimension to IWUA's functioning, as it will provide information on end user's perceptive water management and overall functioning of IWUAs.

3. Performance evaluation to measure land tenure security outcomes

a. Evaluation overview

We will carry out a mixed methods evaluation to assess outcomes of the Land Tenure Security Sub-Activity. Anchoring our evaluation in the project's logic model, we will first investigate if the outputs necessary to yield short- and medium-term outcomes related to land security are in place. Notably, we will study whether land rights have been formalized in the perimeter, if COFOCOMs have received the necessary training, and if they are using the proper documentation. To assess outcomes for this sub-activity we will rely on a pre-post analysis and qualitative outcomes analysis to assess the ease with which landholders on the perimeter are able to receive rights documentation, and the frequency of disputes and conflicts over land holdings and rights claims. Table V.5 maps our evaluation methods to the research questions and presents key outcomes we will investigate.

Table V.5. Evaluation methods, research questions, data sources, and key outcomes for evaluation of Land Tenure Security Sub-Activity

Evaluation method	Research questions	Data sources	Key outcomes
Mixed methods analysis (qualitative outcomes analysis, quantitative descriptive analysis, implementation study)	• RQ20. Is the land registry used as a tool by local authorities to continually record changes in land holdings? Do landholders have access to the correct documentation according to the project plan? Were land use plans at the commune level successfully completed and adhered to?	• Review of administrative data available by local authorities • Project documentation • KIIs • FGDs • Surveys of households	• Availability of land tenure documents • Use of land tenure tools at the local level • Ease of accessing land tenure documents • Completion of and adherence to land use plans • Continuity of land transaction reporting in land registry
Pre-post analysis	• RQ22a. Was the level and risk of land conflict reduced? • RQ22b. Did land tenure security increase?	• Surveys of households • Conflict monitoring system	• Number of disputed land and property rights cases • Time required to resolve disputes • Number of parcels incorporated into official land information system • Perceptions of land tenure security
Qualitative outcomes analysis	• RQ22b. Did land tenure security increase?	• KIIs • FGDs	• Perceptions of land tenure security

Notes: KII = key informant interview; FGD = focus group discussion

Research questions in table are abbreviated versions of full-text questions in Chapter IV.

b. Methods, outcomes and data sources

We will use a mixed methods analysis to investigate the functioning of the land registry, landholders' access to the registry, and the completion of and adherence to land use plans in the communes (RQ20). We will base this analysis on quantitative and qualitative data, both primary and secondary. First, we will conduct a review of all administrative data and records available to us from the project implementer, ONAHA, and COFOCOMs who are involved with incorporating and ensuring the accuracy of parcel information in the official land information system. We will supplement the records from these stakeholders with a review of the monitoring data from MCA-N's Indicator Tracking Sheet on a variety of indicators (land rights formalized indicator, COFOCOMs' capacity, perimeters registered, and conflicts successfully mediated). We will carry out FGDs with farmers to better understand their experiences obtaining the proper land tenure documentation, as well as their interactions with their COFOCOM. These discussions will give us a better understanding of whether formalization procedures are clear and consistent.

Using the same methodology as outlined in our discussion of the Irrigation Perimeter Development Activity (Chapter V, Section B.1.b), we will assess quantitative changes in land tenure security outcomes (RQ22a) using a pre-post analysis. As discussed, the pre-post design precludes us from attributing any difference in outcomes over the course of the Compact to the effects of the activity because of the absence of a comparison group.

Using household survey data conducted at baseline, midline, and endline, we will estimate the changes in land tenure outcomes over time for PAP households. We will collect information on the frequency of land disputes arising from competing claims, including those from among extended family, neighbors, authorities, and outsiders, and the threat of government expropriation. We will assess whether the issuance of the *contrat d'occupation* is associated with a reduction of such disputes. We will also collect data on land tenure security, and in the pre-post analysis examine any differences in tenure security across different stakeholder groups, such as between men and women, between landlords and tenants, and between groups with different tenure status, such as those whose name is on the document and those whose name is not. We will both gauge households' perceptions of security using self-reported measures as well as proxies for tenure security, such as expenditures on land investments and inputs, demonstrated ability to use land as collateral in financial transactions, and any formal or informal actions that households have pursued in clarifying their use rights including the time elapsed before receiving requested documents. Because threats to tenure security are often specific to local institutional contexts, we will work closely with MCA-N and MCC to ensure that our survey questions comprehensively address the key concerns affecting Konni perimeter households' use rights claims.

We will also conduct a qualitative outcomes analysis to complement the pre-post outcomes study to assess beneficiaries' perceptions of whether land security outcomes have improved (RQ22b), as well as understand how these perceptions differ by group, such as between men and women and between owner-operators and tenants. As mentioned, the qualitative outcomes analysis will not allow us to infer causal relationships between program activities and outcomes, but will provide a summary view of whether the land reforms are producing the outcome targets of the Land Tenure Security Sub-Activity, and the ways in which land holders have been affected by project activities.

After analyzing the quantitative data from the midline household data collection, we will collect qualitative data through KIIs and FGDs to carry out our outcomes analysis. The key stakeholders whom we plan to interview include the following: representatives from ONAHA, representatives from Cooperatives 1 and 2 in Konni overseeing land management in the perimeters, representatives from the *Secrétariat Permanent Régional du Code Rural*, village chiefs, and representatives from COFOCOMs. In addition, we will conduct FGDs with farmers to understand whether they feel that land tenure security has increased. Through these conversations, we will better understand how jurisdictional conflicts between institutional and traditional authorities are affecting farmers' abilities to fully exercise their land rights.

4. Agricultural Support Services Sub-Activity outcomes

a. Evaluation overview

We will adopt a mixed methods performance evaluation using qualitative and quantitative approaches to evaluate the SSA Sub-Activity. This sub-activity encompasses a series of trainings in skills and concepts addressing improved agricultural practices; capacity-building for cooperatives, producer associations, and savings and credit groups; and literacy, numeracy, hygiene, and nutrition with the aim of improving agricultural productivity and value chain integration. The quantitative component of the evaluation will focus on measuring self-reported gains in knowledge and skills across the training domains and the ways in which participants

have internalized and implemented the training material in their own practices. Our qualitative evaluation aims to identify barriers to implementing the material as cited by participants, and whether they considered the training material to be relevant to their needs and capabilities. Table V.6 provides an overview of the evaluation methods, key research questions, data to be used in answering the research questions, and outcomes of interest.

Table V.6. Evaluation methods, research questions, data sources, and key outcomes for evaluation of the Agricultural Support Services Sub-Activity

Evaluation method	Research questions	Data sources	Key outcomes
Quantitative descriptive analysis	• RQ23a. Did participants perceive that they learned new skills/knowledge? Did this vary by subgroup? If they didn't perceive learning/acquiring new knowledge, why or why not? • RQ24. What percentage of participants of adult functional literacy and numeracy classes report improvement in their skills and/or improved knowledge? • RQ25. What percentage of participants self-report increased knowledge of sustainable land and water resources management? • RQ26. What percentage of participants can name and explain at least 2–3 new or improved agricultural practices that they did not know before the training? • RQ27. What percentage of members of *comités de gestion* within the cooperatives indicate improved knowledge of cooperative management? • RQ28a. Have participants applied new practices and technologies? • RQ29a. Were savings and loans groups created and fostered by the project?	• Surveys of households • SAA contractor reports • Monitoring data • Drone imagery	• Self-reported knowledge gains • Factors preventing knowledge gains • Self-reported improvements in literacy and numeracy skills • Self-reported management skills • Self-reported application of improved production practices
Qualitative outcomes analysis	• RQ23b. If training participants didn't perceive learning/acquiring new knowledge, why not? • RQ28b. If training participants have not applied knowledge, why not? • RQ29b. Based on their participation, have savings and loans group participants indicated they have improved access to credit? • RQ30. How are cooperatives applying knowledge?	• FGDs • KIIs • SAA contractor reports	• Examples of knowledge application • Perceptions of training relevance and/or suitability • Perceived barriers to knowledge application • Self-reported changes in personal and professional practices and skills

Notes: SSA = Agricultural Support Services Sub-Activity; KII = key informant interview; FGD = focus group discussion

Research questions in table are abbreviated versions of full-text questions in Chapter IV.

b. Methods, outcomes, and data sources

We will conduct a **quantitative descriptive analysis** to assess self-reported gains in skills and knowledge levels for participants attending trainings, drawing on household survey data in

conjunction with the contractor reports submitted to MCC/MCA-N.[10,11] Because administering comprehensive knowledge exams across all the domains in which respondents receive training would likely impose large respondent burden, our priority in this evaluation will be to capture self-assessed outcomes. Our household survey modules will be training-specific, with questions focused on the content and key objectives of each type of training, such as financial literacy (RQ24) and natural resource management (RQ25). We will ask participants which concepts and skills they believe they acquired, and will examine whether households have applied the practices and technologies promoted in the trainings (RQ28a.). These questions will be featured in both the midline and endline household surveys.[12] Because adoption decisions for new agricultural practices and technologies should be observable within two years of the training (for example, BenYishay and Mobarak [2018]), data collected in the endline will indicate how much the new agricultural practices have been adopted. Over this time frame, farmers are likely able to resolve constraints inhibiting their ability to apply knowledge. We will also evaluate whether some of the promoted agricultural practices are detectable from drone imagery collected by RTI International, which would enable us to estimate perimeter-wide adoption rates and resolve any uncertainties associated with our survey sample. Our analysis of endline survey data will also assess the long-term retention of concepts, which is a more relevant proxy of knowledge acquisition than a traditional post-training questionnaire. We will use the comparison of results from the midline and the endline to identify where short-run knowledge gains did not translate into long-run adoption. We will aggregate responses by subgroups of interest, such as women and youth 15 to 35 years old, to test for any statistically meaningful differences in their responses from those of men and non-youth. The results of this descriptive comparison may be useful in targeting revisions to training content or methodology for future training iterations elsewhere.

We will use a **qualitative outcomes analysis** to provide a deeper analysis into the perceived outcomes and explore why they were or were not achieved. One way to accomplish this is by analyzing information obtained through conversations that allow for open-ended responses on overall perceptions of the training and self-perceptions on learning and adoptions. We will use this qualitative data to triangulate our analysis of outcomes using the quantitative data sources. Because this sub-activity has a strong focus on training women and youth, we will use the FGDs to obtain perspective on the extent to which different training methods were employed with these groups, and whether the methods and content were sufficiently targeted to their needs,

[10] Because our household surveys will not be conducted immediately after the trainings are complete, any attendance information collected in the survey instrument would be recall-based and liable to inaccuracies that attendance data collected by the contractor would avoid. We can use the attendance information to gauge whether participants attending the full training program indicate more growth in skills and knowledge than participants who only partially attended, though we note that the contractor may have an incentive to misrepresent their level of success.

[11] Material covered in the training is likely to be new for the majority of participants. As a result, any baseline data collected before the trainings begin should indicate little to no familiarity with the training concepts, yielding limited value for evaluation purposes. A pre-post design that leverages baseline knowledge levels is unlikely to contribute much information about the effectiveness of the trainings beyond what is obtainable through the proposed descriptive analysis of outcomes collected after the training.

[12] Our baseline survey also features questions on agricultural practices, but final decisions on which practices are promoted in the agricultural trainings are yet to be made. For practices which ultimately are targeted in training sessions, we will be able to conduct pre-post analyses.

preferences, and constraints (RQ23b). For example, trainings on profitable economic activities will be provided to youth with the aim of reducing out-migration, and our FGDs will address whether skills they were taught have influenced their decision to continue residing in Konni.

Information from our FGDs will also allow us to better understand possible barriers to adoption (RQ28b), especially if the quantitative data reveals that adoption rates lagged targeted levels. We will carry out FGDs to identify the causes of non-adoption, which will aid in our evaluation of the suitability of the training. Our FGDs will also allow us to obtain perceptions from women on whether access to credit has increased as a result of participation in savings and loans groups (RQ29b).

Finally, we will interview a variety of stakeholders to obtain perceptions on how training outcomes have affected communities as a whole. We will interview the consultants implementing the activity, as well as representatives from the Ministry of Agriculture, and specifically the General Directorate for Agriculture and the Departmental Directorate for Agriculture. To obtain perceptions on improved technology adoption, we will interview staff from the *Direction de la Vulgarisation et de Transfert de Téchnologie* from the Ministry of Agriculture. KIIs with Regional Agriculture Chambers and traders will provide qualitative information on perceived changes in agricultural marketing practices, and the relationship between new marketing outlets and training participants' ability to translate agricultural trainings into improved production practices. These KIIs not only provide information about farmer training and adoption but will provide additional information on how cooperatives applied knowledge (RQ30).

5. Performance evaluation to measure the Policy Reform Activity

a. Evaluation overview

The Policy Reform Activity consists of two sub-activities. The Fertilizer Reform Sub-Activity aims to make fertilizer more accessible and affordable to farmers by reforming procurement, stimulating market competition, and rolling out a targeted subsidy program. The National Statistical Capacity Sub-Activity has the objective of building capacity in the National Institute of Statistics and relevant ministries to collect and analyze data, and develop data-informed policies. To evaluate these two sub-activities, we will carry out a mixed methods performance evaluation using qualitative and quantitative evaluation techniques. We propose a qualitative outcomes analysis to identify root causes when reform activities did not generate the outcomes specified in project documents. In evaluating the Fertilizer Reform Sub-Activity, we will use a pre-post analysis to measure changes in fertilizer market activity over the course of the Compact. Table V.7 provides an overview of our approach to evaluating the Policy Reform Activity, which is further detailed below.

Table V.7. Evaluation methods, research questions, data sources, and key outcomes for evaluation of the Policy Reform Activity

Evaluation method	Research questions	Data sources	Key outcomes
Qualitative outcomes analysis	• RQ31b. Did the Fertilizer Reform Sub-Activity produce the expected outputs? If the sub-activity did not lead to increased private sector participation in the fertilizer sector, why not? • RQ32. Did the National Statistical Capacity Sub-Activity produce the expected outputs? Have reform activities improved GoN's statistical capacities in data collection, analysis, and reporting?	• KIIs • FGDs • Monitoring data	• Perceptions of access to and affordability of improved inputs • Procedural changes to GoN statistical operations • GoN statistical capabilities
Pre-post analysis	• RQ31a. Did the Fertilizer Reform Sub-Activity lead to increased private sector participation in the fertilizer sector? Have reform activities made fertilizer more affordable and accessible?	• Surveys of households • Price data collection • Monitoring data	• Retail fertilizer prices • Availability of fertilizer in local markets • Number of traders selling fertilizer

Notes: KII = key informant interview; FGDs = focus group discussion; GoN = Government of Niger
Research questions in table are abbreviated versions of full-text questions in Chapter IV.

b. Methods, outcomes, and data sources

We will use a **qualitative outcomes analysis** to assess the outcomes of the Fertilizer Reform Sub-Activity as well as the National Statistical Capacity Sub-Activity. We will conduct interviews with representatives from the private and public sector to assess their perceptions on any changes to fertilizer prices and markets derived from this sub-activity. To assess whether farmers and/or households perceive changes to the fertilizer market, we will conduct FGDs. This information will complement the quantitative data gathered as part of the pre-post analysis described below. To understand the outcomes of the National Statistical Capacity Sub-Activity, we will review any available administrative data (such as procedural changes, organigrams, guidance documents, availability of new systems) and carry out KIIs with government staff at multiple levels to assess their perception of acquired capacity. As ministries often experience turnover at the senior level, we plan to interview both senior and mid-level staff. KIIs will also allow us to assess what institutional changes have occurred within the *Institut National de la Statistique du Niger* and key ministries (water and sanitation, agriculture and livestock, and environment).

To evaluate the magnitude of the effects of the Fertilizer Reform Sub-Activity, we will use a **pre-post analysis**, which we will describe in complete detail in Chapter V, Section B. We will use household surveys collected at the baseline, midline, and endline to determine whether fertilizer price, availability (in both seasons, and at the demanded time), and accessibility in local markets change over the period of analysis. As mentioned, the pre-post design is unable to support causal claims in the absence of a comparison group. Because the reforms are nationwide, no meaningful comparison group will be available, as no portion of the country is exempt from fertilizer reforms. Additionally, although we expect that reform components that induce competition, remove distortions, and provide subsidy support for low-income farmers will collectively affect the price and quantity of fertilizer available, other Compact activities will also impact fertilizer markets. For example, if construction of the Konni irrigation perimeter facilitates crop shifting into input-intensive varieties and crops, the perimeter itself will impact

the number and density of traders selling fertilizer to PAP households. Therefore, comparison of relevant outcomes using baseline and endline data will not permit us to discern whether any changes are associated exclusively with fertilizer market reforms and not with other IMAP activities, or even factors unrelated to IMAP.

6. Assessment of sustainability of Konni perimeter investments and complementary investments

Near the end of the contract period, we will analyze IMAP activities' prospects for the long term through a **qualitative sustainability analysis**. This analysis will help us understand if any detectable results are expected to be sustained (RQ5). Our sustainability analysis will draw on the implementation and outcome analyses we previously described, and will also identify key barriers or facilitators to sustainability. To accomplish this, we will look at various dimensions of sustainability, including the sustainability of upgraded irrigation infrastructure, governance structures (IWUAs, cooperatives, COCOFOMs), technical capacities (at the farmer level and ministry level), and system level (generalized income increases along the key value chains, or land tenure security). Our infrastructure assessment, along with the review of IWUA governance structures and capacity, will be vital to determining the likely sustainability of the irrigation infrastructure. We will also rely on KIIs with representatives from ONAHA to identify key challenges and barriers to the sustainability of the infrastructure. To assess other dimensions of sustainability, we will carry out FGDs with beneficiaries, as well as KIIs with relevant stakeholders, such as General Directorate for Agriculture/ Departmental Direction for Agriculture in Konni, traders, representatives from COCOFOMs, members of cooperatives, and representatives from the ministries receiving statistical capacity support.

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VI. DATA COLLECTION

In this chapter, we describe our approach to developing data collection instruments. We also describe how we will train our data collection partners and the procedures we will put in place to ensure that all collected data satisfies high quality standards. The chapter closes with a summary of all data collection activities, sample sizes, relevant modules, and anticipated exposure periods for outcomes of interest.

A. Local data collection partners

Mathematica will competitively procure the local data collection partner for collecting quantitative and qualitative data. The procurement process will assess the firm's overall approach to collecting high quality data, experience in collecting data in a similar context, and the expertise of the team leading the efforts. Mathematica will also review costs carefully to ensure they are reasonable and competitive. Finally, Mathematica will carefully check references to verify the prior performance of the firms. To facilitate data collection coordination efforts, we hope to hire the same firm for each round of quantitative and qualitative data collection. We will sign a contract with the data collection firm with a base period and several option periods corresponding to the different data collection efforts, so an extensive review of proposals only occurs once, thereby maximizing resources.

B. Our approach to collecting high quality data

Instrumental to the success of this evaluation is collecting high quality data that is accurate, reliable, and timely. To minimize data collection risks, we will institute several processes to reduce threats to data quality. First, we will prepare instruments and protocols tailored to each of the sub-activities being evaluated and the respondents interviewed. The project's quality assurance reviewer then will review the instruments and protocols to ensure that the survey questions help answer the research questions and are context appropriate and specific enough to obtain the targeted information.

Once the instruments and protocols are finished, we will pre-test them with the support of our local data collector. We will incorporate any needed changes to the instruments or protocols and send them to MCC and MCA-N for feedback.

We will ensure high quality data by providing thorough and consistent oversight on all aspects of the data collection process. We will require that the local data collector conduct a training of at least six days under the supervision of an experienced Mathematica data collection trainer. In addition, the data collection firm will train more enumerators than needed to ensure that even if there is staff turnover, there are enough trained enumerators to conduct the training. Once the enumerators are trained, we will pilot the instrument. For the quantitative data, we propose using a computer-assisted personal interviewing (CAPI) system on tablets with a platform such as Survey Solutions, which was developed by the World Bank. This approach would enable us to review the data and conduct consistency checks on an ongoing basis. The system is designed to work in low-resource countries by operating in a user-friendly format on a variety of tablets. A CAPI system greatly increases data quality by controlling the skip pattern, removing the need for data entry, and reducing survey administration time. As the data are being

collected, a supervisor will be required to check the data for inconsistencies on a daily basis. Mathematica will also review the data on a rolling basis.

