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Quasi-experimental Impact Evaluation (ex-post) of IFAD's AD2M Project in Madagascar

Final Report

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Abbreviations and Acronyms

AD2M	Appui au Développement du Menabe et du Melaky (Support for the Development of Menabe and Melaky)
AIR	American Institutes for Research
ATET	average treatment effect on the treated
ATW	Around The World
CEPs	champs écoles paysans (farmer fields schools)
GIS	geographic information system
IFAD	International Fund for Agricultural Development
IPWRA	inverse-probability-weighted regression adjustment
MGA	Malagasy Ariary
NDVI	normalized difference vegetation index
SRA	système de riziculture améliorée (improved rice system)
SRI	system of rice intensification
WUA	Water User Association

Acknowledgements

Plain-Language Summary

Background

Farmers in western Madagascar live in an arid region that makes it difficult to survive on their own production. As in many other regions in less developed countries, there is a big initiative to improve agricultural production. Agricultural development is particularly important for a country like Madagascar, with 77.8% of the population living in rural settings (Rasambainarivo & Ranaivoarivelo, 2003). In such a dry region, it is important to understand whether large-scale investments in irrigation infrastructure can improve outcomes for smallholder farmers. To do so, we focused on crop yields, cropping in multiple seasons and improved agricultural practices. We identified these outcomes as key indicators of improved agricultural livelihoods.

Appui au Développement du Menabe et du Melaky (AD2M) farmers had the opportunity to change the way they grow crops. The programme created new irrigation infrastructure in areas that had not been irrigated, and rehabilitated existing irrigation infrastructure when possible. The irrigation allowed farmers to use better agricultural techniques. For example, they potentially could manage water flow to crops better during the primary growing season, and could support a second growing season with the more efficient water supply. We would expect crop yields to increase if farmers followed these techniques.

Evaluation findings

We found meaningful improvements in the AD2M project beneficiaries' agricultural productivity. Annualised rice yields were estimated to be about 25% greater for treated versus control households, and annualised total value of crop production per hectare was estimated to be about 16% higher for treated versus control households. Focus group discussions with farmers revealed that they attribute the increased rice production to improved irrigation and adoption of the row-cropping method. Evidence also suggested that most of the gains in the treated communities came from the ability to crop in the second season; treated households were much more likely to crop more than one season. AD2M also improved access to extension services and trainings, as well as the use of purchased inputs. Finally, treated households also worried less about finding food than did untreated households.

AD2M was effective in improving the delivery of water. Farmers in AD2M communities were 15 percentage points more likely to report receiving their water on time. The timing is important because crops can fail if water is unavailable at key points in the growing cycle. Farmers also were 26 percentage points more likely to report that their irrigated water was of good quality. Access to irrigation can only improve farming outcomes if it is of sufficient quality.

Results suggest that household welfare increased due to the intervention. The value of crop production per capita increased by 13.6% for AD2M beneficiaries. Agricultural production is a primary source of income for rural farmers; thus, we expect the increased crop value to contribute to greater income. Non-monetary measures of household welfare also improved. Beneficiary households reported worrying about food 10.3% less often over the prior week than

comparison households. Households benefitting from AD2M owned 1.04 more durable consumer items than comparison households. Qualitatively, respondents reported that individual incomes indeed increased as a result of increased rice yields. Respondents indicated that purchasing power increased and that more people had become able to live in stone or brick houses.

Qualitative data confirmed that AD2M introduced, and encouraged farmers to grow, new crops, with the most frequently mentioned being onions, beans, peanuts and tomatoes. Farmers in focus group discussions shared their belief that multi-cropping improved soil quality, and many reported continuing to grow these new crops today. Curiously, the farmers reported little crop expansion during the quantitative survey. Rice, cassava, and beans/pulses were common crops in the area for all farmers. Other crops were far less common.

On the negative side, some respondents reported increased tension as a result of AD2M. There appears to have been a division between farmers that cooperated with AD2M and those that did not, as well as a general mistrust of Water User Association (WUA) members among non-WUA farmers. Despite the tensions between AD2M, farmers in intervention areas were 10% more likely to engage with extension workers. So, farmers still felt it worthwhile to engage with extension workers.

Recommendations

As with other ex-post evaluations, one must consider the limitations of the study. The Appui au Développement du Menabe et du Melaky project was implemented in areas that were more agriculturally and hydrologically promising. Therefore, we cannot rule out that there were underlying differences between treatment areas and comparison areas, despite our efforts to avoid this.

One recommendation to keep in mind for future irrigation programming is to be mindful of the seasons when planning activities. Farmers expressed frustration that some AD2M activities were poorly timed, such as dam repairs in Mahabo during the rainy season. A second recommendation is to place more emphasis on initial sensitization to the program and community engagement; some farmers felt they were not consulted about program activities and were left out of key decisions. Community surveys suggest that AD2M WUAs may have even simply replaced existing, functioning farmers' associations. A third recommendation is to invest in higher quality irrigation materials. Qualitatively, farmers reported that infrastructure was not durable once AD2M left. Quantitatively, only 40 percent of treated farmers felt the irrigated water was of good quality. Although higher than in control areas, this rate remains low. Finally, the findings from our evaluation underscore the importance of maintaining clear communication with community members throughout program implementation (especially when taking an important action such as a water cut) and including modes of communication appropriate for illiterate community members.

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I. Introduction

We evaluated the impact of access to newly constructed or rehabilitated irrigation in western Madagascar. Access to irrigation is an important way to increase food security for farmers otherwise dependent on much riskier, rain-fed agriculture. Climate change increases the need to protect farmers from weather shocks that negatively impact agricultural yields. This is particularly true for farmers in the Appui au Développement du Menabe et du Melaky (AD2M) target regions of Menabe and Melaky in central western Madagascar, where farm households currently face very high levels of poverty and malnutrition.

Research has frequently shown that many projects that aim to increase the area under irrigation have not led to the hoped-for gains (Branca, Lipper, McCarthy, & Jolejole, 2013). There are a number of reasons cited in the literature, including the quality of initial feasibility studies, the quality and appropriate location of irrigation infrastructure, and the efficacy of governance put in place to regulate water uses and users and ensure maintenance of irrigation infrastructure.

The research questions addressed in this report, covering the impact of irrigation on crop production and stability of crop income, provide much-needed evidence on the likely gains to farmers from future irrigation interventions in Madagascar. The descriptive