For qualitative data, we will hire only interviewers with prior experience in running focus groups or conducting KIIs. We will ensure that they adhere to the highest standards for qualitative data collection through intensive training on how to conduct qualitative interviews and effectively run focus groups, and hiring only those interviewers who meet our stringent criteria. The training includes information on how to gain the trust of focus group participants and facilitate a conversation without inserting any bias. Mathematica and the local data collector may conduct some of the high-level interviews jointly to ensure that there is representation from Mathematica should a stakeholder be interested in learning more about the evaluation. Such joint interviews will primarily occur in instances in which Mathematica can leverage an existing planned trip so its staff can also conduct interviews with key informants. In addition, Mathematica will conduct ongoing interviews as part of the implementation analysis each time staff need to travel to Niger for the evaluation. To ensure that protocols are followed properly, Mathematica will conduct interviewer observations and attend interviewer debriefings. The data collection firm will then have to code the data and will also be required to send Mathematica transcripts of all interview conversations to review the coding and ensure they meet our rigorous quality standards.

C. Data collection timing and overview

Table VI.1 presents the timetable for the planned implementation activities on the Konni perimeter (top panel) and the timing for collecting each type of data that will be used in our evaluation (bottom panel).[13] This table allows for ready comparison of how our data collection timing will align with the status of project activities. For example, our interim quantitative data collection will be scheduled to monitor the effects of project implementation, which will not yet be completed, whereas the endline will provide for a two-year window after the conclusion of implementation to observe differences in outcomes. For any changes in implementation timing that would influence our data collection, we will discuss with MCC and MCA-N whether revising data collection timing would be appropriate.

Data collection timing is specific to the evaluation method for which the data will be used. Baseline, interim, and endline quantitative data will be collected to monitor progress in outcomes from before any IMAP activities begin to more than two years after activity completion to allow sufficient time for farmers to modify their practices and realize increases in agricultural productivity and consumption. Qualitative data will be collected within one year of the conclusion of IMAP activities so that all implementation-related questions can be answered completely. To regularly monitor prices of key inputs and outputs at varying stages of the supply chain (see Section V.B.5.b for a complete description), price data collection will occur continuously between the time periods of baseline and endline quantitative data collection. Our in-country coordinator will routinely visit markets, cooperatives, input suppliers, and extension agencies to collect price data on inputs and outputs.

[13] The implementation timing is based on our reading of the most current project documents available. We will revise this table with any updated timing provided by MCC/MCA-N.

Table VI.1. Timetable for planned implementation and data collection activities

Year	2020				2021				2022				2023				2024				2025				2026			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Konni perimeter construction																												
Konni perimeter training activities																												
Konni irrigated production																												
Land inventories and RAP implementation																												
Roads for markets																												
Policy reforms																												
Baseline quantitative data collection (Konni, training)																												
Interim quantitative data collection (Konni, training)																												
Endline quantitative data collection (Konni, training)																												
Qualitative data collection (by firm)																												
Administrative/institutional data collection and select KIIs by Mathematica																												
Project data collection																												
Denotes end of Niger Compact																												

Tables VI.2 and VI.3 present the sample unit, sample size, relevant modules, and exposure period for the quantitative and qualitative data sets we will collect. The exposure period indicates the time required after an intervention for a change in outcome to be observed. The exposure periods draw on findings from literature, where possible, and otherwise are based on an outcome's relative position in the project's logic model.

D. Challenges

Although our planned data collection is designed to elicit the best possible answers to the key research questions, its implementation also might present some challenges. Below we discuss some of those challenges and how we plan to resolve them.

Stakeholder leadership and staff transitions. Even a well-designed evaluation with committed implementation partners and a clear plan for program delivery can encounter problems when key people change. A strong initial commitment to the evaluation from stakeholders at the national and regional levels will help mitigate the effects of such transitions. This approach includes obtaining institutional buy-in, not just personal commitments, from those who occupy leadership positions at the outset of the study. If new people assume key leadership and staff positions during the evaluation period, we will ensure that they are briefed and informed about the evaluation and the level and type of contribution expected of them, and made aware that their participation is valued.

Recall bias. Considering the time lapse between the design and eventual roll-out of implementation, as well as the times when data will be collected, it is possible that respondents may have difficulty in remembering the details and timing of the activities. This bias is likely to be particularly strong for decisions or events that took place a few years earlier, such as design decisions. In addition, perceptions may have changed over time or have been affected by current events, leading to inaccurate answers to questions about the past. Focus groups related to some of the trainings may occur months or even years after a training has occurred, resulting in possible recall issues. In those instances, we will include prompts in our protocol to summarize the context and timing that we are interested in learning about. For those cases in which faulty memories are likely to be especially relevant, we will give more weight to written documentation. To help deal with recall bias, our interviewers will be trained to help respondents reference the appropriate time frame for each question.

Response bias. It is likely that some responses obtained through qualitative methods will be biased. For example, training participants may not be comfortable in providing an honest perception of their contact farmer if they think it could result in unfavorable treatment in the future. For this reason, we plan to triangulate different parties' responses to interview and focus group questions, and interpret these responses in light of interviewees' incentives, experiences, and affiliations.

Table VI.2. Summary of quantitative data collection

Data collection	Timing	Sample unit / respondent	Sample size	Relevant instruments / modules	Exposure period
Administrative/institutional data from IWUAs and ONAHA	Quarterly/annually	N/A	N/A	• Modules on irrigation in the household surveys • IWUA financial reports and annual budgets • Land use rights documentation	We estimate that outcomes will be responsive over varying time frames. For beneficiary outcomes, please see the indicative exposure periods described below.
Project data from MCA-N, land/RAP contractor, SISM contractor, SAA contractor	Quarterly/annually	N/A	N/A	• Irrigation construction contracts • SAA monitoring information on training participant outcomes for SAA modules on literacy, village savings and loan programs, improved productive activities, and natural resources management • Land conflict monitoring system dispute outcomes	We estimate that outcomes will be responsive over varying time frames. For beneficiary outcomes, please see the indicative exposure periods described below.

Data collection	Timing	Sample unit / respondent	Sample size	Relevant instruments / modules	Exposure period
Household survey for pre-post analysis	Baseline: Q1 2020 Interim: Q1 2023 Endline: Q1 2026	Household	600 households Households will be selected through a stratified random sample from the RAP database, with gender of household head and land holdings being the two strata.	• Household roster • Poverty Probability Index • Land holdings and leasing/rentals • Farm and livestock assets • Cropping pattern • Agricultural inputs and practices • Agricultural outcomes • Agricultural and non-agricultural income • Irrigation access and usage • Food and nutritional security • Consumer expenditure • Self-reported knowledge gains from agricultural trainings • Self-reported knowledge gains from non-agricultural trainings • Land tenure security perceptions and experience with land disputes and their resolution • Financial services access and usage	We estimate that outcomes will be responsive over different time frames, and will vary from the following: **For irrigation-related outcomes:** • 12–24 months after completion of perimeter construction for changes in agricultural practices to be measurable • 36–60 months after completion of perimeter construction for changes in agricultural production and household consumption to be measureable **For training-related outcomes:** • 0–12 months after training for self-assessed gains in knowledge to be reported • 12–24 months after training for improved practices to be adopted • 24–60 months after training for increases in productivity to be detectable

Data collection	Timing	Sample unit / respondent	Sample size	Relevant instruments / modules	Exposure period
Drone/satellite imagery and data products from RTI International and NASA	Continuous	Land parcel / pixel	Comprehensive across Konni perimeter	• Crop type mapping • Predicted crop yields • Irrigation water availability and consumption	These data sources will provide information on true exposure periods.

IWUA = irrigation water user association; MCA-N = Millennium Challenge Account/Niger; NASA = National Aeronautical and Space Administration; ONAHA = Office National des Aménagements Hydro-Agricole; pro-WEAI = Project-Level Women's Empowerment in Agriculture Index; SISM = Sustainable Irrigation System Management; SSA = Agricultural Support Services.

Table VI.3. Summary of qualitative data collection

Data collection	Timing (include multiple rounds)	Sample unit / respondent	Sample size	Relevant themes	Exposure period
Interviews with key informants	Throughout implementation; Q3/4 2023	Stakeholders	Approximately 20 (see Appendix B for a listing of all KIIs)	*Each interview will have a targeted protocol. Depending on the knowledge of the interviewee, we will cover some of the topics below:* • Project implementation • Functioning of improved irrigation • Perceptions regarding changes of cost of water and community-level outcomes • Role, leadership, and functioning of IWUAs • Land tenure registry process and perceptions of land security • Perceptions on training program and outcomes • Cost and access to improved inputs • Access to markets for irrigated crops	The exposure period between the intervention and when outcomes can be observed will vary based on the activity and outcomes of interest. Table VI.2 provides further details on the exposure period by outcome of interest. We do not expect respondents to have developed a reliable perception of outcomes until late in 2023. We will, however, keep abreast of activities to determine the most appropriate time to conduct interviews—particularly for the implementation analysis. We aim to follow progress regularly throughout the evaluation.
Focus group discussions	Q3/Q4 2023	PAP, collective	A total of 10: 6 PAP, 4 collective (cooperative and IWUA focused)	*Discussion guides and protocols for FGDs will be tailored to the participants. Depending on the respondent, the themes could include questions related to the following:* • Experiences with implementation • Perceptions of functioning of new/improved irrigation • Adequacy, efficiency, and cost of water for irrigation • Perceptions of changes in outcomes based on new/improved irrigation • Outcomes for women • Outcomes for youth • Perceptions of the role, leadership, and participation in IWUAs • Land tenure registry process and perceptions of land security	We hope to conduct FGDs in late in 2023 because we believe at that point we will be able to observe perceptions of outcomes among the largest share of beneficiaries.

Data collection	Timing (include multiple rounds)	Sample unit / respondent	Sample size	Relevant themes	Exposure period
				• Perceptions of the training program and outcomes • Perception of cost and access to improved inputs • Perception of access to markets	
Site visits	Interim: Q2/Q3 2022 Follow-up: Q3/Q4 2025	Konni perimeter irrigation infrastructure	TBD	• Inspection of physical infrastructure systems (e.g., pumping stations, secondary and tertiary canals) • Operational systems and ONAHA/IWUA protocols	For infrastructure-related outcomes, we anticipate an exposure period of 12–24 months after completion of perimeter construction for changes in maintenance practices to be measurable.

FGD: focus group discussion; IWUA = irrigation water user association; KII = key informant interview; ONAHA = *Office National des Aménagements Hydro-Agricole*; PAP = project affected person; TBD = to be determined.

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VII. ADMINISTRATIVE ISSUES

A. Summary of IRB requirements and clearances

Mathematica is committed to protecting the rights and welfare of human subjects, and will prepare and submit an application for approval of the research and data collection plans to an institutional review board (IRB) registered with the Office for Human Research Protections, U.S. Department of Health and Human Services. We intend to use Health Media Lab as our IRB because of our positive experience with it on other MCC projects. For each IRB application, we will submit a set of required documents, including a research protocol that provides details of the study and data collection activities, copies of all data collection instruments, and a completed IRB questionnaire summarizing the key elements of the research protocol and plans for protecting participants' confidentiality. The data collection instruments we will prepare and submit to the IRB will include consent statements approved by MCC that guarantee the confidentiality of respondents to the extent possible.

We will provide evidence of IRB approval to MCC. IRB approval is valid for one year; we will submit annual renewals for subsequent approvals as data collection proceeds through follow-up collection processes. We expect the annual renewals to require only minimal updates to the core application materials because we will collect similar data from year to year. If data collection instruments change substantially from those approved by the IRB, we will reapply for review. Small changes to the instruments (such as rewording or reordering of questions, or editing changes) do not require reapplication, but the final instruments must be submitted to the IRB for documentation. We will submit the instruments for review in both English and French. We will collaborate with the local data collection firm to obtain approval for conducting fieldwork from the National Statistics Institute in Niger.

B. Data protection

Mathematica and the local data collection firm will ensure the confidentiality of all data collection respondents, including for data collection participation, personally identifiable information, and other sensitive data. The data collection instruments (both the quantitative instruments and qualitative protocols) will include consent statements approved by MCC that guarantee the confidentiality of respondents to the extent possible. If data are collected on paper instruments, the local data collection firm will ensure the safe handling and transport of the instruments from the field to the main office for data entry; the instruments will be stored there in lock-and-key cabinets. If data are collected electronically (our preferred approach), they will be stored on a secure server approved by Mathematica. The data collection firm will share electronic data files with Mathematica via a secure file transfer system, such as a file transfer protocol or file exchange website (FX or BOX site). The data will be stored on a secure Mathematica server and will be accessible only to project team members who use them. All project team members have signed a nondisclosure agreement pertaining to confidential information. For internal control and audit purposes, the local data collection firm will retain the data files, both in paper and electronic form, for the entire duration of the project, including the base contract and the subsequent option contracts. All of the collected data and databases are the property of Mathematica and will be delivered to us at the end of the contract.

C. Preparing data files for access, privacy, and documentation

Public use data will enable any stakeholder, researcher, or agency to understand the source data and analysis behind MCC evaluations, and may inspire a wide range of new policy-relevant research, thus maximizing the benefits of MCC's investments in large-scale data collection efforts in developing countries. The Mathematica team will prepare public use quantitative data files following MCC's Evaluation Microdata Guidelines and will deliver complete data packages for the MCC Evaluation Catalog. In addition to de-identified quantitative data files, we will provide user manuals and codebooks according to the most recent guidelines set forth by MCC. Public use data files will be free of personal or geographic identifiers that would enable unassisted identification of individual respondents or their households, and we will remove or adjust variables that introduce reasonable risks of deductive disclosure of the identity of individual participants. We will also recode unique and rare data by using top and bottom coding or replacing affected observations with missing values. If necessary, we will also collapse any variables that make an individual highly visible because of geographic or other factors into less easily identifiable categories.

Unlike quantitative data, for which we will be able to use fairly straightforward processes to provide anonymity, many of the key informants and focus group participants who will be invited to participate in the qualitative data collection may have a unique perspective (for example, as the leader of a certain institution). We might need to make substantial changes to the transcripts to protect these respondents' identities. These modifications to the transcripts might render them less valuable as a public good; without such protections, however, respondents would be unlikely to offer complete and honest answers to questions essential to the evaluation. If we provide public use versions of the transcripts without rendering them adequately anonymous, participants could be at risk of social or professional repercussions if powerful institutions or individuals learned of any negative comments made during the interviews. We will attempt to redact FGDs such that no identifiers will remain that could be used to link respondents to their comments. We do not, however, believe this redaction is possible with respect to KIIs. We will seek IRB guidance and advice on how to balance MCC's desire for data accessibility with the need to protect respondents' identities.

D. Dissemination plan

The Mathematica team will present evaluation findings in person at both MCC and MCA-N headquarters. We will also participate in any other MCC-financed dissemination and training events related to the findings from the baseline, interim, and final reports. To ensure that the results and lessons from the evaluation reach a wide audience, we will work with MCC to increase the visibility of the evaluation and findings within the agriculture sector, especially for policymakers and practitioners. After acceptance of the interim and final evaluation reports, the team will develop a policy brief with findings and analysis relevant to MCC and Government of Niger decision makers. We expect the broader research community to have a strong interest in the evaluation findings. To facilitate wider dissemination of findings and lessons, we will collaborate with MCC and other stakeholders to identify additional forums—conferences, workshops, and publications—for disseminating the results.

E. Evaluation team roles and responsibilities

Our team has vast experience in Niger and combined expertise in irrigation infrastructure, agriculture development projects, rigorous performance and impact evaluations, complex data collection, and French language skills, and therefore will be able to meet MCC's evaluation needs. Our program manager, **Mr. Matt Sloan,** oversees the project team and provides technical leadership. He is responsible for high quality project delivery on all products, ensures coordination with various partners and the team, and serves as MCC's primary point of contact. **Dr. Mutsa Masiyandima** serves as the senior analyst–irrigation infrastructure and will support the evaluation, with a focus on assessing the irrigation infrastructure and irrigation data. **Dr. Christopher Ksoll** serves as the senior analyst– agriculture development and principal investigator (PI), leading all quantitative evaluation design and analysis tasks. **Dr. Anthony D'Agostino** will assist Dr. Ksoll as senior analyst, working on the design of the performance evaluations and analysis. **Dr. Jane Fortson** will provide quality assurance on all deliverables. **Ms. Patricia Costa**, a senior analyst, will work on data collection instrument development and will oversee the qualitative and quantitative data collection, with support from a junior analyst, **Ms. Galina Lapadatova**. **Ms. Poorva Upadhyaya** manages the project internally for Mathematica. **Ms. Margo Berends**, a junior analyst, along with Ms. Lapadatova will support the training, data collection, and analysis tasks. **Mr. Saidou Amadou Moussa,** our in-country coordinator, is a native of Niger and will oversee data collection fieldwork, monitor data quality, coordinate site visits, assist with communications with MCA-N, and keep our team apprised of project implementation.

F. Evaluation timeline and reporting schedule

In Table VII.1, we present the evaluation timeline and reporting schedule.

Table VII.1. Evaluation timeline and reporting schedule

Round	Data collection	Data cleaning and analysis	First draft report expected	Final draft report expected
Base Period (Baseline Report)	Jan–Feb 2020	March–May 2020	August 2020	January 2021
Option Period I (Interim Report)	Jan–Feb 2022	March–May 2022	August 2022	January 2023
Option Period II (Final Report)	Jan–Feb 2026	March–May 2026	August 2026	January 2027

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REFERENCES

Abric, S, M. Sonou, B. Augeard, F. Onimus, D. Durlin, A. Soumila, and F. Gadelle. "Lessons Learned in the Development of Smallholder Private Irrigation for High-Value Crops in West Africa." The World Bank, FAO, IFAD, Practica, ARID and IWMI Joint Discussion Paper 66917. Washington, DC: World Bank, 2011.

Aker, Jenny. "Dial 'A' for Agriculture: A Review of Information and Communication Technologies for Agricultural Extension in Developing Countries." *Agricultural Economics,* vol. 42, no. 6, 2011, p. 631–647.

Ali, Daniel A., Matthew Collin, Klaus Deininger, Stefan Dercon, Justin Sandefur, and Andrew Zeitlin. "Small Price Incentives Increase Women's Access to Land Titles in Tanzania." *Journal of Development Economics,* vol. 123, no. C, 2016, pp. 107–122.

Ali, Daniel A., Klaus Deininger, and Markus Goldstein. "Environmental and Gender Impacts of Land Tenure Regularization in Africa: Pilot Evidence from Rwanda." *Journal of Development Economics,* vol. 110, no. C, 2014, p. 262–275.

Anderson, Jock R., and Gershon Feder. "Agricultural Extension: Good Intentions and Hard Realities." *The World Bank Research Observer,* vol. 19, no. 1, 2004, p. 41–60.

Aw, Djibril, and Geert Diemer. *Making a Large Irrigation Scheme Work.* Washington, DC: World Bank, 2005.

Backiny-Yetna, Prospere and Kevin McGee. "Gender Differentials and Agricultural Productivity in Niger." Policy Research Working Paper 7199. Washington, DC: World Bank, 2015.

Benjaminsen, Tor A., Stein Holden, Christian Lund, and Espen Sjaastad. "Formalisation of Land Rights: Some Empirical Evidence from Mali, Niger and South Africa." *Land Use Policy,* vol. 26, no. 1, 2009, p. 28–35.

BenYishay, Ariel, and A. M. Mobarak. "Social Learning and Incentives for Experimentation and Communication." *The Review of Economic Studies,* vol. 95, 2018, p. 1–34.

Bezu, Sosina, and Stein Holden. "Demand for Second-Stage Land Certification in Ethiopia: Evidence from Household Panel Data." *Land Use Policy*, vol. 41, 2014, pp. 193–205.

Bos, M.G., D.H. Murray-Rust, D.J. Merrey, H.G. Johnson, and W.B. Snellen. "Methodologies for Assessing Performance of Irrigation and Drainage Management." *Irrigation and Drainage Systems,* vol. 7, 1994, p. 231-261.

Buehren, Niklas, Markus Goldstein, Ezequiel Molina, and Julia Vaillant. "The Impact of Strengthening Agricultural Extension Services: Evidence from Ethiopia." *World Bank Policy Research Working Paper,* 2017, p. 1–28.

Burney, Jennifer, Lennart Woltering, Marshall Burke, Rosamond Naylor, and Dov Pasternak. " Solar-Powered Drip Irrigation Enhances Food Security in the Sudano-Sahel." *Proceedings of the National Academy of Sciences,* vol. 107, no. 5, 2010, p. 1848-1853.

Burney, Jennifer A. and Rosamond L. Naylor. "Smallholder Irrigation as a Poverty Alleviation Tool in Sub-Saharan Africa." *World Development,* vol. 40, no. 1, 2012, pp. 110–123.

Burney, Jennifer A., Rosamond L. Naylor, and Sandra L. Postel. "The Case for Distributed Irrigation as a Development Priority in Sub-Saharan Africa." *Proceedings of the National Academy of Sciences*, vol. 110, no. 31, 2013, p. 12513-12517.

Central Intelligence Agency. "The World Factbook: Niger." December 10, 2018. Available at https://www.cia.gov/library/publications/the-world-factbook/geos/ng.html. Accessed January 4, 2019.

Corral, Carolina, Xavier Giné, Aprajit Mahajan, and Enrique Seira. "Improving Yields with Improved Recommendations." In *Learning for Adopting: Technology Adoption in Developing Country Agriculture,* edited by Alain de Janvry, Karen Macours, and Elisabeth Sadoulet. Chapter 10. Clermont-Ferrand, France: Ferdi, 2016, p. 103–106.

Creswell, John W. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (3rd edition). Thousand Oaks, CA: Sage Publications, Inc, 2009.

Crewett, Wibke and Beneditk Korf. "Ethiopia: Reforming Land Tenure." *Review of African Political Economy*. vol. 35, no. 116, 2008. p. 203-220.

Davis, K., E. Nkonya, E. Kato, D.A. Mekonnen, M. Odendo, R. Miiro, and J. Nkuba. "Impact of Farmer Field Schools on Agricultural Productivity and Poverty in East Africa." *World Development,* vol. 40, no. 2, 2012, p. 402–413.

Deininger, Klaus, Daniel A. Ali, and Tekie Alemu. "Impacts of Land Certification on Tenure Security, Investment, and Land Market Participation: Evidence from Ethiopia." *Land Economics,* vol. 87, no. 2, 2011, p. 312–334.

Deininger, Klaus, Daniel A. Ali, Stein Holden, and Jaap Zevenbergen. "Rural Land Certification in Ethiopia: Process, Initial Impact, and Implications for Other African Countries." *World Development,* vol. 36, no. 10, 2008, p. 1786–1812.

Deininger, Klaus, and Hans P. Binswanger. "Rent Seeking and the Development of Large-Scale Agriculture in Kenya, South Africa, and Zimbabwe." *Economic Development and Cultural Change,* vol. 43, no. 3, 1995, p. 493–522.

Deininger, Klaus, and Aparajita Goyal. "Going Digital: Credit Effects of Land Registry Computerization in India." *Journal of Development Economics,* vol. 99, no. 2, 2012, p. 236–243.

Deininger, Klaus, and Songqing Jin. "Tenure Security and Land-Related Investment: Evidence from Ethiopia." *European Economic Review,* vol. 50, no. 5, 2006, p. 1245–1277.

Devoto, Florencia, Esther Duflo, Pascaline Dupas, William Parienté, and Vincent Pons. "Happiness on Tap: Piped Water Adoption in Urban Morocco." *American Economic Journal: Economic Policy*, vol. 4, no. 4, 2012, pp. 68–99.

Dillon, Andrew. " The Effect of Irrigation on Poverty Reduction, Asset Accumulation, and Informal Insurance: Evidence from Northern Mali." *World Development*, vol. 39, no. 12, 2011, pp. 2165-2175.

Domènech, Laia. "Is Reliable Water Access the Solution to Undernutrition?" International Food Policy Research Institute, *IFPRI Discussion Paper*, 2015, pp. 1–36.

Duflo, Esther, and Rohini Pande. "Dams." *The Quarterly Journal of Economics*, vol. 122, no. 2, 2007, pp. 601–646.

Dugje, I.Y., L.O. Omoigui, F. Ekeleme, A.Y. Kamara, and H. Ajeigbe. "Farmers' Guide to Cowpea Production in West Africa." Ibadan, Nigeria: IITA.

Evenson, Robert E. "Economic Impacts of Agricultural Research and Extension." In *Handbook of Agricultural Economics*, edited by Bruce L. Gardner and Gordon C. Rausser. Elsevier Science B.V, 2001.

Food and Agriculture Organization (FAO). Agriculture Production Data. Available at http://www.fao.org/faostat/en/#data/RT. Accessed January 18, 2019.

Food and Agriculture Organization (FAO). 2016. AQUASTAT Main Database, Food and Agriculture Organization of the United Nations (FAO). Accessed: May 21, 2019.

Feder, Gershon, Richard E. Just, and David Zilberman. "Adoption of Agricultural Innovations in Developing Countries: A Survey." *Economic Development and Cultural Change*, vol. 33, no. 2, 1985, pp. 255–298.

Foster, Andrew D., and Mark R. Rosenzweig. "Microeconomics of Technology Adoption." *Annual Review of Economics*, vol. 2, no. 1, 2010, pp. 395–424.

Glendenning, Claire, Suresh Babu, and Kwadwo Asenso-Okyere. "Review of Agricultural Extension in India: Are Farmers' Information Needs Being Met?" International Food Policy Research Institute, *IFPRI Discussion Paper*, 2010, pp. 1–48.

Goldstein, Markus, Kenneth Houngbedji, Florence Kondylis, Michael O'Sullivan, and Harris Selod. "Formalizing Rural Land Rights in West Africa: Early Evidence from a Randomized Impact Evaluation in Benin." Policy Research Working Paper 7435. Washington, DC: World Bank, 2015.

Gottlieb, Charles, and Jan Grobovsek. "Communal Land and Agricultural Productivity." *Journal of Development Economics*, vol. 138, 2019, pp. 135–152.

Ho, Peter, and Max Spoor. "Whose Land? The Political Economy of Land Titling in Transitional Economies." *Land Use Policy*, vol. 23, no. 4, 2006, pp. 580–587.

Hossain, M., F. Naher, and Q. Shahabuddin. "Food Security and Nutrition in Bangladesh: Progress and Determinants." *Electronic Journal of Agricultural and Development Economics*, vol. 2, no. 2, 2005, pp. 103–132.

Hussain, Intizar, and Munir A. Hanjra. "Irrigation and Poverty Alleviation: Review of the Empirical Evidence." *Irrigation and Drainage,* vol. 53, no. 1, 2004, pp. 1–15.

Hussain, Syed S., Derek Byerlee, and Paul W. Heisey. "Impacts of the Training and Visit Extension System on Farmers' Knowledge and Adoption of Technology: Evidence from Pakistan." *Agricultural Economics*, vol. 10, no. 1, 1994, pp. 39–47.

Illiassou, Mossi Maïga. "La gestion collective des systèmes irrigués : cas des aménagements hydroagricoles rizicoles dans la vallée du fleuve Niger au Niger." Mémoire en vue de l'obtention de Diplôme d'études Approfondies, Université Toulouse-le Mirail. 2005.

Kondylis, Florence, Valerie Mueller, Glenn Sheriff, and Siyao Zhu. "Do Female Instructors Reduce Gender Bias in Diffusion of Sustainable Land Management Techniques? Experimental Evidence from Mozambique." *World Development,* vol. 78, 2016, pp. 436-449.

Kondylis, Florence, Valerie Mueller, and Jessica Zhu. "Seeing is Believing? Evidence from an Extension Network Experiment." *Journal of Development Economics,* vol. 125, no. C, 2017, pp. 1–20.

Krishnan, P., and M. Patnam. "Neighbors and Extension Agents in Ethiopia: Who Matters More for Technology Adoption?" *American Journal of Agricultural Economics,* vol. 96, no. 1, 2013, pp. 308–327.

Ksoll, Christopher, Chantal Toledo, Seth Morgan, Anca Dumitrescu, and Kristen Velyvis. "Evaluation of the Burkina Faso Agriculture Development Project: Design Report." Washington, DC: Mathematica Policy Research, June 6, 2017.

Larsen, Anna F., and Helene B. Lilleør. "Beyond the Field: The Impact of Farmer Field Schools on Food Security and Poverty Alleviation." *World Development,* vol. 64, no. C, 2014, pp. 843–859.

Lawry, Steven, Cyrus Samii, Ruth Hall, Aaron Leopold, Donna Hornby, and Farai Mtero. "The Impact of Land Property Rights Interventions on Investment and Agricultural Productivity in Developing Countries: A Systematic Review." *Journal of Development Effectiveness,* vol. 9, no. 1, 2017, pp. 61–81.

Lawry, Steven, Cyrus Samii, Ruth Hall, Aaron Leopold, Donna Hornby, and Farai Mtero. "The Impact of Land Property Rights Interventions on Investment and Agricultural Productivity in Developing Countries." The Campbell Collaboration, 2014.

Lund, Christian. "Struggles for Land and Political Power: On the Politicization of Land Tenure and Disputes in Niger." *The Journal of Legal Pluralism and Unofficial Law,* vol. 30, no. 40, 1998, pp. 1–22.

MCC and UC-PMC. "Rapport sur le Foncier et Recommandations pour l'Activité de Sécurisation Foncière - Périmètre de Konni." 2017.

McKenzie, David. 2012. "Beyond Baseline and Follow-Up: The Case for More T in Experiments." *Journal of Development Economics,* vol. 99, 2012, pp. 210–221.

Merrey, Douglas J. and Hilmy Sally. 2014. "Improving Access to Water for Agriculture and Livestock in Niger: A Preliminary Analysis of Investment Options for the Millennium Challenge Corporation." Submitted to Millennium Challenge Corporation (MCC).

Migot-Adholla, Shem, Peter Hazell, Benoit Blarel, and Frank Place. "Indigenous Land Rights Systems in Sub-Saharan Africa: A Constraint on Productivity?" *The World Bank Economic Review,* vol. 5. no. 1, 1991, pp. 155-175.

Millennium Challenge Corporation (MCC). "Millennium Challenge Compact between the United States of America Acting Through the Millennium Challenge Corporation and the Republic of Niger Acting Through the Ministry in Charge of Foreign Affairs and Cooperation." Washington, DC: Millennium Challenge Corporation, July 29, 2016.

Nkwae, Boipuso and Dixon Dumba. "From Certificates of Rights to Long-Term Leaseholds in Botswana." *Habitat International*, vol. 34, no. 4, 2010. pp. 367-373.

Place, F., and K. Otsuka. "Land Tenure Systems and their Impacts on Agricultural Investments and Productivity in Uganda." *Journal of Development Studies,* vol. 38, no. 6, 2002, pp. 105-128.

Place, Frank. "Land Tenure and Agricultural Productivity in Africa: A Comparative Analysis of the Economics Literature and Recent Policy Strategies and Reforms." *World Development,* vol. 37, no. 8, 2009, pp. 1326–1336.

Prindex. "Prindex Comparative Report: March 2019." Prindex, 2019.

Ragasa, Catherine, Guush Berhane, Fanaye Tadesse, and Alemayehu S. Taffesse. "Gender Differences in Access to Extension Services and Agricultural Productivity." International Food Policy Research institute (IFPRI), ESSP II Working Paper, 2012.

Sekhri, Sheetal. "Wells, Water, and Welfare: The Impact of Access to Groundwater on Rural Poverty and Conflict." *American Economic Journal: Applied Economics,* vol. 6, no. 3, 2014, pp. 76–102.

Sitko, Nicholas J., Jordan Chamberlin, and Munguzwe Hichaambwa. "Does Smallholder Land Titling Facilitate Agricultural Growth?: An Analysis of the Determinants and Effects of Smallholder Land Titling in Zambia." *World Development,* vol. 64, no. C, 2014, pp. 791-802.

Swanson, Burton E. "Changing Extension Paradigms Within a Rapidly Changing Global Economy." *Proceedings of the European Seminar on Extension Education Theory and Practice of Advisory Work in a Time of Turbulences.* Perugia, Italy: INEA, 2009.

Tack, Jesse, and Jenny C. Aker. "Information, Mobile Telephony, and Traders' Search Behavior in Niger." *American Journal of Agricultural Economics*, vol. 96, no. 5, 2014, pp. 1439-1454.

Turiansky, Abbie, Christopher Ksoll, Caroline Lauver, and Matt Sloan. "Niger Irrigation and Market Access: Evaluability Assessment." Mathematica Policy Research Technical Report. Washington, DC: Mathematica Policy Research, November 8, 2018.

United Nations. "Human Development Data 1990–2017." Available at http://hdr.undp.org/en/data. Accessed January 4, 2019.

Waddington, Hugh, Birte Snilstveit, Jorge Hombrados, Martina Vojtkova, Daniel Phillips, Philip Davies, and Howard White. "Farmer Field Schools for Improving Farming Practices: A Systematic Review." The Campbell Collaboration, 2014.

World Bank. "Développement de l'Irrigation au Niger: Diagnostic et Options Stratégiques." Rapport 49379. Washington, DC: 2009.

World Bank. "Agricultural Sector Risk Assessment in Niger: Moving from Crisis Response to Long-Term Risk Management." Washington, DC: 2013.

World Bank. "Republic of Niger: Priorities for Ending Poverty and Boosting Shared Prosperity – Systematic Country Diagnostic." Report No. 115661-NE. 2017.

World Bank. "Project Information Document/Integrated Safeguards Data Sheet (PID/ISDS)." Report No. PIDISDSC23726. 2018.

World Food Programme. "Niger Factsheet." Available at http://www1.wfp.org/countries/niger. Accessed August 10, 2018.

Yami, Mastewal and Katherine A. Snyder. "After All, Land Belongs to the State: Examining the Benefits of Land Registration for Smallholders in Ethiopia." *Land Degradation & Development*, vol. 27, no. 3, 2016. pp. 465– 478.

You, Liangzhi, Claudia Ringler, Gerald Nelson, Ulrike Wood-Sichra, Richard Robertson, Stanley Wood, Zhe Guo, Tingju Zhu, and Yan Sun. "What Is the Irrigation Potential for Africa? A Combined Biophysical and Socioeconomic Approach." IFPRI Discussion Paper, 2010.

APPENDIX A

EVALUATION QUESTIONS AND LINKS TO LOGIC MODEL

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Table A.1. Evaluation questions and links to program logic

Activity	Question group		Theory of change level
Overarching questions			
	RQ1	Did the Project components interact as envisioned during project design to reach a common objective? If yes, what facilitated the interaction and if not, why not?	Compact activities and outputs; program logic assumptions
		a. Was there close coordination and planning among the different contractors designing and implementing the Activity (land allocation, infrastructure, IWUA, and agricultural services)? Did UNOPS in the role of project management consultant facilitate the roll out and coordination of activities?	
	RQ2	To what extent did the Project interact with the grant facility of the Climate-Resilient Communities Project? What facilitated the interaction and what didn't?	Compact activities
	RQ3	Did PAP households experience changes in their household incomes, volumes and value of agricultural products sold and traded, food and nutritional security, and production of cash crops?	Long-term beneficiary outcomes
	RQ4	Do stakeholders believe the Project was well designed to achieve the Project Objective? What changes occurred and why?	Compact activities and outputs
	RQ5	If the Project produced results, are they expected to be sustained? If the Project did not meet its expected results, why not?	Sustainability of perimeter and beneficiary outcomes; sustainability of Compact outputs
	RQ6	What lessons can be drawn to inform future projects?	Compact activities; Compact outputs; perimeter outcomes; beneficiary outcomes; program logic assumptions
	RQ7	What is the post compact ERR of the Project (except for the Roads for Market Access Activity)?	Long-term perimeter outcomes
Irrigation perimeter development			
	RQ8	Were project activities implemented as planned? If not, what changes occurred?	Compact activities
	RQ9	Were the expected outputs produced by the Activity?	Compact outputs
	RQ10	Is the new/improved infrastructure functioning properly in terms of water flow?	Short-term perimeter outcomes
	RQ11	Is water for irrigation in farmers' plots available as expected from the irrigation system, including frequency, timing, and amount as per planned irrigation schedules? If no, why not?	Short-term perimeter outcomes
	RQ12	Did irrigated land increase as expected (as a whole and per family)? If not, why not?	Medium-term perimeter outcomes
	RQ13	Did the cost of irrigation water change? If no, why not?	Medium-term perimeter outcomes
Management services and market facilitation			
	RQ14	Were project activities implemented as planned? If not, what changes occurred?	Compact activities
	RQ15	Were the expected outputs produced by the Activity?	Compact outputs
SISM	**RQ16**	Were IWUAs set up? How many were setup?	Compact outputs
	RQ17	What was the profile of the participants in IWUA training activities (total number of participants disaggregated by sex and age)?	Compact outputs; short-term beneficiary outcomes
	RQ18	What percentage of IWUA leadership committee members were women at the end of the Compact?	Short-term beneficiary outcomes
	RQ19	Are IWUAs functioning as expected? Is the irrigation infrastructure being maintained properly?	Medium-term beneficiary outcomes

Table A.1 (*continued*)

Activity	Question group		Theory of change level
LTS	**RQ20**	Is a land tenure registry functioning according to plan? Is the land registry used as a tool by local authorities to continually record changes in land holdings? Do land holders have access to the correct documentation (*contrats d'occupation* or long-term leases for farmers, publicly held property titles of overall perimeters) according to the project plan? Were land use plans at the commune level successfully completed and adhered to?	Compact outputs and outcomes; short-term beneficiary outcomes
	RQ21	Are the local land commissions in the project zone better equipped to ensure sustainable management of land rights in/around the perimeter?	Short-term institutional outcomes
	RQ22	Was the level and risk of land conflict reduced? Did land tenure security increase?	Medium-term beneficiary and perimeter outcomes
SAA	**RQ23**	Did participants in SAA training activities perceive that they learned new skills/knowledge? Did this vary by subgroup? If they didn't perceive learning/acquire new knowledge, why or why not?	Short-term beneficiary outcomes
	RQ24	What percentage of participants of adult functional literacy and numeracy classes report improvement in their skills (basic reading and writing) after the training? What percentage of them indicate improved knowledge of nutrition and hygiene, and budgeting and record keeping (since these concepts were introduced as part of the literacy and numeracy training)?	Short-term beneficiary outcomes
	RQ25	What percentage of participants report increased knowledge of sustainable land and water resources management?	Short-term beneficiary outcomes
	RQ26	What percentage of participants in agricultural trainings can name and explain at least 2-3 new or improved agricultural practices that they did not know before the training?	Short-term beneficiary outcomes
	RQ27	What percentage of members of *comites de gestion* within the cooperatives indicate improved knowledge of cooperative management?	Short-term beneficiary outcomes
	RQ28	Have participants applied new practices and technologies? Was this different for women/men or youth (15-35)/non-youth participants? If knowledge was not applied, why not?	Medium-term beneficiary outcomes
	RQ29	Were savings and loans groups created and fostered by the project? Based on their participation, have group participants indicated they have improved access to credit?	Compact outputs; short-term beneficiary outcomes
	RQ30	How are cooperatives applying knowledge?	Medium-term beneficiary outcomes
Policy Reform			
	RQ31	Did the Fertilizer Reform Sub-Activity produce the expected outputs? What changes occurred to the original design? Did the Sub-Activity lead to increased private sector participation in the fertilizer sector? If not why not? Have reform activities made fertilizer more affordable and accessible?	Compact activities and outputs; medium-term beneficiary outcomes
	RQ32	Did the National Statistical Capacity Sub-Activity produce the expected outputs? What changes occurred to the original design? Have reform activities improved GoN's statistical capacities in data collection, analysis, and reporting?	Compact activities and outputs; medium-term institutional outcomes

ERR = estimated rate of return; GoN = Government of Niger; IWUA = irrigation water user association; LTS = Land Tenure Security; PAP = project-affected person; SAA = Agricultural Support Services; SISM = Sustainable Irrigation System Management; UNOPS = United Nations Office for Project Services.

APPENDIX B

LIST OF KIIS AND FOCUS GROUP DISCUSSIONS

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Table B.1. Qualitative data collection, by evaluation and source

Data source	Data collection method	Number of interviews	Evaluation	Area of focus
Project documentation				
Compact documents	Desk review	NA	All evaluations	• Project design and implementation/deviations from design
Implementation reports	Desk review	NA	All evaluations	• Project design and implementation/deviations from design/ project outcomes
Monitoring data	Desk review	NA	All evaluations	• Project implementation/deviations from design/project outcomes
MCA/IMAP implementers/other implementing agencies				
Former and current staff from MCA/IMAP implementers	Interviews	TBD (final composition of MCA-N)	All evaluations	• Project implementation/deviations from design/project outcomes • Collaboration with Climate Resilient Communities Project • Overall perceptions of outcomes
ONAHA	Interviews	2 (National and Konni)	Irrigation perimeter development	• Project implementation/deviations from design • Perceptions of functioning of new/improved irrigation systems • IWUA function and sustainability
Ministry of Agriculture/ General Directorate for Agriculture/ Departmental Direction for Agriculture	Interviews	2 (National and Konni)	Management services and market facilitation	• Project implementation/deviations from design/project outcomes • Perceptions of growth, composition, management, and sustainability of project-supported cooperatives • Outcomes of the Fertilizer Reform Sub-Activity • Outcomes of the National Statistical Capacity Sub-Activity
Ministry of Agriculture/ *Direction de la Vulgarisation et de Transfert de Technologie*	Interviews	2 (National and Konni)	Management services and market facilitation	• Implementation and outcomes of CEP • Perceptions of growth, composition, management, and sustainability of project-supported cooperatives • Perceptions of adoption of new technology and practices
Ministry of Agriculture/ DAC/POR	Interviews	2 (National and Konni)	Management services and market facilitation	• Project implementation/deviations from design • Capacity and sustainability of cooperatives • Gender integration/women's empowerment within cooperatives

Table B.1 (*continued*)

Data source	Data collection method	Number of interviews	Evaluation	Area of focus
Ministry of Water and Hygiene	Interviews	1	Irrigation perimeter development, and Management services and market facilitation	• Project implementation/deviations from design/project outcomes • Perceptions of functioning of new/improved irrigation systems • IWUA creation, capacity, and sustainability • Lifespan of irrigation infrastructure and evolution of land productivity
MOJEDEC	Interviews	1	Management services and market facilitation	• Youth participation and outcomes
Regional Agriculture Chambers	Interview	1	Irrigation perimeter development, Management services and market facilitation, Roads for market access, and Policy reform	• Project implementation/deviations from design • Regional perspectives on anticipated outcomes (particularly related to increased agricultural productivity, fertilizer reforms, access to other inputs/technology)
Local land commissions	Interviews	1	Management services and market facilitation	• Project implementation/deviations from design • Land tenure registry process and perceptions of land security
Beneficiaries & others				
PAPs (PAP focus groups by perimeter, 1 outside of perimeter, women PAP-only focus groups, and youth-only focus groups)	Focus group discussions	5	Irrigation perimeter development, Management services and market facilitation, Roads for market access, and Policy reform	• Project implementation • Perceptions of functioning of new/improved irrigation • Adequacy and efficiency of water for irrigation • Perceptions of changes of cost of water • Perceptions of changes in outcomes based on new/improved irrigation • Gender-specific changes in outcomes • Perceptions of the role, leadership, and participation in IWUAs • Land tenure registry process and perceptions of land security • Perceptions of training program and outcomes • Perceptions of cost and access to improved inputs • Perceptions of access to markets • Perceptions of cooperatives' effects on improving market access
IWUA members and leaders	Focus group discussions	2	Management services and market facilitation	• IWUA capacity and determinants of capacity • IWUA sustainability

Table B.1 (*continued*)

Data source	Data collection method	Number of interviews	Evaluation	Area of focus
Traders	Interviews	4	Management services and market facilitation	• Changes in market access • Changes in improved product because of post-harvest handling and storage • Experiences with cooperatives
Members of cooperatives in Konni	Focus group discussions	2	Management services and market facilitation	• Cooperative capacity, and determinants of capacity • Sustainability of cooperatives • Perceptions of training outcomes and application of new practices/technologies
Leaders of cooperatives	Interviews	2	Management services and market facilitation	• Cooperative capacity and determinants of capacity • Sustainability of cooperatives • Perceptions of training outcomes
Fertilizer distributers	Interviews	2	Policy support	• Outcomes of fertilizer law and perceptions of changes in cost
Site visits				
New/rehabilitated irrigation infrastructure	Site visits	2	Irrigation perimeter activity	• State of irrigation infrastructure

CEP = Champ École Paysanne*;* DAC/SOR = Directorate of Cooperative Actions and Support to Rural Organizations; IMAP = Irrigation and Market Access Project; IWUA = irrigation water user association; MCA-N = Millennium Challenge Account/Niger; MOJEDEC = Mouvement des Jeunes pour le Dévelopment et L' Education Citoyenne; ONAHA = Office National des Aménagements Hydro-Agricole; PAP = project-affected person; TBD = to be determined.

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APPENDIX C

MCC COMMENTS ON DRAFT REPORT

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Table C.1. EMC Comments

#	EDR Page	Section	Name & Sector	Comments & Questions	Suggestions	Response
1	p.12	C. Economic rate of return and beneficiary analysis on the Konni perimeter	Andrew Tarter (MCC-GSI)	"Mathematica's baseline data collection can be used to update the Konni perimeter ERR model with estimates of crop yields, crop prices, cropping patterns, and project costs."	This is great. MCC-GSI is engaged in similar work around ERR models for Konni, in preparation for Compact de-scoping in June or July. Does Mathematic believe the updated ERR model will be available by then, or later?	Our anticipated timeline for Konni baseline data collection is January 2020, but this will only allow for collecting pre-treatment yield/price values. This information might be useful for calibrating the baseline values of ERR models for non-Konni perimeters, but we believe that the real value of our data collection in updating the ERR will be in the post-intervention values and tracking how crop yields and prices have responded to IMAP.
2	p.21	IV. EVALUATION DESIGN	Andrew Tarter (MCC-GSI)	"In addition, if a sufficient number of land parcels become available from the land rights formalization activities, we propose an RCT that tests the effect of receiving irrigated land on agricultural productivity, household income, and women's empowerment."	This is of high interest to the Gender and Social Inclusion team at MCC. Furthermore, a new White House Initiative, Women's Global Development and Prosperity (W-GDP), mandates that MCC report on these types of outcomes. To that end, we strongly encourage this approach, particularly the collection the household-level income changes as a result of the project activities, disaggregated by sex, whenever possible.	Thank you for informing us of the W-GDP initiative. We are incorporating gender-disaggregated questions on aspects like income and labor supply in our survey instruments, and would welcome any comments on those.
3	p.32	B. Performance evaluation to measure Konni perimeter outcomes: b. Methods, outcomes, and data sources	Andrew Tarter (MCC-GSI)	"We will conduct a quantitative descriptive analysis to assess household-level outputs and short-term outcomes when baseline values do not provide information to answer research questions." "We will examine how values vary by subgroup of PAP, focusing especially on the gender of the household head or of the key decision maker for irrigation decisions."	Fantastic. Are outputs meant as household income changes, or also agricultural output changes?	We use "outputs" here with reference to the logic model, so the household-level project outputs that would be assessed using a quantitative descriptive analysis would primarily consist of whether household members attended the various trainings, with their knowledge gains from these trainings representing "short-term outcomes." Since the trainings are likely to address topics that are unfamiliar to attendees, we do not believe that baseline values will be very informative. Household income changes and changes in agricultural output are long-term outcomes in the logic model, and would be assessed using the pre-post analysis approach since baseline values are available and meaningful, and we want to get a sense of how much these outcomes have changed over the course of the evaluation.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
4	p.32	B. Performance evaluation to measure Konni perimeter outcomes: b. Methods, outcomes, and data sources	Andrew Tarter (MCC-GSI)	"A key limitation of the pre-post method is the inability to attribute changes in outcomes as effects from project activities. Without a valid comparison group, there is no information about how treated households and their agricultural practices might have evolved in the absence of the rehabilitated Konni irrigation perimeter. As a result, we cannot isolate the share of outcome changes due to Konni investments, as opposed to other factors that affect the entire perimeter" "In the absence of a credible comparison group, for which we believe none exists, given Konni's unique experience as a former irrigation perimeter, this piece of our analysis will not support any causal claims about project impacts, or even claims that the perimeter investments contributed to observed outcomes. Instead, the data analysis will indicate whether any changes in outcomes were detected over the period of observation. Consequently, the pre-post design is limited in its ability to extrapolate findings to similar project activities that would be implemented elsewhere."	Later you suggest that there are some control groups, in the land study: "Comparison group households may be difficult to track over time. If those households not awarded land have a high degree of mobility, their attrition from the sample is likely to bias the estimated impact. To remedy this possibility, we propose implementing a tracking survey for migrants. This approach would allow us to reduce sample attrition and time their survey responses to coincide with responses from all other members of the treatment and comparison groups." Would it be possible to tie the Konni Perimeter Implementation and Outcomes Analysis sample to the land sample somehow, perhaps at a later time, to link the control groups from the land sample to the implementation sample? Conversely, could sampling some households just outside of the perimeter permit a control group for the Perimeter Implementation and Outcomes Analysis? (Granted, the land falls outside the perimeter, but it may not be qualitatively different land than the irrigated land and the same may be true of the population, permitting a proxy control group).	Our evaluation design for IMAP varies for the different investments. For the overall Konni investment, there is no comparison group. We have also dropped the farmer incentives study and the land allocation study that would have been suitable for a rigorous evaluation design such as a randomized control trial. We considered this research design in the evaluation options memo shared with MCC on November 27, 2018. We ultimately decided against pursuing such a spatial regression discontinuity design, in which plots just outside the perimeter (and therefore not receiving access to irrigation) would constitute a comparison group, for two key reasons: 1. Since the Konni perimeter project will rehabilitate an existing perimeter, we would not be able to rule out that differences in outcomes between parcels inside the perimeter and those just outside the perimeter were not due to pre-existing structural differences in these areas. For example, perimeter area could have fundamentally different soil characteristics resulting from prior, intensive cropping that has not affected parcels outside the perimeter. 2. The power requirements of a spatial regression discontinuity design are very high. The relatively small number of parcels on the perimeter edge means we would be unable to statistically detect effect sizes of the anticipated magnitude. Because the anticipated target group for the land allocation study are landless people - ie, by definition they do not have land on or off perimeter - linking the two would not be possible, as our Konni sample draws exclusively from PAP households.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
5	p.65	F. Data sources: Instrument modules	Andrew Tarter (MCC-GSI)	"If MCC and MCA primarily target women as land parcel recipients, we will add a gender module that includes questions on intra-household decision making, control over resources, and indicators included in the Project-Level Women's Empowerment in Agriculture Index (pro-WEAI)."	These are great qualitative metrics. I know the WEAI encourages adaptations and modular additions. Would it be possible to create such a module with questions that get at household-level income changes as a result of receiving land? If possible, we would love to see these data in association with (tied to) the WEAI metrics.	We have dropped the land allocation study from this EDR as discussions with MCC suggest that there will not be sufficient land available to have a sufficiently large beneficiary group for an impact study. However, we look forward to having discussions early on regarding design characteristics for a similar study covering the Ouna and Sia-Kouanza perimeters.
6	p.59-60	Land Allocation Study	Andrew Tarter (MCC-GSI)	"MCC and MCA are considering the allocation of irrigated land on the Konni perimeter to vulnerable populations, and MCC has indicated interest in a study of the effects of receiving irrigated perimeter land for non-PAPs. Though it is currently unclear whether land will be available for allocation, in this section we outline a possible research design if land is available, with priority given to vulnerable groups such as landless farmers, women, or youth." "This study will provide rigorous evidence on the agricultural and economic impacts of providing households or individuals with a plot of irrigated land. In particular, this study is designed around the following research questions:"	I just want to make it clear that it would not be sole individuals within vulnerable populations in this non-PAP group. The idea is to award vulnerable groups (women's associations and youth associations of multiple members) land to be managed collectively. This doesn't (nor should it) preclude intra-group comparisons as a nested level of analysis, but the comparison should also be inter-group (between associations) if possible. This would present difficulty in control groups. Also, the number of comparison groups would ostensibly be much lower than the number of total beneficiaries, so research design for this part might be best served by case-study comparison research designs (see Case Study Research: Design and Methods, Robert Yin 2003, or others).	We are dropping the land allocation study chapter.
7	p.5	Figure II.1. IMAP Logic Model	Andrew Tarter (MCC-GSI)	The logic model gets at 'qualitative' metrics affecting vulnerable populations (greater participation of women and youth; increased access; economic empowerment; etc.)	Just want to reiterate our interest also in quantitative metrics (i.e. changes in household level income).	That's right - our survey instruments will collect information on quantitative metrics like total household income, financial access, etc.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
8	p.7	Overview of Management Services	Kaj Gass (AG)	The description is missing some useful contextual information to show the "degree" at which the project is redressing these issues. Given the size of the compact, readers are likely to think these investments are of a much higher magnitude, as opposed to being a rather modest $7.4 million or roughly $600/trainee for SAA and around $4 million for GDSI. It's just my opinion that this context matters somewhat in determining how far activities are able to go.	Suggest some incorporation of investment size relative to overall compact and irrigation infrastructure. I would also add some nuance that the finance piece is microfinance support (light touch) and that the GDSI work will be structured differently between Konni and S-K, whereas one has an existing coop that needs to be fissured and then the creation of a new one in S-K. We can provide some more detailed information soon about the strategies and direct intervention.	Thank you for that suggestion - we have included the budget numbers cited in the RFQ, though from your comment it appears that the values may have changed since then (MSMF is listed as $9.1M, whereas $7.4M + $4M exceeds that).
9	p.12	ERR discussion	Kaj Gass (AG)	Discussion does not include any further commentary about potential missing information.	Just as an example, there are several elements of management services that are not incorporated into the current calculation such as processing, marketing and literacy gains. Are these worth pursuing further, etc?	As far as we understand all investments made in the Konni perimeter will be included in the ERR, since they are program costs that need to be accounted for. The effects of the MSMF interventions will also be included in the ERR to the extent that they raise household incomes for PAPs and/or raise crop yields and/or change crop allocation to higher-value crops. These responses may be more likely for processing and marketing activities which would raise the net value from sales.
10	p.13	Potential discrepancy in information	Kaj Gass (AG)	Just noting that the statement "In Niger, 5 percent of the country…irrigated" contradicts an earlier statement on page 1 (IFPRI 2017) that 0.5% is equipped with irrigation.		Thank you for pointing that out. We have now only made reference to the latest FAO figures, which we believe are the most defensible and widely-referenced estimates for total irrigated area for Niger.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
11	p.13	Confusing discussion	Kaj Gass (AG)	I note that the second paragraph within section A is a bit difficult to understand in determining whether information provided comes from Niger or Mali or Benin.	This section could benefit from having another look with an eye towards whether the examples provided are reflective of the project scheme in Niger and some of the historical issues affecting Nigerien irrigation schemes. The final paragraph makes an excellent point on the important distinction that "largescale" irrigation could have versus what has typically been done in small schemes. This is essential info for MCC that has primarily focused on large.	We have provided some additional context on the history of irrigation perimeter schemes in the Literature Review section.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
12	p.14-17	Effects of extension	Kaj Gass (AG)	I find this discussion and research quite interesting but find, at times, to be less relevant to the scheme that we are proposing. Particularly on discussing public extension, which this project is really only tertiarily cutting into	Just a few things that could be helpful but certainly ok if ignored: - Less focus on public extension and more on shortterm TA - What standard measures have been taken in the past when evaluating effect of farmer-led training that can be used to compare since there are so many different modalities of doing this type of work; yields, income, etc.? - It might help to dive more into what is meant by "direct" and indirect training. Are there distinctions that should be taken into account? - Probably the trickiest element of evaluating against past work is that there are so many additional variables besides just the TA/info provided—just look at this project which has finance, processing, coop, marketing, etc. included. - Biggest thing for me that is missing is a discussion on WHEN the best time is to collect information. Even in our own history, we've had poorly timed evaluations that weren't able to capture effects of training. I think a discussion on this would be really crucial since we typically seem to evaluate outputs as opposed to true outcomes.	Our response: - From what we understand, the extension would be over two growing seasons, which is probably the duration of many TA programs evaluated through an RCT. We are not aware of a literature on short-term TA, since the purpose of training is to equip farmers with income-growing activities, the duration would tend to be at least one if not multiple growing seasons. If there are studies on such TA, please share them with us and we will review. - The standard measures that are evaluated are those you cite, yields, income, and adoption of new technologies. - The content and delivery of the different types of agricultural capacity-building differ greatly, but aim to affect similar outcomes (adoption, household income) - For examining the effects of training in the pre-post, that is correct. That would have been the main justification for conducting a farmer training RCT, the only systematic difference between the two experimental groups would be the difference in incentive. Therefore the recovered estimates would be independent of the effects of finance, processing, coop, marketing, and any other services provided on the perimeter, since all PAPs are receiving them. As discussed with MCC this might be an option for Siya-Kouanza. - That is right - this is not a key discussion in the literature and we have both made explicit the exposure time for cited studies (where such information is available), and stated in the literature review that this has not been a core focus of empirical work.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
13	NA	Discussion/definition of PAP	Kaj Gass (AG)	This comment is sparked from the very last paragraph on p.19 that states that all PAPs will benefit from land rights, which I question whether that is true or not; however, there needs to be a discussion on PAPs, given their immense importance in the design of activities and selection/eligibility to receive Management Services activities.	Not sure which section it is best placed but it would be helpful to define what makes someone a PAP and subsequently what being a PAP makes them eligible for in the context of this project since basically being eligible for training and being a PAP are hand in hand.	On p.8 we have included relevant text: "These beneficiaries, also referred to as project affected persons (PAPs), are defined as individuals (and members of their household) who will have access to irrigated land on the perimeter...Because of the complementary nature of the Irrigation Perimeter Development Activity and the Management Services and Market Facilitation Activity – eligibility for receiving training through the Management Services and Market Facilitation Activity is granted only to PAPs - households are likely to participate in both activities."
14	p.21	Impact Evals	Kaj Gass (AG)	In the second paragraph, the discussion of impact evals is brought up. I only note the proposed study on farmer incentives and of land allocation. Wondering if scope remains for GDSI.		We do not think scope exists for using an impact evaluation on GDSI since a small number of IWUAs are being created, which we believe would be the natural unit for randomization. If there were 100+ IWUAs we would have been able to propose an impact evaluation.
15	p.22	Overarching RQs	Kaj Gass (AG)	Comments on RQ1a, RQ4 and RQ7	RQ1a) This might be an internal discussion but I'm a bit uncertain why we have UNOPS examined? If them, why not also look at MCA and MCC coordination?	RQ1a is a direct adoption of text from the RFQ which focused on the role of UNOPS as Project Manager. Our implementation analysis will examine coordination between MCC and MCA, and amongst the various contractors and implementers.
					RQ4) Seen how these questions have fared before. Are there specifics that we can get into: impact on income, perception of stakeholders on impeding outcomes, timing, and provision of inputs vs training? If it is open-ended, could be a Pandora's Box of requests.	This research question will largely be evaluated in the endline, since we will be seeking feedback on an ex-post basis. We therefore don't see this RQ leading to requests. When conducting KIIs with stakeholders to discern whether they believe the project was well designed, we will ask them about specifics similar to those you have listed, such as the timing and sequencing of program activities, availability of information about program offerings, preparedness and quality of implementing staff, etc.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
					RQ7) Could add a sub question like "Are there elements not captured in the ERR that could be important as economic benefits?	In our EA we provided a more comprehensive discussion of the ERR than we did in the EDR. To the extent that our interim evaluation leads us to identify new/previously unanticipated benefit streams, we would plan to include pertinent data collection in the final evaluation, and therefore for these streams to be incorporated into the revised ERR.
16	p.11	B. Theory of Change	Hamissou Samari (M&E)	MCC is working with the roads evaluator and the definition of the roads "beneficiaries" might evolve. If that happens, MPR might need to revise this section accordingly. We will share updates in any case		Based on the RFP, the beneficiaries for which we are to assess the effects of the roads are the Sia-Kouanza beneficiaries. A change in the definition of beneficiaries for the roads evaluation would not change our design since we would still be focused on the Sia-Kouanza farmers. Please do let us know of any such changes and we will make the appropriate revisions in that paragraph.
17	p.15	B. Effects of extension services and farmer training…	Hamissou Samari (M&E)	The report points to "the most common extension services models", including the T&V model, and reveals that that model has been "widely criticized as excessively top down and inattentive of locally varying needs and circumstances." However, the reports did not provide information on whether the results have met expectations. The process may have been criticized, but have outcomes met expectations?		Government policy targets are rarely stated in the literature, since the empirical focus has largely been on measuring outcomes. We do include a paragraph, starting with "Given the magnitude…" that summarizes some of the synthesis reviews of extension effects, and we have included some additional references.
18	p.16	B. Effects of extension services and farmer training…	Hamissou Samari (M&E)	The "peer farmers" technique seems to have greater "adoption" effects on the broader farming outcomes than would "richer farmers". Does the literature provide sufficient guidance on how to select those "peer farmers". Is social status a criterion?		Social status is a criterion. In BenYishay and Mobarak, peer farmers are selected through a village focus group and are supposed to be "representative of the average village member in their wealth level and geographically dispersed throughout the village"
19	p.17	B. Effects of extension services and farmer training…	Hamissou Samari (M&E)	In the last part of the last paragraph, Mathematica is proposing to "contribute to the literature examining how the identity and social network of 'seeded' farmers affects diffusion patterns." This may present a risk of potentially influencing the actual program implementation.	I would suggest that Mathematica work closely with the COR/PM and MCC Ag Lead to ensure that the lines are clearly drawn between the two sets of activities	We have dropped the farmer incentives study.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
20	p.17	C. Effects of land tenure reforms	Hamissou Samari (M&E)		For additional reference, I would suggest that you look at the findings from the interim evaluation by the WB of MCC's investment in rural land reforms in Benin. It was an impact evaluation which provides learnings on linkages between land tenure security and investments in the agriculture sector. The full report can be found here: https://data.mcc.gov/evaluations/index.php/catalog/169	Thank you for this recommendation. We have included this citation in the literature review on land reform effects.
21	p.26	IV. Evaluation Design	Hamissou Samari (M&E)	Any existing literature on younger beneficiaries? The literature revue thus far has been focused on dynamics between adult men and women from farmer training concepts to land tenure.		That's right - there is very little scholarly work on younger beneficiaries, largely due to the assumption that plot management decisions and benefits accrue to the cultivator who is typically the adult. Specifically with regards to farmer training, there appear to be no rigorous studies on the effect of extension or agricultural education on youth, outside of work on the 4-H program in the US. A somewhat dated but likely still relevant synthesis report of extension in sub-Saharan Africa states, "While women in agriculture have received increasing attention, rural youth are largely neglected, even though more than half of SSA's population is under the age of fifteen and this number is increasing...Stemming their exodus requires creating both agriculture-related training and employment opportunities." (Venkatesan and Kampen 1989) http://documents.worldbank.org/curated/en/490621468742530466/Evolution-of-agricultural-services-in-Sub-Saharan-Africa-trends-and-prospects

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
22	p.44	5. Performance evaluation to measure the Policy Reform Activity	Hamissou Samari (M&E)	MPR needs to share the interface of what the high-frequency surveying (on input prices, input availability and output prices) will look like. Also given the low literacy level, how does MPR plans on ensuring quality and reliability of the (SMS?) responses?		The mobile price data collection specifics are still in development since the initial bids we received from data collection firms were too high. Since we are attempting to obtain market prices, the literacy level matter only to the extent that we either cannot find any literate respondents; or if literate farmers obtain higher prices for the same product. Both are unlikely to be true. We have dropped the trader price survey from this EDR as its main focus would be on Siya-Kouanza and this report currently focuses on Konni.
23	p.12	C. Economic rate of return and beneficiary analysis on the Konni perimeter	Sarah Lane (M&E)	Is it correct that the ERR time horizon is 24 years? Is that a typo?		That is correct. The "Konni CBA.xlsx" ERR model shared with us is based on annual data for 2017-2041. This includes time before the perimeter is constructed, such that the ERR does not assume the perimeter's lifespan is that entire period, but rather 22 years (2020-2041).
24	p.21	IV. Evaluation Design	Sarah Lane (M&E)	How is the price data being collected 12 times yearly? If the details of this data collection are referred to later in the report then disregard.		We have dropped the high-frequency trader survey from this EDR since it is focused on Konni.

Table C.1 (*continued*)

25	p.27	Konni Perimeter	Kaj Gass (AG)	Comment on RQ9 that we may want to have some add-on questioning lines like; any unintended outputs, what were notable constraints, and how does this investment compare to similar construction projects? Would be additionally helpful to have some discussion on attributing resources within activity design. Since we're attempting to achieve so many different objectives, were resources appropriately allocated? Should more time/effort/$ be put towards X, Y or Z? Should some activities be prioritized to be done well before or well after another? Can any analysis be placed into ownership and government buy-in to carry on support? What additional support mechanisms are proposed by all actors? Are these RQs getting at how we can best ensure successful transition of infrastructure? This goes a bit towards earlier discussion of whether timing and resources are all appropriately aligned but could go back to beneficiary selection (just as an example). Specific to RQ11: Since there are such seasonal differences in water availability, will surveys (side question, do these ONAHA water user surveys exist?) be the best way of capturing? Specific to RQ12: What is meant by "per family"		Questions about unintended outputs and notable constraints will be addressed through our proposed data collection. A comparison of this project to other construction projects would require substantially more effort and is outside the RFP's scope. If this is something that MCC would like to pursue, then we'd need to have that conversation. To assess the allocation of resources, we can ask stakeholders and beneficiaries if they believe the allocation was appropriate. A more demanding approach of developing a metric for "appropriateness" against the range of alternative allocations would require more resources. We believe that a more basic approach will still yield valuable insights. For example, we could ask PAPs whether they would have preferred to see more services/resources put into activity A versus activity B, or providing them with 100 units that they would distribute across activities according to what they perceived to be the most valuable. Comments about ownership and government buy-in will be addressed in our sustainability and implementation analyses. These RQs are not getting at "how MCC can best ensure successful transition of infrastructure," which would require assumptions about the universe of alternative procedures and methods for transitioning ownership and control over infrastructure. Conducting such a study would require information from numerous transitions which is currently outside the scope of the evaluation. Our proposed approach will examine what are some of the key constraints that have impeded or slowed down transition, which we think is different than the RQ stated here. Our survey instrument will ask respondents about irrigation water availability over the previous year, which we believe is the best way to capture any season-varying characteristics without relying on costly, repeat data collection. The March 2018 MCC/MCA-N M&E plan indicates that ONAHA will be carrying out annual Water User Surveys to measure the "perception of quality of water service by water users" (page 56). Our qualitative data

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
						collection will also be a way to collect information from farmers as to whether water was available at the wrong time of the season for their preferred crop. "Per family" is text taken from the RFP and will be a household-level analysis of whether access to irrigated land increased as expected.
26	p.36	GDSI RQs	Kaj Gass (AG)	RQ17: What does this really get at? I personally think this might be better worded to be clearer. RQ19: The portion that delves into maintenance might be better as a quant measure; however, I think the ONAHA relationship would be best served as Qual and spelled out as a topic.	Additionally within Quant, it is important to measure the payment for fees (maybe also reasons for non-payment as well as looking into the structuration of maintenance funds for the equipment. For qualitative research, it might be useful to take a similar approach as SAA by finding out whether there are any perceived remaining needs out of the IWUAs	These are two separate comments. In terms of profile we will assess whether the project was for example successful at achieving the targeted gender distribution (if it will have set up a gender target), as well as whether poorer households are also represented in the training. At this point we do not know what the targeted diversity of the training participants is so we cannot yet provide more accurate information on what the target profile is. In terms of your second comment, the payment of IWUA fees is absolutely a core theme of the sustainability analysis (RQ19). As part of the IWUA outcomes analysis, we will also present information from administrative records on water user payments, if this information is available. As for "perceived remaining needs out of the IWUAs," we are conducting a qualitative outcomes analysis that will include FGDs and KIIs that will identify such needs (Table V.4).

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
27	p.40	SAA RQs	Kaj Gass (AG)	Advocating again for a discussion/analysis on the structuration of the activity since it holds so many different purposes. Missing from the RQs is a look into market access improvements via coops, as well as gains in processing—this could be an element of "are coops applying knowledge" but seems to be more a measure of whether we put coops in a position to function for their members. I'm also surprised that increased incomes aren't a larger element of quantitative measurement here. Granted that it could fit into perceptions but the end result of the trainings is increase efficiency of farmers' input investments and increase the final sales value of production.	Specific to RQ 26: Can this be tuned up to have trainees asses their valuation of new skills as opposed to just whether they learned it? RQ27: Which modules/types of training are most useful? RQ30: I'm wondering on the usefulness of this RQ38 and 39: I know these are a bit challenging to get a handle on. I'm wondering if we might want to expand the questions and differentiate the interventions effects on "beneficiaries" and the stakeholders that are the 'target' of the reform.	We can perform a descriptive analysis of the coops, since a rigorous quantitative analysis is infeasible (only 2 cooperatives, to the best of our knowledge). We have planned for interviews with 2 leaders of cooperatives (Appendix B), and have included the following bullet in our areas of focus when conducting FGDs with PAPs: "Perceptions of cooperatives' effects on improving market access" Because access to irrigation and the SAA are bundled together, our pre-post analysis combined the changes due to both of these activities. We categorize the larger analysis in the overall Konni chapter. In this section, we provide the descriptive analysis specifically related to SAA outputs and outcomes. We have extensive questions in our household survey to back out changes in income. We don't believe that PAPs self-valuing their new skills will provide us accurate information, since they are incentivized to over-report how helpful the activity has been. An alternative that we think is viable is, "Do you think these skills are valuable?" which is more likely to elicit truthful responses. We will be able to include in our FGDs, feedback on which types of trainings PAPs would to be most useful. We can drop RQ30 if MCC would like it dropped. Our qualitative data collection collects information from beneficiaries and target stakeholders. The quantitative data collection also relies on beneficiary households, as well as traders to obtain comprehensive information on these research question. Are there additional modifications you would like to propose?
28	p.65	Challenges	Kaj Gass (AG)	Let's just make sure that the assumption in number one are correct. Placeholder on this until we can confirm number of parcels.		We have dropped the land allocation study.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
29	N/A	Integration of findings for informing implementation	Kaj Gass (AG)	This point would likely fall within the paragraph that describes the interaction with SAA consultant. Given that we have this emphasis on analyzing farmer incentives, what can be done to turn this into a feedback loop for informing the project and maybe refocusing investments on effective trainings?	Suggest working with the SAA consultant on determining this.	We have dropped the farmer incentives study.
30	Overall	N/A	Hamissou Samari, (M&E)		MCC is working with NASA to leverage satellite technologies to collect data on a set of key evaluation indicators including yields and crop selection (if possible). MCC is happy to share those data with MPR for their evaluation needs. I would suggest that MPR include that as a supplemental/additional data collection source (in addition to household surveys and proposed high-frequency data collections).	Thank you for that suggestion. We have included drone/satellite imagery as part of the quantitative data collection efforts, and provided a description of how we foresee the data and analysis generated by RTI and NASA being useful for completing the evaluation in Section V.B.2.
31	Overall	N/A	Hamissou Samari, (M&E)		The evaluation type description must include a statement of the independence, or non-independence of the evaluation. The statement shall also indicate any potential conflicts of interest and if they exist, how they are mitigated. Details requiring more than a few simple sentences should be presented elsewhere within the document, and the statement must indicate where they are discussed. A statement of independence must indicate whether the evaluation results will reflect the independent assessment of the authors; it may also indicate the source(s) of evaluation funding and substantive support conducting the evaluation.	We have included the following in a footnote in I.B.: "Mathematica 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."

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
32	p.17-19	Effects of Land Tenure Reforms	Kent Elbow (MCC Land)	I can't help feeling that a good portion of the literature review is somewhat beside the point in the context of a state-owned irrigation perimeter. For example, the review devotes considerable discussion to the potential effect of transferability of parcels once they are formalized, a characteristic (transferability) that is not likely to be realized in the Konni perimeter. One needs to recognize that the formally (in legal terms) the perimeter is the property of the state. The most likely formalization instrument is the "contrat d'occupation" which places considerable restrictions on transferability of parcels. For example, parcels may not legally be sub-leased, purchased or sold. This is not a conventional "land title," which is the term used throughout most of the literature review. (None of the above is intended to suggest that formalization of property rights in the Konni perimeter is not an important goal, but simply that one should consider that titling instruments can – and do – differ significantly in characteristics.)	Recognize explicitly that "formalization" in the case of the Konni perimeter will likely be on the basis of a titling instrument labeled the "contrat d'occupation" and not a full land title. Then perhaps reconsider the relevance of some of the contents of this section.	Thank you for providing this information. When writing the original EDR, we had anticipated that the contrat d'occupation would be transferable, but we have since learned that it is unlikely to be transferable. We have therefore removed from the literature review references where the focus was on land titling programs that conferred ownership and its consequent effects. We have instead included a few additional references where similar tenure instruments have been conferred.
33	p.24	Evaluation Design Overview (table)	Kent Elbow (MCC Land)	The word "ownership" is inaccurate in item RQ25. As noted above, parcels in the Konni irrigation perimeter are "owned" by the state, which signs contracts with farmers to ensure that they have access to the parcels according to defined terms.	The language noted should be reformulated.	We have dropped the land allocation study.
34		Performance evaluation to measure Konni perimeter outcomes (Footnote 3)	Annie Thompson, (MCC Land)	Same as above comment. The concept of parcel "ownership" is a charged term and not accurate in the context of the Konni perimeter.	The language noted should be reformulated. Suggest possibly changes in land holdings between.	We have revised the text in footnote 3 to reflect this, using the recommended "changes in land holdings between baseline and endline," which replaces "changes in land ownership between baseline and endline."
35	p.38	Table V.5.	Kent Elbow, (MCC Land)	I'm puzzled at the listing of "restrictions on land transactions" as a Key Outcome.	Perhaps add a note to explain what is meant by this entry since I don't believe it is a targeted outcome.	We have removed "Restrictions of land transactions" as an outcome.
36	p.59	Land Allocation Study (footnote)	Annie Thompson, (MCC Land)	MCA has updated data analysis on distribution of parcels by size in light of ONAHA regulation as well as simulations of land allocation.	Suggest connecting with MCA Land team and MCA GIS specialist.	We have received data on PAP landholdings which will be useful for sampling. We have dropped the land allocation study from the EDR.
37	p.60	Land Allocation Study	Kent Elbow, (MCC Land)	Regarding the possibility of a lottery as the mechanism for allocating available land: because	Consider the effects on study design of multiple lotteries, each	We have dropped the land allocation study from this EDR, but look forward to having discussions

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
				there are multiple "vulnerable groups" (women, youth, "other"…) who would be eligible to be allocated land, there is likely to be more than one lottery (e.g., one for women, one for youth, perhaps separate lotteries by village groupings…). Each lottery might involve very few parcels, which may have implications for design of the land allocation study.	likely to allocate relatively few parcels.	early on regarding design characteristics for a similar study covering the Ouna and Sia-Kouanza perimeters.
					Note Annie, MCC Land: Mathematica can refer to the principles and criteria for land allocation in Konni document in draft form as of April 2019) which proposes basic % breakdown for how land left after treatment of PAPs could be divided - 40% to women's groups, 30% to youth groups and 30% to groups of handicap/otherwise vulnerable populations – along with other useful context on the land allocation exercise.	Thank you for this - we will request this document from Hamissou.
38	p.31	Performance evaluation to measure Konni perimeter, b. Methods, outcomes and data sources	Sarah Lane (M&E)	How will the expert visual inspection be done? Will there be some kind of conditions survey?		We have provided additional detail in V.B.1 for what the visual inspection will cover, including an assessment of water performance metrics, examining the functionality of irrigation structures, and water flow measurements.
39	p.32	Performance evaluation to measure Konni perimeter, b. Methods, outcomes and data sources	Sarah Lane (M&E)	Will the flow meters be part of monitoring or will MPR install them for high frequency data?		Flow meters would only be used during the on-site inspections, and would not be part of the proposed high-frequency data collection effort.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
40	p.32	Performance evaluation to measure Konni perimeter, b. Methods, outcomes and data sources	Sarah Lane (M&E)	The phases of data collection are in 2022 and 2025. What does the sector say about the exposure period? How will MPR mitigate if there are external circumstances affecting key outcomes in those year (i.e. drought)?		We would be able to monitor yields on a continuous basis, not just the years of data collection, using remote sensing data trained on ground-truthed data collected during midline and endline. In order to maintain quality standards, we would need to proceed with data collection as scheduled regardless of the weather conditions. We will be able to control for annual precipitation in our regression model, but this will have limited effect since the entire study area will experience the same weather outcomes. The most rigorous studies answering this question are also constrained by scarce data collection budgets, and so largely rely on either examining endline or midline and endline surveys. They therefore select a timing period that is long enough to presumably detect an effect, but without knowing if it coincides with peak effect magnitude.
41	p.60	Land allocation study, Methodology	Sarah Lane (M&E)	Has DCO agreed to the lottery for the RCT?		This appears to be an internal MCC comment.
42	Overall	Budget	Sarah Lane (M&E)	Where is the budget for this evaluation? How does this relate to each of the proposed methodologies? How does this relate to the parts of the project that are not part of this EDR? Will the parts of the project that are not part of Konni have similar methods?		We have shared a budget proposal with MCC that addresses these items.
43	Overall	Measuring the objective	Sarah Lane (M&E)	Are there idea of the best way to time the data collection to meet the objectives of higher yields and more trade? I worry that having two data collection points with so many variables may make it difficult to measure results.		One solution could be to monitor yields on a continuous basis, not just the years of data collection, by using remote sensing data trained on ground-truthed data collected during the in-person survey rounds.
44	p.71	Data collection, other	Aaron Szott (EA)	How long does a farmer training regimen need to be in operation for before its impact is worth studying? It looks like the best case scenario would allow for 1 years' worth of own-plot learning for farmers. (Or can meaningful learning take place in a more artificial/classroom type of setting?) I wonder if this is enough time to expect an impact and what happens if the construction timeline slips.		The timeframes that papers including Kondylis et al. (2017) and BenYishay and Mobarak (2018) are on the scale of 1-2 years, with longer exposures being necessary for outcomes such as productivity and income to respond, whereas adoption decisions may be visible 1 year later. The timetable for the project would allow for several years of exposure before the endline data collection supporting the farmer training study or the pre-post analysis.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
45	N/A	Data collection	Hamissou Samari, (M&E)	How much (and how) is MPR planning to cooperate with GFSS/Feed the Future in the data collection efforts? We have had these discussions in the past, but I'm wondering whether there could be areas where we can work together to avoid redundancies, respondent fatigue, and potentially generate cost savings?		We would be glad to have those conversations with GFSS and Feed the Future, though would caution that we will follow a very specific sampling strategy in order to satisfy answering all of the RQs. Our approach involves a random sample that is stratified by gender and land holdings, while ensuring sufficient coverage of PAPs who will be receiving the farmer training program. As well, with the removal of the land allocation study, we will only be surveying PAPs. We are currently incorporating Feed the Future questions on food security and agricultural techniques in our household survey for comparability against other FtF results. Please advise if you think additional opportunities for cooperation and effort-reduction might be feasible.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
46	Overall	Data sources	Jenny Lisher (M&E)	Why is geospatial and land admin data (not just project data) not being utilized per best practice in understanding of land use change and similar recommendations flagged in MCC/MPR Senegal/Burkina irrigated perimeter evaluations? As in EDR stage, suggest MPR consider the opportunities and related cost and learning trade-offs of using these other data sources		Since the submission of the draft EDR, MCC has signed contracts with RTI and NASA commissioning geospatial work. We will be participating in ongoing dialogues with them to best identify how their data collection and data analysis efforts can support the evaluation. As some of the finished data products and delegation of responsibilities remain unclear, we have opted for providing a more general discussion in Section V.B.2 for how we will use drone/satellite imagery. Our evaluation design for the land tenure investments are based on our conversations about evaluation priorities with the land sector team. We understood that the main purpose of MCC's investment in land tenure security is to securitize land rights within the perimeters. At this point it is not entirely clear what transfer rights would be associated with the *contrat d'occupation, and* what transfers would be registered in land admin data. If it becomes clear that there are land transactions related to the perimeter that are comprehensively recorded in land admin data we would discuss the tradeoffs of collecting information on land transactions (cost implications versus learning) with MCC.
47	Overall	Team composition	Jenny Lisher (M&E)	Before moving forward with implementation, including questionnaire finalization, MPR would benefit from bringing onboard land and geospatial experts per lessons learned in Burkina evaluation. This is especially true considering MPR's team consistency is similar to Burkina which faced large issues in understanding around land benefits/logic under similar framework of irrigation/agriculture/land activities.		The RFP required, as key staff, an expert in irrigation infrastructure and an expert in agriculture development only. We would be happy to discuss bringing a land expert and an additional remote sensing expert onto this project. It would have a budgetary impact, which we could estimate after we discuss how deeply involved you would want these additional staff to be.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
48	Overall	Timing of data collection	Jenny Lisher (M&E)	If do 2022 as midline, really just measuring perhaps provision of land title and farmer training but without irrigation which will just be completed in 2022. Need to think a bit more about when "treatment" expected and related exposure periods trying to capture. Also, can Mathematica verify that proposed baseline of 2019 is not a drought or shock year in terms of environment that may affect agriculture production? Can Mathematica verify before follow-up surveys whether drought/large shock that could affect ability to track benefits?		Your question raises two issues: (1) delays in construction might mean that 2023 would be a better time for the collection of interim data. We have now planned data collection for Q1 of 2023. (2) We propose to use remote sensing and weather information to contextualize production. However, making interim or final data collection dependent on whether it's a good agricultural year would not meet Mathematica's standards of rigor or objectivity.
49	Overall	Budget and cost effectiveness	Jenny Lisher (M&E)	Where is proposed budget? MCC cannot approve EDR without related budget and costing. There also does not seem to be any cost effectiveness/cost options within the proposal. Has MPR considered cost effectiveness options? Are full hhld surveys necessary for data collection in interim vs a smaller tracking survey or admin/geospatial/qualitative data collection? What are the key changes we would want to see at each period before evaluations decides to move forward and collect data? Can these decision points be flagged?		The revised EDR includes a budget. The motivation for conducting the midline survey is to provide evidence of program effects before the Compact terminates, to provide information to the Government of Niger as to whether activities should continue. We do not believe there will be major cost savings in using a smaller tracking survey, which would be expensive to mobilize if conducting on a frequent basis. Substantially altering the household survey would require reprogramming, retesting, and re-piloting, which are all costly activities. We are happy to talk through these different options with MCC.
50	Overall	Incorporation of Burkina/Senegal Lessons Learned	Jenny Lisher (M&E)	How is MPR incorporating lessons learned from Burkina and Senegal evaluations where similar activities/evaluations? For example, measuring issues around water users/problems within irrigation , geospatial, longer-term outlook, land tenure/conflicts/transfers, changes in utilization, etc.		Yes, the Niger evaluation team is aware of the Senegal and Burkina evaluations. For example, we have proposed remote sensing analysis to MCC to be able to provide longer term assessments and collect information on changes in usage. Our learning has also influenced our design for the other topics mentioned.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
51	p.1	"Due to the delays in Dosso-Gaya, MCC and Mathematica have agreed to develop evaluation designs for activities in Konni as delays in collecting baseline information would undermine the planned evaluation design."	Jenny Lisher (M&E)	Per comments at EDR presentation, can we delay collection of baseline data until can get EDR and budget approved and informed decision making to avoid issues faced in Senegal/Burkina evaluations (incorporate lessons learned from those evaluations)? Usually questionnaire design is not approved or even allowed to be drafted until after EDR and budget approval. The team has raised concerns with questionnaire and evaluation design that need to be resolved prior to moving forward with baseline data collection. Can MPR suggest some alternatives based on current implementation timeframe and growing seasons? May/June data collection is unlikely without risking quality control.		We have communicated the tradeoffs around the timing of the data collection to MCC.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
52	p.2	"To address questions related to program implementation and sustainability of the activities under IMAP, we propose conducting a qualitative analysis through document review, targeted KIIs, and discussions with focus groups. To assess changes in outcomes, we propose a quantitative performance evaluation (pre-post analysis) to estimates changes in outcomes spanning the intervention's duration, based on survey data collected at baseline, midline, and endline"	Jenny Lisher (M&E)	Please explain cost effectiveness of collecting midline data in this performance evaluation pre-post analysis. What additional information would a midterm provide? What is the added cost of midline data collection? How many growing seasons after key treatments completed (farmer training, irrigation and land) would be counted by the interim data collection proposed of 2022? Can farmers recall data from year vs multiple season data collection?		The interim data collection allows us to investigate outputs and behavior change that are likely to be affected in the short-term such as knowledge acquisition, adoption of best practices (inputs, harvesting techniques, marketing), and perceptions of land tenure security. Many of the outputs and short-term outcomes cannot (currently) be measured in other ways. We plan to collect information 1-2 years after farmers have started cultivating under the new conditions. As the project timeline becomes clearer, if necessary, we will update the data collection timeline. Our budget breaks out the costs of interim data collection. If the collaboration with RTI shows that it is possible to measure changes in agricultural practices using drone sensing, we propose to discuss with MCC whether this information would be sufficient for the interim report.

Table C.1 (*continued*)

53	p.3	"**Impact evaluation of contact farmer incentives**. Technical assistance to farmers on and off the perimeters is an important component of the IMAP activity. To disseminate new technical knowledge, the project plans to use contact farmers who will be incentivized to teach other farmers. MCC seeks to understand which incentive approaches lead to highest levels of adoption. We propose evaluating contact farmer incentive schemes using a randomized controlled trial (RCT). This evaluation method will focus on measuring the relative effectiveness of farmers learning about and adopting such targeted technologies as double ridging, straw mats, low-pressure drip irrigation, rotary hoeing, crop rotation, and the system of rice improvement and/or	Jenny Lisher (M&E)	Similar to Burkina, the "evaluation of possible land allocation" is not simply of land allocation but combined effects of Irrigation Perimeter investments-land, farmer training, irrigation and markets. Similarly, the Konni Perimeter Evaluation is not just irrigation but of farmer training, land and markets--really it is the evaluation of the effects of these various group of activities on PAPs. As flagged in Burkina and again at the EDR presentation for Niger, the evaluations should refocus around types of beneficiaries and groups of investments since largely getting same package of investments minus differences in farming techniques. Hence Koni perimeter would be Koni Perimeter PAP performance evaluation, Land Allocation would be Koni Perimeter-non-PAP impact evaluation and farmer training would be PAPs plus farming differences. If those outside of irrigated perimeter are not being included in the farming sampling frame, this should be clarified in the EDR. However, it would be helpful to understand why farmer training stand alone is not being measured as would allow to separate out effects of farming interventions vs farming plus land plus irrigation interventions.		We have dropped the land allocation study chapter from the EDR. We do not include beneficiaries outside the perimeter in our quantitative analysis, as MCC's investments primarily benefit PAPs (and perhaps land allocation recipients) and our understanding was that MCC's learning priorities did not include beneficiaries outside the perimeter. Therefore we do not foresee a learning opportunity to assess the effects of the farmer training in isolation, absent the combination of training and irrigation interventions.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
		intensification. **Impact evaluation of possible land allocation**. Formalizing perimeter land rights is a primary sub-activity of the IMAP activity. Although the majority of Konni perimeter parcels are not expected to change hands, some land might become available for reallocation to non-project affected persons (non-PAPs). We propose conducting a lottery-based RCT to provide rigorous evidence on the agricultural and economic impacts of providing households or individuals with a plot of irrigated land."				
54	p.3	Timeline	Jenny Lisher (M&E)	How can the evaluation collect baseline data in Konni for non-PAPs as will not know whether have additional land until later and will not know who the non-lottery winners are? Seems like only "baseline" can collect in summer of 2019 would be for PAPs. As such, would need to clarify/revise EDR accordingly.		We have removed the land allocation study chapter.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
55	p.7	"The Agricultural Support Services Sub-Activity and Land Tenure Security Sub-Activity will also include beneficiaries located outside the perimeters."	Jenny Lisher (M&E)	May want to clarify that although these services are outside of perimeter, the evaluation is focused only on the group of investments within the irrigated perimeter.		We have included that clarification in the designated text.
56	p.8	"Specialized training in land rights coupled with technical assistance will result in increased land tenure security."	Jenny Lisher (M&E)	This could benefit from refinement. First, it is the provision of land rights (and related reduction in conflict) plus a strengthened land governance system and related land allocation (based on technical assistance/training) that would lead to increase perception of tenure. It is also not just improved land tenure security as an end, but rather the combined irrigation plus tenure plus ag knowledge that is expected to lead to behavior change and related increase in investments (see benefit stream for land per logic diagram on p.10 or p.11). p.11 econ analysis description is clearer.		Thank you for that comment. We have revised the wording in the Theory of Change to better clarify the precipitating factors that will lead to improved tenure security and on-farm investments.
57	p.8	"The potential beneficiaries of the Management Services and Market Facilitation Activity are households that experience an increase in yields, sales, or profits as a result of having at least one member participating in trainings."	Jenny Lisher (M&E)	Keep in mind that beneficiaries will also have land and irrigation-not only training.		Yes, we add a qualifier to the text (in addition to receiving access to irrigation and land tenure documentation for beneficiaries on the perimeter)

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
58	p.12	ERR, "As part of the evaluation, we will compute the ex-post ERR of the Konni perimeter using updated estimates of benefits and costs across the IMAP's activities, drawing primarily on data collected for the pre-post analysis we will describe in Chapter V. This ex-post ERR can be compared to that of other investments, and can also enable MCC and other stakeholders to determine the soundness of this project based on whether it surpasses MCC's hurdle rate of 10 percent."	Jenny Lisher (M&E)	The ERR described only deals with irrigated perimeter; however, in revising the ERR, can MPR include any data from investments outside the perimeter? If RCTs carried out, will ERR analysis include this additional data to the pre-post analysis?		MCC's ERR only includes benefit streams from within the perimeter. In updating the ERR we plan to include only benefit streams to beneficiaries in the perimeter (PAPs and possibly non-PAPs if there is land allocation to non-PAPs). Your point is well taken that this would understate the ERR if costs for investments outside the perimeter are included. Could MCC provide details on what proportion of investments in LTSA and farmer training are expected to benefit beneficiaries outside the perimeter? This would allow us to exclude that from the cost basis of the ERR.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
59	p.17	Lit review overall	Jenny Lisher (M&E)	The lit review separates out benefits of irrigation, ag and land but does not seem to look at combined effects. Can MPR provide analysis at least of ag/land co-efforts or note that benefits of this evaluations is ability to show combined effects of ag/land/irrigation investments as well as standalone for ag and land?		To the best of our understanding, there are not papers that measure combined effects because then attribution could not be performed, and ultimately researchers would want to understand the marginal effect of an intervention in isolation. We have chosen not to underscore that a benefit of this evaluation is the ability to show combined effect, because the implementation design does not allow for decomposing the total effect amongst its constituent parts. As well, even if effects are communicated as a combined outcome, complementary interventions are seen as auxiliary to the main intervention, which is likely to be irrigation given the magnitude of its cost and the perception that irrigation access is the greatest constraint (compared to knowledge or land rights). As a consequence, researchers focus less on proper measurement of these other inputs, like trainings. Papers like Nakano et al. (2011) [https://elibrary.worldbank.org/doi/abs/10.1596/1813-9450-5560] recognize the crucial role that complementary inputs play in increasing crop productivity and striving to achieve an African Green Revolution for rice production, but do not view the effects of irrigation as a combined effort with other interventions. Instead, aspects like reforming fertilizer markets or training farmers in using new varieties collectively support increasing the impact of the irrigation scheme. Similarly, this World Bank report stresses "holistic" agricultural intensification (https://openknowledge.worldbank.org/handle/10986/2692, page 296), but then it is unfeasible to disentangle effect contributions from the various interventions.
60	p.17	lit review-land tenure reforms	Jenny Lisher (M&E)	This is a bit oddly worded. Really we are talking about land governance and tenure strengthening rather than "reforms". Suggest revising language to reflect this.		We have changed all references of "land tenure reform" to "land tenure strengthening"

Table C.1 (*continued*)

61	p.17	"Empirical work has primarily examined the effect of tenure formalization on intermediate farm-level outcomes, such as access to credit, perceptions of tenure security, and incidents of social conflict, with land productivity and household consumption as final outcomes of interest (Lawry et al. 2017). Sitko et al. (2014) drew on a nationally representative household survey in Zambia, and found suggestive evidence of land titling increasing investment in irrigation equipment, inorganic fertilizer application, and erosion control management each by about two to four percentage points. In their systematic review of impacts of property rights interventions, Lawry et al. (2017) found that tenure recognition increases the monetary value of land productivity on average by 40 percent, but found much smaller effects	Jenny Lisher (M&E)	This section would benefit from some revision. The findings have changed based on recent lit reviews/systematic analysis-see Dan Higgins/IFAD or MCC in 2018. Also, Lawry evaluations reviewed largely focused solely on titling and effect on credit/income without looking at context or intermediate aspects necessary to get there. The smaller effects in Sub-Saharan Africa were thought to be due to strong existing customer tenure situations and/or smaller parcel sizes/income compared to Latin America/Asia. Whether or not Niger Konni perimeter does in fact view their tenure as insecure is hence a key issue to explore. May also want to cite papers directly rather than Lawry review. Finally, the lit review on land seems to largely focus on land formalization/titling and expropriation without looking at literature on strengthening of land governance and allocation.		Thank you for those comments. We have substantially revised the land reform section of the literature review.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
		among programs in Sub-Saharan Africa. They observed no evidence that the connection between tenure recognition and productivity gains operates through a credit mechanism, given the absence of conclusive changes in formal and informal borrowing. "				

Table C.1 (*continued*)

62	p.19	"Our overall evaluation of the Land Tenure Security Sub-Activity will not offer rigorous evidence on the impacts from farmers receiving land title because there is no comparison group whose plots will not be formalized; all PAPs will benefit from secure land rights. However, the empirical literature on the effects of land allocation is thin. If formalizing title rights on the Konni perimeter yields a large enough number of plots for reallocation to substantiate an RCT, as we propose in Chapter VII, the findings would make a genuine contribution in understanding the impacts of land provision that is bundled with secure rights. If women receive the majority of reallocated plots, IMAP would result in a rare experiment of women receiving a land parcel and property rights, which offers a novel setup for estimating	Jenny Lisher (M&E)	The suggestion that little empirical evidence is outdated. See Rwanda, Benin, Ethiopia, Ghana, etc. Good that separating out land titling vs land allocation here but may want to clarify that land titling plus farmer training plus irrigation means cannot separate out individual effects of each and no comparison since PAPs all get titling. While the RCT around land allocation would provide for combined effect of land provision, irrigation, farming and titling but similar to PAPs not the individual effects of land titling.		Since we are no longer proposing the RCT, we have entirely removed the text in question.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
		the extent to which secure land access inhibits efficient agricultural production practices."				
63	p.21	"We will use a quantitative performance evaluation (a pre-post analysis) to estimate changes in agricultural outcomes for households on the Konni perimeter."	Jenny Lisher (M&E)	Suggest rephrasing to "…for **PAP** households on the Konni perimeter" just to avoid confusion with non-PAPs on Konni.		Have modified text to "PAP households".
64	p.21	"In addition, if a sufficient number of land parcels become available from the land rights formalization activities, we propose an RCT that tests the effect of receiving irrigated land on agricultural productivity, household income, and women's empowerment."	Jenny Lisher (M&E)	May want to rephrase as Resettlement activities rather than land formalization activities. There are a group of investments going to PAPs based around RAP. Land formalization is one output of that. Also, when discussing RCT noting it would test effect of receiving irrigated land, farmer training and land tenure on ....Namely, the effects cannot be separated and go further than just land allocation.		We have removed the land allocation study chapter.
65	p.22 (and p.31)	Data sources	Jenny Lisher (M&E)	Can MPR also consider administrative data and geospatial data to answer these questions which could be more cost effective/support in tracking these results over time?		Please see our response in Row 3.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
66	p.23	"RQ20 Is a land tenure registry functioning according to plan? Is the land registry used as a tool by local authorities to continually record changes in land holdings? Do land holders have access to the correct documentation (contrats d'occupation or long-term leases for farmers, publicly held property titles of overall perimeters) according to the project plan? Were land use plans at the commune level successfully completed?"	Jenny Lisher (M&E)	Could be beneficial for MPR to incorporate data source of land administrative data (not just project data), especially to track land transactions and land use plans/allocation. Same suggestion for RQ21 on land commission offices and RQ22 on land conflict		Our understanding of the land tenure investments is that land transactions will not be allowed. We therefore believe the land administration database will provide limited help to the evaluation. As for RQ22, we have included reference to a "conflict monitoring system," and would be glad to use administrative data where helpful in answering the research questions.
67	p.24	"RQ22Was the level and risk of land conflict reduced? Did land tenure security increase?"	Jenny Lisher (M&E)	Wouldn't we also want to use RCT data from land allocation if carried out?		We have removed the land allocation study chapter.
68	p.23-24		Jenny Lisher (M&E)	Why is RQ 20, 21 and 22 under SISM instead of LTS?		We have RQs 20 through 22 listed under LTS in the table, but I think this is not immediately clear because of the page break. We have added another "LTS" reference in the earlier part of the table to improve clarity.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
69	p.24	"RQ23What are the income, food security, and agricultural productivity impacts of granting irrigated land to vulnerable populations?"	Jenny Lisher (M&E)	This questions should have included farmer training and land tenure --not only irrigated land. Reason being we cannot separate effects of solely granting irrigated land. If RCT proceeds, evaluation should include land tenure security and conflict measures.		We have removed the land allocation study chapter.
70	p.28	"RQ14. Were project activities implemented as planned? If not, what changes occurred?"	Jenny Lisher (M&E)	May want to consider administrative data, especially in provision of land rights		Great - have included as a data source for RQ14.
71	p.30	"Performance evaluation to measure Konni perimeter outcomes"	Jenny Lisher (M&E)	Unclear why separating out by activities when grouping evaluation of irrigation and then the land/farmer/WUA side. These are combined activities affecting the same group of beneficiaries with combined effects. Although some questions seem relevant for irrigation or farming, perhaps can reframe to be clear one overall performance evaluation with various measures and then potential RCT for non-PAPs and for types of farmer training within PAPs.		Due to the large number of evaluation questions (36) we felt that providing a structure would benefit the performance evaluation, and clarify how activity-specific RQs listed in the RFP are being addressed. Structuring the performance evaluation by activity takes into account that timelines, implementers and (to some extent) research questions are specific to an activity. The performance evaluation encompasses all those activities. We have dropped the land allocation and farmer training study, so your other suggestions don't apply more.
72	p.31, Table V2	"RQ7. What is the post-Compact ERR of the project (except for the Roads for Market Access Activity)?"	Jenny Lisher (M&E)	Similar to above comment, wouldn't the ERR want to include impact evaluation elements from farmer training outside perimeter as well as any outcomes able to get from non-PAPs within perimeter?		Please see our response in Row 14.

Table C.1 (*continued*)

73	p.37-land security outcomes and related p.38 on land evaluation chart of methodologies	Evaluation overview "We will carry out a mixed methods evaluation to assess outcomes of the Land Tenure Security Sub-Activity. Anchoring our evaluation in the project's logic model, we will first investigate if the outputs necessary to yield short- and medium-term outcomes related to land security are in place. Notably, we will study whether land rights have been formalized in the perimeter, if COFOCOMs have received the necessary training, and if they are using the proper documentation. To assess outcomes for this sub-activity we will rely on a pre-post analysis and qualitative outcomes analysis to assess the ease with which landholders are able to receive title documentation, and the frequency of disputes and conflicts over land ownership and property rights claims. Table V.5 maps our evaluation	Jenny Lisher (M&E)	Per above comments, suggest Mathematica consider dividing the evaluation by PAPs vs non-PAPs rather than by activities. For PAPs it is pre-post but for non-PAPs on irrigated perimeter, there could be an impact evaluation. In either case, it is not simply receiving title and frequency of disputes but rather the effect of that interim outcome of tenure security on longer-term outcomes on food security, ag production, use of resources/investments, etc.		We have modified the language so that now we "assess the ease with which landholders are able to receive rights documentation, and the frequency of disputes and conflicts over land holdings and rights claims." to reflect our updated understanding of the preferred tenure instrument. We specify these outcomes, because the effects of the LTS on food security, ag production, and related measures will be bundled with the effects of irrigation and provision of training given the overlapping interventions. With the removal of the land allocation study chapter, all evaluation efforts will exclusively be centered on PAPs, so we do not believe that a PAP vs. non-PAP distinction will now be a possible means of organizing our design.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
		methods to the research questions and presents key outcomes we will investigate."				
74	p.38 land evaluation chart	Outcomes: "Availability of land tenure documents, Use of land tenure tools at the local level,, Ease of accessing land tenure documents, Restrictions on land transactions, Completion of land use plans"	Jenny Lisher (M&E)	In order to answer RQ20 on whether land registry being used to continually record changes in land tenure, suggest looking at continued land transactions in the registry--not just restrictions or ease of accessing documents. MCC and Mathematica might also want to consider revising the research question from completion of land use plans to completion and ADHERENCE to land use plans on the perimeter as the key to land use management is not only creation of a land use plan but continued use and following of the land use plan created.		Great point - we have included adherence to the land use plans in revised RQ wording, and included "Continuity of land transaction reporting in land registry" as a key outcome.
75	p.38 land evaluation chart	RQ 22 a and b	Jenny Lisher (M&E)	Per earlier comments, if RCT for land allocation, these questions would also be answered by the RCT and not only pre-post. As such, suggest revising to include--though RCT unlikely.		We have removed the land allocation study chapter.
76	p.38 text	"We will assess quantitative changes in land tenure security outcomes (RQ22a) using a pre-post analysis. As discussed, the pre-post design precludes us from attributing any difference in outcomes over the course of the Compact to the effects of the activity because of the absence of a comparison group."	Jenny Lisher (M&E)	Again, the issue of lack of comparison is only for PAPs. If RCT done for non-PAPs, land tenure security outcomes could be detailed just as they are for irrigation/farmers/land allocation-though would be combined effects (similar to PAPs)		We have removed the land allocation study chapter.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
77	p.39	"Because threats to tenure security are often specific to local institutional contexts, we will work closely with MCA-N and MCC to ensure that our survey questions comprehensively address the key concerns affecting Konni perimeter households' rights claims."	Jenny Lisher (M&E)	Was this step completed prior to development of recent questionnaire submitted to MCC for review?" If so, what were the key threats?		We have submitted the questionnaires for stakeholder and MCC review to obtain feedback on the questionnaire in order to ensure the final questionnaires incorporate these key concerns. We have not yet received feedback on the key threats that Konni households face.
78	p.39	"We will collect information on the frequency of land disputes arising from competing claims among extended family and among neighbors, and whether the introduction of formal title is associated with a reduction of such disputes"	Jenny Lisher (M&E)	Suggest not limiting to neighbors/family members but any disputes including those against authorities, outsiders, government expropriation		We have edited the text to include those potential sources of land disputes.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
79	p.39	"We will also collect data on land tenure security, and in the pre-post analysis examine any differences in tenure security across different stakeholder groups, such as between men and women and between landlords and tenants.	Jenny Lisher (M&E)	Beyond landlord/tenant, could simply flag differences among those with different tenure status. Namely if name on title or not, if have title vs another documentation		We have edited the text to include comparisons among groups with different tenure status
80	p.39	"We will both gauge households' perceptions of security using self-reported measures as well as proxies for tenure security, such as expenditures on land investments and inputs, demonstrated ability to use land as collateral in financial transactions, and any formal or informal actions that households have pursued in clarifying their land rights including the time elapsed before receiving requested documents."	Jenny Lisher (M&E)	Yes, this is KEY! However, may want to clarify that investments/inputs not proxy for land tenure but effect of secure tenure. Also if looking at collateral in financial institutions, likely want to consider bank data as a data source. If looking at transaction time, land records will be a key source---not just survey data. Also need to have clear definitions of start/stop dates for transaction tracking and differentiate among types of transaction.		Regarding the relationship between land tenure security and investments, there is evidence of investments proxying for security, of security driving investments, and investments driving security. If tenure security stimulates investments, then our pre-post measurements should be able to capture that. Since the contrat d'occupation forbids sub-leases and sales, we do not foresee there being any transactions aside from inheritances by heirs.
81	p.59 land allocation RCT	RCT land allocation	Jenny Lisher (M&E)	Per earlier comments, if RCT moves forward, would be able to also consider other land tenure questions like tenure security and conflict.		We have removed the land allocation study chapter.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
82	p.59 Land allocation RCT	"RQ24. When given productive land and comprehensive training in best agricultural practices, do disadvantaged populations achieve crop yields comparable to those of existing landholders?"	Jenny Lisher (M&E)	Unclear purpose of measuring non-Paps to PAPs/existing landholders. Rather the question would be measuring non- PAPs/vulnerable groups before and after project. This is especially true as PAPs and non-PAPs are not comparable, especially if non-PAPs will be solely vulnerable groups and potentially lack of experience with irrigated land.		We have removed the land allocation study chapter.
83	p.60	"The comparison group will comprise the remaining individuals who were not selected; they will receive neither land nor a land title"	Jenny Lisher (M&E)	Might want to flag that they also will not receive irrigated land or farmer training.		We have removed the land allocation study chapter.
84	p.61	"We will assess whether they are able to achieve the same level of knowledge and adoption as PAP households that may have had experience with irrigated agriculture in the past when the perimeter was still functional."	Jenny Lisher (M&E)	See above comment re using PAPs as a comparison group to non-PAPs. How will you separate out effects from irrigation knowledge as referenced here vs income vs other factors that may have influenced selection? The RCT would only be using non-PAP/lottery winners before and after project and not the comparison to PAPs which are not comparable		We have removed the land allocation study chapter.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
85	p.61	"We also will examine whether receiving an irrigated plot has a positive impact on total household income, food security status, and agricultural productivity, recognizing that household outcomes for beneficiaries are likely to be a combination of production from off-perimeter land and their on-perimeter parcel."	Jenny Lisher (M&E)	Similar to above comments, it is not solely effect of irrigated land but rather irrigated land, tenure via title and farmer training. Per comment during MPR presentation at MCC, it would help for MPR to rephrase around the set of investments involved and what each evaluation actually can/can't measure considering the bundle of investments.		We have removed the land allocation study chapter.
86	p.63	"Final (2–5 years of exposure, coordinated with Konni perimeter endline survey)"	Jenny Lisher (M&E)	Final should not be only 2 years of exposure. If interim is 1-3 years (endline should be 4-5. Note MPR does describe timeline as such in description (2022 and 2025) following chart so perhaps just chart needs to be revised. Also consider if timeline for implementation pushed for lottery/land allocation, likely would need to have separate data collection timeframes for Konni PAPs and RCT--in fact likely this timeline pushed and need interim 2 years post compact and 5 years post compact as infra will not be completed until at least 2022. As this is a set of investments, including infra, the evaluation may not want to monitor someone ahead of the irrigation operational.		We have removed the land allocation study chapter.
87	p.63	admin data (data source chart)	Jenny Lisher (M&E)	Unclear why would only use admin data determining eligibility for lottery. Suggest considering using land administrative data to verify land allocation and formal land transfer tracking.		We have removed the land allocation study chapter.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
88	p.63 (and related description of survey modules on p.65)	modules	Jenny Lisher (M&E)	Mathematica is missing one of the most important modules, which they also missed in similar Burkina irrigated perimeter RCT evaluation--namely land tenure security and land transfers/utilization. These modules are included in annexes but not noted here so perhaps just accidentally left out here?		We had made changes in the land allocation study before removing that chapter.
89	p.63	Land admin data description "Administrative data from implementer In the process of applying for the land allocation lottery, households should provide the implementer with basic demographic details and responses to the lottery eligibility criteria. The implementer should also collect contact information from eligible households sufficiently detailed to ensure that other data collectors are able to locate the household for follow-up surveys. MCC and MCA will decide the eligibility criteria; Mathematica will review any application forms the implementer uses in collecting administrative data."	Jenny Lisher (M&E)	This is not land administrative data but rather project data. Please revise chart and description accordingly. Both project and land administrative/official land data is key for evaluation. At times MPR does reference project data and at other times land admin data. Just need to be consistent and make a distinction between these two data types.		We have removed the land allocation study chapter.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
90	p.64	sample size of 200 hhlds in MDE assumptions	Jenny Lisher (M&E)	Unlikely will have enough land for 100-200 treatment hhlds but perhaps. As discussed during MCC presentation of EDR, likely this RCT will not make it due to smaller benefits of vulnerable groups (longer time to adopt irrigation/farming practices and have resources to invest) and unlikelihood of sufficient land after PAPs. Let's keep as a possibility with the understanding that unlikely. We can reassess to see if have 100 parcels or more available for lottery distribution. Need to ensure there is a separate budget listed for this component and a cutoff date for decision making.		We noted this same concern in previous communication to MCC. MCC and Mathematica agreed to develop a design for this activity for two reasons, a) the land allocation might still go ahead even though currently it looks less likely, and b) the effort spent on designing the evaluation could plausibly be useful for Sia-Kouanza where the possibility of land being available is much higher if the perimeters are indeed constructed.
91	p.65	"The land allocation study survey will primarily use modules from the pre-post Konni perimeter household survey and include modules on agricultural inputs and practices, agricultural outcomes, agricultural and non-agricultural income, food and nutritional security status, and access to and use of financial services"	Jenny Lisher (M&E)	Per above, missing noting land modules. Also importantly for both Konni and the RCT, need to ensure modules on water use present per learnings from MPR evaluations in Senegal and Burkina. There are a variety of reasons why perimeter may not work--irrigation, farmer training and related behavior change on water usage, and land. In Senegal and Burkina, one question came up unknown around usage and functioning of the irrigation/drainage. Part of this is included in the infra performance side, but also need to understand household use for PAPs and non-PAPs who receive the land. There are modules again listed in annex but not noted in text for some reason. Please clarify.		We have added the modules in the text here. They are included in the survey.
92	p.69	CAPI quality control and use	Jenny Lisher (M&E)	As MPR faced issues in quality control of CAPI in Burkina, losing a land module, please explain the quality control procedures that will be put in place to avoid such an occurrence in Niger.		As part of the quality control procedures, we will review data from the pre-testing task by group of beneficiaries. This will help in identifying programming issues that affect a subsample of survey respondents.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
93	p.70	"Data collection timing is specific to the evaluation method for which the data will be used. Baseline, interim, and endline quantitative data will be collected to monitor progress in outcomes from before any IMAP activities begin to more than two years after activity completion to allow sufficient time for farmers to modify their practices and realize increases in agricultural productivity and consumption"	Jenny Lisher (M&E)	2 years is likely insufficient for farmers to modify practices in terms of showing ag productivity and consumption. Did MPR mean 5 years after for ag productivity with 2 years interim effects like land tenure and ag investments?		There is some inherent tension in the logic model because there are different exposure periods by activity and timelines for expected changes vary, yet we only administer a single survey for the interim report that is meant to collect information on medium-term outcomes. Based on our reading of the literature, the main mechanism for the increase in agricultural output would be the increase in yields due to consistent water availability in the rainy season that affects the 2452 hectares and the increase to 1226 hectare of cultivated land in the dry season (either from the ERR baseline of 520 ha or the Ag consultant TOR baseline of 200-380 hectares). The increase in dry season area alone corresponds to at least a 23 percent increase in total cultivated area. Framed differently, we anticipate large increases in the long-term outcome of increased crop yields due to the irrigation perimeter development (even as soon as 1-2 years after completion of the perimeter), even before the medium-term outcomes through the farmer training mechanism (producers apply improved agricultural practices) may have occurred since the latter rely on behavior change. Behavior change due to the land tenure security channel might only occur by the endline. One main use we see for the remote sensing data is to be able to provide more information on the exposure periods.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
94	p.71 Gantt chart	"Baseline quantitative data collection (Konni, training, land)"	Jenny Lisher (M&E)	How can data collection baseline occur for anyone beyond Konni PAPs? Namely unknown control group for land RCT. Farmer training in this case would only include PAPs (unless expand to cover stand along farmer training benefits/outside perimeter). Also for farmer training consider that some PAPs might receive irrigation earlier than others (with the two sections of irrigation), which could also affect benefit stream timing.		We have removed the reference to land study and dropped the optional land allocation study. As for the benefit stream timing, the interim survey will measure average across different cohorts of beneficiaries on the perimeter. If the time when different cohorts receive land is very different, we can disaggregate the analysis by the timing of when beneficiaries received access to the land.
95	p.71 Gantt chart	timing of implementation	Jenny Lisher (M&E)	Konni irrigation construction and farmer training timing needs to be revised to reflect when contractors on board and begin work (slightly delayed based on discussions). Also, may want to highlight when actual "treatment" is considered. Namely, when first part of irrigated perimeter and second part of irrigated perimeter completed and when PAPs provided land tenure vs. non-Paps, etc. Right now hard to tell when actual "treatment" will occur and hence when benefits to be expected.		We update the timeline to provide detail on when the different sectors on Konni are expected to be rehabilitated.
96	p.73	Summary of quantitative data collection	Jenny Lisher (M&E)	Suggest distinguishing between project data and administrative/institutional data sets		We have updated the table and differentiated between administrative datasets and project datasets. We have also distinguished between these two types of sources in the timetable for implementation and data collection activities (Table VI.1)

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
97	p.74	modules	Jenny Lisher (M&E)	This is a much better/comprehensive list than what was described in the earlier text. Per above comments, suggest adding key aspects in text for evaluation descriptions earlier in the EDR. In addition, the evaluation would benefit from adding specific women's modules. As have raised in the past and recently highlighted by IFPRI in a 2018 systematic review, women's land tenure and perceptions are different than head of household. Similarly their use of resources and behavioral change differs from men and how much they have been included in these trainings and titles/land use rights. MCC usually recommends inclusion of women's modules in survey modules to capture women's views. This is apart from the question MPR raises on women head of households being allocated land.		Our questionnaire is already very long, based on the pilot and we are working through ways to shorten the questionnaire. The addition of additional modules would require permission from MCC to exceed the questionnaire length of 2 hours for households, as well as an additional request to the IRB.
98	p.74 exposure periods	timing	Jenny Lisher (M&E)	MPR lays out separate exposure periods for each investment but how do these overlap re combined investments, considering Konni and farmer training evaluation benefits are likely dependent on irrigation, land and ag combined? Also it seems irrigation may need to be completed and by the growing seasons as prior some disruption of operations/can't use irrigation techniques without irrigation. Also, unclear considering exposure periods listed, which of these streams will be captured by the 2022/2025 data collection periods. For example taking pre-post Konni states 12-24 months and 36-60 months in interim of 2022 and endline of 2025. What can be captured in 2022 if irrigation not planned to complete until end 2021/early 2022? Or if take training, MPR noted exposure periods of, "0-12 months, 12-24 months and 24-60 months". Throughout exposure periods, would be helpful to map/flag what is hence being captured in current data collection timeline proposed (and update as necessary based on implementation timeline)		Given the different timelines, data collection that is optimal to ascertain the logic for one investment might not be optimal for the others. With our data collection referencing the completion of the perimeter, we follow the exposure period of the primary investments MCC is making.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
99	p.75	"Baseline: Q2/Q3 2019 (after lottery application but before receiving land)"	Jenny Lisher (M&E)	As flagged during presentation of EDR by MPR, Mathematica would not be able to use same baseline period for Konni PAPs and non-PAPs. We will not know land available or applicants until later on. Please revise accordingly. Similarly, exposure periods and data collection timeframes don't seem to match up as non-PAPs will likely get land and training after PAPs.		We have removed the land allocation study chapter.
100	p.77	FGDs-2023	Jenny Lisher (M&E)	MPR might want to consider that perceptions of tenure and land use change over time and as such 2023 data collection for qualitative data will not necessarily inform or mesh with interim and endline data collected in 2022 and 2025.		We propose to collect qualitative data after analysis of quantitative data in order to be able to investigate surprising findings in the quantitative data. While this will be about half a year after the quantitative data collection, we think this provides the best opportunity for learning.
101	p.81	"Evaluation team roles and responsibilities"	Jenny Lisher (M&E)	Would be helpful to add in land and geospatial experts to the team based on lessons learned in Senegal and Burkina MPR irrigated perimeter/land evaluations.		Please see our response to line 3.
102	p.81	"Table IX.1. Evaluation timeline and reporting schedule"	Jenny Lisher (M&E)	Believe mean 2022 for interim data collection not 2021.		Yes, we have fixed that to reflect interim data collection occurring in 2023.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
103	p.92	"RQ20 Is a land tenure registry functioning according to plan? Is the land registry used as a tool by local authorities to continually record changes in land holdings? Do land holders have access to the correct documentation (contrats d'occupation or long-term leases for farmers, publicly held property titles of overall perimeters) according to the project plan? Were land use plans at the commune level successfully completed?"	Jenny Lisher (M&E)	Land registry questions require not only outputs and short-term but also medium/long-term to understand sustainability and continually using formal system to record land transactions.		Based on the March 2018 M&E plan's logic model (page 12), these question inquire about outputs and short-term outcomes of the LTS sub-activity.
104	p.92	RQ 21	Jenny Lisher (M&E)	Similar to above, the key is sustainability. Lessons learned by MCC show these land institutions are often unsustainable, including equipment and capacity. As such, it's key to look at medium and long-term as well==not just whether equipped in short-term.		We will be investigating the sustainability of all project activities to answer the overarching RQ5: "If the Project produced results, are they expected to be sustained? If the Project did not meet its expected results, why not?"
105	p.92	RQ22-land tenure and conflict	Jenny Lisher (M&E)	Medium-term indeed key but land tenure perceptions should also be tracked in short and long-term, and conflicts in long-term		Our survey for the interim evaluation includes questions on land tenure security and conflicts, and we anticipate the final evaluation to do so as well.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
106	p.98	Local land commissions	Jenny Lisher (M&E)	Mathematica may want to consider looking at land transactions in additions to perceptions and process in order to capture outcomes.		Based on our most recent discussion with the land team, we believe that MCC's main land tenure related focus is on Konni perimeter beneficiaries. Since the current plan is for them to have a non-transferable *contrat d'occupation*, we are unsure about the comment's focus on land transactions.
107	p. 2	Mathematica: "We removed reference to the farmer training and land allocation studies previously here."	Andrew Tarter (MCC-GSI)	Ok, but why? These interventions are the most-interesting from Gender and Social Inclusion standpoint. They are the social investments. Perhaps this is just a 'contact'/lead farmer model comparison that is being nixed? Or are all evaluations in the suite of farmer trainings being removed?		After several MCC-Mathematica discussions, we realized the proposed studies were either infeasible or would produce sufficient learning to justify their prerequisite effort. We will still be evaluating the farmer training through questions on self-reported knowledge gains and adoption of taught practices.
108	p. 5	Mathematica: "This evaluation focuses only on the group of investments made within the irrigated perimeter."	Andrew Tarter (MCC-GSI)	Fair enough. But the farmer trainings in #1 are also, largely, happening within the perimeter. Why were these removed from the evaluation design?		See answer to #1.
109	p. 6	Mathematica: "These beneficiaries, also referred to as project affected persons (PAPs), are defined as individuals (and members of their household) who will have access to irrigated land on the perimeter. "	Andrew Tarter (MCC-GSI)	I don't think all PAPS are beneficiaries. A PAP is defined as a person affected by the activities.		We have clarified our definitions in this section.
110	p. 8	IMAP Logic Model	Hamissou Samari (M&E)	As discussed in our past meetings, at the next M&E Plan revision, we might have to slightly modify the result box that says "women and youth are economically empowered in their household and community", since we have no way of measuring youth economic empowerment		We will update our logic model when an M&E revision is made.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
111	p. 11	Mathematica: "The IMAP project identifies beneficiaries as all households affected by the project and, excluding impacts from the Roads for Market Access Activity, estimates this total to be more than 37,500 people across all project irrigation perimeters (MCC 2016). "	Andrew Tarter (MCC-GSI)	Again, not certain, but I think 'affected by' is the PAPs definition, and 'participating in' it the beneficiary definition.		We have updated and clarified our definitions of PAPs and beneficiaries.
112	p. 15	Mathematica: "Two of the most common extension services models are training and visit (T&V) and farmer field schools (FFSs). "	Andrew Tarter (MCC-GSI)	Input-supply is probably the world's most common model, due to lack of funding for extension agents. It is simply the distribution (sometimes with pamphlets) but without training.		Since the SAA features an in-person training component, we focus our literature on comparable training models.
113	p. 17	"There is a substantial gender component in the provision of extension services: the vast majority of trainers are men. "	Andrew Tarter (MCC-GSI)	This is better described as a substantial gender challenge or paucity.		We have modified the original language to "gender aspect", since we think the 'challenge' arises when there is a mismatch in the gender share of cultivators vis-à-vis extension officers. If 90% of cultivators are male, the dominance of male extension workers would not be problematic. Since this is a literature review, this statement is not specific to a particular emprical context. We would need further information about local specifics before describing the situation as a challenge.
114	p. 17	"If male extension workers are more likely to visit male farmers, women farmers are less likely to receive training and information. "	Andrew Tarter (MCC-GSI)	It's less about visiting and more about receiving.		We have modified the language to describe the act of male farmers receiving outreach efforts from extension officers.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
115	p. 17	"If male extension workers are more likely to visit male farmers, women farmers are less likely to receive training and information. "	Andrew Tarter (MCC-GSI)	This awareness of the gender issue is present here, and in the draft of this document. Yet, it was not prepared for in the pilot visit and report. That report noted reluctance of women to speak to male enumerators, and later gave the reason of difficulty of recruiting female enumerators. I acknowledge the former (which you rightly point out here and in the earlier draft), but I reject the latter. There have been plenty of other studies by contractors that were able to recruit and utilize female enumerators.		We have updated our Pilot Report to more accurately describe our key findings and how it informs our baseline data collection approach.
116	p. 17	"This will likely be the only contribution possible for this portion of the evaluation, since the proposed pre-post design does not provide impact estimates for the effectiveness of receiving agricultural training on adoption patterns or farm productivity"	Andrew Tarter (MCC-GSI)	Ok. So you are saying it's not possible, because the design does not include it. So it is actually possible, but the design does not include it. So the question is why the design does not include it. The survey itself asks many questions about yields, and fertilizer, and other aspects related to training. I think that changes in these responses at the endline would easily permit some assumptions about training. Furthermore, a few more questions about training could resolve this.		We will be asking questions about training, but the evaluation design cannot resolve the non-random selection of beneficaries into agricultural training. The implementation of the farmer training program is incompatible with any causal estimate of the training's impact.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
117	p. 21	"We structure the evaluation around the theory of change in Figure II.3, which we described in Chapter II, Section B. The research questions for the evaluation flow directly from the project's theory of change, and they aim to test whether the project has had the anticipated effects on the intended outcomes. "	Andrew Tarter (MCC-GSI)	Women's economic empowerment is explicitly in the TOC, but excluded from the evaluation.		We are incorporating questions on women's economic empowerment in our household survey.
118	p. 21	"We have categorized the evaluation questions into four groups corresponding to the question's position in the logic model and/or the area over which we anticipate the outcomes might take effect: (1) overarching questions related to implementation and sustainability, (2) questions about outcomes as measured at the level of individual beneficiaries,"	Andrew Tarter (MCC-GSI)	In your responses to my earlier comments found at the end of this document you said changes would be measured at the household level. Here you state individual.		The household survey will consist of some questions that are pertinent at the household-level (e.g., crop yields, access to land) and some at the individual-level (e.g., employment, earnings). Given the number of research questions the surveys are intended to respond to, it will not be possible to conduct comprehensive individual-level questions for all areas of interest.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
119	p. 21	"Specifically, we will use a combination of quantitative and qualitative performance evaluations. "	Andrew Tarter (MCC-GSI)	On page 2 of this report, it states "We propose a mixed methods implementation and outcomes analysis to evaluate the implementation, results, and sustainability of the rehabilitation of the Konni perimeter and such complementary IMAP activities as farmer training and policy reforms". Here you are saying you are doing performance evaluations, rather than outcomes. Am I missing something?		A performance evaluation refers to an evaluation that does not have an experimental or quasi-experimental component, which would be termed an impact evaluation.
120	p. 21	"We will use a quantitative performance evaluation (a pre-post analysis) to estimate changes in agricultural outcomes for PAP households on the Konni perimeter."	Andrew Tarter (MCC-GSI)	I understand that MCC does performance evaluations and outcome/impact evaluations. Here in this sentence you are saying you'll do a performance evaluation but you are looking at ag. outcomes. So ag. outcomes are the measure of performance?		That is correct. The performance of the investments are proxied by changes in agricultural outcomes (among other changes), but cannot be causally linked because of the absence of a comparison group.
121	p. 21	"If available, we will use estimates derived from drone imagery and satellite imagery to understand changes in agricultural practices and yields across time."	Andrew Tarter (MCC-GSI)	You ask questions about yields in the suvey.		We have clarified that satellite and drone imagery will complement related data collected in household surveys.
122	p. 21	"This evaluation design applies MCC's Gender Integration Guidelines, and includes critical components that support a gender assessment of all project activities."	Andrew Tarter (MCC-GSI)	I humbly disagree. Women's increased economic empowerment is in the logic. Yet the activities that most-directly engage this (the differential gender effects of farmer training; and the WEAI) have been removed.		We will be incorporating questions on women's economic empowerment, with guidance from GSI, into our household surveys.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
123	p. 21	"We have calculated sample sizes with sufficient power to present sex- and age-disaggregated results, and we plan to conduct surveys with male and female household heads. "	Andrew Tarter (MCC-GSI)	Here, and in the original draft, you note that you plan to interview female heads-of-household. Yet in the Pilot report, you stated: 1. That women were reluctant to speak to male enumerators; and later you stated the issue was 2. the difficulty of recruiting female enumerators (which has not been my experience with multiple other surveys on this Compact). So if you planned it here, and earlier, why were none of the pilot days dedicated to this issue?		See response to #17.
124	p. 21	"Additionally, in our qualitative evaluation, we will interview and hold focus group discussions (FGDs) with women and younger beneficiaries to learn how they have benefited from improved access to irrigation; gained relevant knowledge from farmer training; benefited from new land parcels; and been affected by national policy reforms, such as those that affect fertilizer prices."	Andrew Tarter (MCC-GSI)	How do you plan to do this later if you were not able to do this in the pilot?		Our focus groups will be conducted separately from our household survey.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
125	p. 21	"Additionally, in our qualitative evaluation, we will interview and hold focus group discussions (FGDs) with women and younger beneficiaries to learn how they have benefited from improved access to irrigation; gained relevant knowledge from farmer training; benefited from new land parcels; and been affected by national policy reforms, such as those that affect fertilizer prices."	Andrew Tarter (MCC-GSI)	Earlier you indicated that titling was removed. And you also noted that all beneficiaries within the perimeter would receive land. So the entire n of the survey will have received new land parcels. So what is being proposed here?		A small number of women will receive use rights to land parcels through a community gardens model. This number is too small to justify a standalone study, but would serve as a useful group to include in our FGDs.
126	p. 22	Table IV.1. Evaluation design overview	Robert Fishbein	Correction of the role of UNOPS.		We accepted the change.
127	p. 22		Andrew Tarter (MCC-GSI)	The last sentence on the previous page still references land and training studies.		Those components of the MCC investments are still in place and will be the object of part of our qualitative analysis.
128	p. 22	"RQ1: Did the project components interact as envisioned during project design to reach a common objective? If yes, what facilitated the interaction and if not, why not?"	Andrew Tarter (MCC-GSI)	How will you determine this if a crucial part of the project is the farmer training components, which you have eliminated from the evaluation?		We have not removed farmer training from our evaluation, as we are still asking questions in both our survey and in our qualitative data collection.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
129	p. 22	"RQ3: Did PAP households experience changes in their household incomes, volumes, and value of agricultural products sold and traded, food and nutritional security, and production of cash crops? "	Andrew Tarter (MCC-GSI)	With the exception of food and nutritional security, the question refers almost exclusively to quantitative data.		Yes, this MCC research question aims to identify quantitative changes in these outcomes.
130	p. 22	"RQ9: Were the expected outputs produced by the activity?"	Andrew Tarter (MCC-GSI)	Forgive my ignorance, but I though outputs are quantitative and outcomes are qualitative. Why is the qualitative outcomes analysis implicated in a question about quantitative outpucs?		Outputs are the direct activities of MCC programs, such as providing trainings to X number of farmers. Outcomes are the effects such outputs have on matters of interest, such as household income, number of households skipping meals, etc. Outcomes are often quantitative. A qualitative outcomes analysis is applied to understand why or why not the intended outcomes were achieved. Whereas the quantitative questions answer "how many?" and "what?" questions, a qualitative outcomes approach answers "how?" and "why?"
131	p. 23	"RQ15: Were the expected outputs produced by the activity?"	Andrew Tarter (MCC-GSI)	See above question about outputs (quantitative), outcomes (qualitative), and the reference to the methodology as qualitative outcomes analysis.		See answer to #22.
132	p. 23	"RQ23: Did participants perceive that they learned new skills /knowledge? Did this vary by subgroup? If they didn't perceive learning/acquire new knowledge, why or why not?"	Andrew Tarter (MCC-GSI)	RQ23-RQ30 are retained here		These research questions still apply, even though the farmer training RCT has been dropped.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
133	p. 23	"RQ23: Did participants perceive that they learned new skills /knowledge? Did this vary by subgroup? If they didn't perceive learning/acquire new knowledge, why or why not?"	Andrew Tarter (MCC-GSI)	How, and why, if you are proposing to remove training analysis?		We are not removing farmer training from the evaluation.
134	p. 26	"Our evaluation will integrate findings from the impact and quantitative performance evaluations, the qualitative performance evaluations, and the revised ERR model to present a comprehensive view of the effects of the IMAP."	Hamissou Samari (M&E)	Does this mean that there are still elements of impact evaluation?		That was an oversight. We have removed impact evaluation from this sentence.
135	p. 79	"We are incorporating gender-disaggregated questions on aspects like income and labor supply in our survey instruments, and would welcome any comments on those."	Andrew Tarter (MCC-GSI)	MCC M&E has a typology for gender evaluations. Type 1 are evaluations that include gender in the logic, as the Niger M&E plan does. Type 3 collects gender disaggregated data only. This is a Type 1, and the design should reflect that.		Our incorporation of women's economic empowerment questions and questions about food and nutritional security align the evaluation with a Type 1 model.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
136	p. 79	"We use "outputs" here with reference to the logic model, so the household-level project outputs that would be assessed using a quantitative descriptive analysis would primarily consist of whether household members attended the various trainings, with their knowledge gains from these trainings representing "short-term outcomes."	Andrew Tarter (MCC-GSI)	On page 25 of this document you state: "We have categorized the evaluation questions into four groups corresponding to the question's position in the logic model and/or the area over which we anticipate the outcomes might take effect: (1) overarching questions related to implementation and sustainability, (2) questions about outcomes as measured at the level of individual beneficiaries, (3) questions related to the entire Konni perimeter, and (4) questions corresponding to changes affecting much or all of Niger." Above you say "level of individual beneficiaries" in reference to outcomes. To the right, in response to my earlier comments, you say "household" level in reference to both outputs and outcomes.		The survey is a household survey, but will be completed by individuals in the household.
137	p. 79	"We use "outputs" here with reference to the logic model, so the household-level project outputs that would be assessed using a quantitative descriptive analysis would primarily consist of whether household members attended the various trainings, with their knowledge gains from these trainings representing "short-term outcomes."	Andrew Tarter (MCC-GSI)	Here you say outputs		Attendance of a training would qualify as a project output.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
138	p. 79	"Since the trainings are likely to address topics that are unfamiliar to attendees, we do not believe that baseline values will be very informative. "	Andrew Tarter (MCC-GSI)	Your previous sentence says you want to look at knowledge gains from trainings. Thus, baseline data on knowledge levels prior to trainings would be informative. Self-reported pre- and post- knowledge changes conducted after the intervention are well-known for unreliability and bias.		That is correct. We believe the level of effort required to discern true knowledge gains is not commensurate with the importance of this question within the overall project logic.
139	p. 79	"Household income changes and changes in agricultural output are long-term outcomes in the logic model, and would be assessed using the pre-post analysis approach since baseline values are available and meaningful, and we want to get a sense of how much these outcomes have changed over the course of the evaluation."	Andrew Tarter (MCC-GSI)	Here you say outcomes		Gains in household income are an outcome for the project.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
140	p. 80	"Because the anticipated target group for the land allocation study are landless people - ie, by definition they do not have land on or off perimeter - linking the two would not be possible, as our Konni sample draws exclusively from PAP households."	Andrew Tarter (MCC-GSI)	Land reallocation. And very little of the land goes to previously 'landless' people. PAPs are different than beneficiaries. See earlier comments on this.		We had earlier thought more land for reallocation would be available.
141	p. 80	"We have dropped the land allocation study from this EDR as discussions with MCC suggest that there will not be sufficient land available to have a sufficiently large beneficiary group for an impact study. However, we look forward to having discussions early on regarding design characteristics for a similar study covering the Ouna and Sia-Kouanza perimeters."	Andrew Tarter (MCC-GSI)	Approximately 5% of current land holders in Konni perimeter are women (n = 245 women). And we anticipate they will all receive land in the perimeter, and that the number will actually increase slightly. I disagree that this number is not sufficient to do an impact study.		The impact study would be limited by the number of land parcels, not the number of women.
142	Farmer trainings	Evaluation of trainings	Andrew Tarter (MCC-GSI)	Which is correct? Does the design measure training impact estimates, or not?		RQ24 in question had been removed from the EDR. The design does not include any impact analysis questions on training.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
143	Farmer trainings	Evaluation of trainings	Andrew Tarter (MCC-GSI)	Since the design does provide impact assessments for income and productivity, even if it doesn't attribute such impact assessments to training, couldn't these questions above be used to determine correlations between receiving and applying training and changes to income and productivity?		The design provides no impact assessments because there is no comparison group for any part of the evaluation. Yes, changes in income could be correlated to training, but such comparisons would still be subject to omitted variable bias that could be driving both. For example, farmers who are motivated would be more likely to attend trainings and implement the recommended practices to realize income gains. Therefore a correlation between the two may be driven by a non-training factor, such as motivation.
144	Data collection	Price data removal	Andrew Tarter (MCC-GSI)	Can some trader price data collection be retained (as pertains to fertilizer and associations?)		We have clarified our in-country price data collection in VI.C.
145	Evaluation design	Perimeter-only focus	Andrew Tarter (MCC-GSI)	Couldn't such beneficiaries outside the perimeter serve as a comparison group with those inside, to help get at whether the receipt of irrigated land was correlated to higher agricultural yields and/or household income changes? Stated differently, if within-perimeter and without-perimeter beneficiaries received the same trainings from Market activity, but both groups did not receive land, data valuable to the ag/land team could be easily procured and knowledge inferred.		At the 12/12 EMC meeting, we reviewed the history of the decision to not pursue a comparison group for any component of the evaluation.
146	Evaluation design	Perimeter-only focus	Andrew Tarter (MCC-GSI)	Could this be a place to collect some of the training data and/or comparison group data that was nixed from the larger survey?		See answer to #40.
147	Evaluation design	Other	Andrew Tarter (MCC-GSI)	Why are these questions retained considering all points made above?		Those questions have all been dropped in the previous EDR version.
148	Evaluation design	Land allocation study	Andrew Tarter (MCC-GSI)	Can the WEAI be salvaged by divorcing it from the dropped land study? Or retained by only looking at large n of women recipients and comparing to an equal amount of male land recipients?		We are oversampling female headed households and incorporating questions on women's economic empowerment in a revised survey instrument.
149	Introduction	PAPs versus beneficiaries	Andrew Tarter (MCC-GSI)	Several places in EDR require revisiting definitions.		We have refined our definition and reference to PAPs and beneficiaries throughout.

Table C.1 (*continued*)

#	*EDR Page*	Section	Name & Sector	Comments & Questions	Suggestions	Response
150	Evaluation design	Removal of WEAI	Andrew Tarter (MCC-GSI)	Is the reason for dropping due to the WEAI being tied to the land study, or due to failure to secure women enumerators?		The WEAI questions will be replaced with a module on women's economic empowerment.
151	Evaluation design	Perimeter-only focus	Kaj Gass (AG)	My largest concern is the focus of "on the perimeter" beneficiaries. Is there a purposeful reason to not seek any impacts from the surrounding community development investments? There are RQs that ask about village savings loans, coop building and literacy but if the assessment is only delivered to irrigated-parcel-receiving-beneficiaries (IPRBs) then we are missing out on a pretty big chunk of community development which is more focused on women and youth. What would be helpful is some kind of Venn diagram that shows training overlaps. Obviously we could do that with typologies of trainees but cannot provide numbers.		During the 12/12 EMC meeting we discussed the complications associated with conducting an analysis outside the perimeter. We believe the knowledge gains would be limited, and the logistical costs of developing a sampling frame high. However, if MCC is interested in pursuing this, we could develop cost estimates for data collection.
152	Data collection	Yield measurement and remote sensing	Kaj Gass (AG)	When evaluating IPRBs (kind of joking on this acronym), are we relying on questionnaires to determine increases in productivity/uptake of training? I was initially concerned that Mathematica thought that remote sensing could be used instead. If it is just a verification tool then that should be fine. They also should consider that ONAHA will be evaluating production, though I think we're all on the same page that their estimates are a bit of a wag.		We will be using both household survey responses, and investigating whether satellite data can infill for in-between survey years.
153	Data collection	Price data removal	Kaj Gass (AG)	I also just had a thought on the pricing question. The cooperative sometimes acts as a purchaser of perimeter products. I think "Cooperative pricing" is a useful point to collect. Only somewhat related, I know nutritional/food security outcomes aren't a target of our programming but does the questionnaire touch on substitution for beneficiaries? For this I mean, even if beneficiaries aren't selling, let's say millet, in December, do we know the price they would have had to purchase that product for if they hadn't stored? I'm pretty sure I saw questions about how much of their produce they store for HH consumption so we should be able to match up.		We have made more explicit that price data will be collected from markets and cooperatives. We will be collecting price data on outputs, which will provide some insight into how much households would spend on various food items.

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APPENDIX D

LOCAL STAKEHOLDER COMMENTS

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Table D.1 Local Stakeholder Comments

FR EDR Page Number	MCA-N Comment	Mathematica Response
2	Qu'est ce qu'un producteur de contact? Dans le cadre du service d'accompagnement agricole, on parle de producteurs leaders qui seront formés par un Consultant (notamment Cowater Sogema) et qui seront tenus à leur tour de former les autres producteurs sur des techniques de production innovantes.	A contact farmer is the CEP member who receives the training from Cowater Sogema, and I believe is the same person as what you are calling the "leading producer." We view the term "contact farmer" as more generic than "lead farmer" which in some contexts connotes being a better, richer, more successful farmer. We believe that contact farmers will not be selected based on those relative characteristics, based on earlier discussions with MCC who have communicated a preference for working with "peer farmers" over "lead farmers."
7	Ce Chiffre n'est pas pour l'instant validé. Les études techniques APS/APD/EIES en cours dans la zone détermineront exactement la superficie des terres à aménager.	We have indicated that this is an approximate figure and look forward to receiving a final value once the technical studies have been completed.
8	Il serait bien de préciser la période, sachant que selon les dernières informations, l'Entreprise chargée de réaliser les travaux serait recrutée en juin 2019.	We have revised the language in the text to "are scheduled to commence" to reflect that this is not a finalized timeframe. The timetable for planned implementation activities appears in Table VI.1
13	Le plan de Suivi Evaluation fait état d'un TRE de 17% pour le Projet Irrigation et Accès aux marchés et pour l'activité de développement des périmètres irrigués, il est mentionné 11% pour Konni, 11% pour Ouna Kouanza et 6% pour Sia.	We agree, but since there is not a roads component for the Konni perimeter, we believe it is best to state the ERR only for the IDP and MSMF activities, as per Table 4 in the March 2018 M&E Plan.
13	Effectivement, la réforme vise une réduction du prix des engrais à 30%	We have incorporated this detail in the text where your comment was made.
21	la question liée à la propriété foncière des femmes. L'expérience développée au Rwanda serait un peu difficile à dupliquer au Niger compte tenu du fait de couple polygame et des risques de répudiation des femmes qui quitteraient alors leur foyer pour la maison familiale d'origine.	That is a fair point - thank you for raising that.
22	il serait plus réaliste de fonder les hypothèses sur l'éventualité d'acquisition de parcelles maximum aux femmes. La sécurité foncière des femmes pour le cas de Konni, serait le maintien du nombre présent sur le périmètre à travers leur enregistrement sur les titres fonciers et l'affectation d'une proportion raisonnable aux groupements féminins sur les réserves aménagées après satisfaction des PAP. Alors, autant proposer autre méthode pour évaluer le lien entre le foncier et l'autonomisation des femmes	We will no longer be carrying out the land allocation study because of statistical issues arising from the small number of plots slated to become available for reallocation.

Table D.1 (*continued*)

22	En effet, dans le cas de figure ci, à Konni, la location des terres sur le périmètre est interdite.	Thank you for that. We have removed reference to land rentals in the literature review, because they are not relevant to the Konni perimeter context.
23	Suite aux consultations publiques sur les principes et critères d'attribution des terres sur le périmètre irrigué de Konni, il a été retenu que les femmes bénéficient de 30% de la réserve foncière. Il faudrait aussi rappeler ici, que comme mentionner plus haut, la location des terres à Konni sur le périmètre est interdite, cependant, les femmes sont les principales exploitantes non détentrices, en opérationnalisant cette règle, le projet contribuerait à rendre encore plus vulnérables ces femmes exploitantes. Des réflexions doivent être meneées afin de mitiger ce risque.	That is an important observation and an insight that should be shared with the Land team. Mathematica is not in the position to act on this observation, but welcome any recommendations for outcome indicators that could be useful in monitoring such concerns.
43	De l'ONAHA ou des Coopératives ? il me semble que ce sont les coopératives qui s'occupent des aspects d'O&M et que à présent ce serait aux AUEI d'assurer cette fonction	That is helpful - we have removed reference of ONAHA being tasked with overseeing O&M.

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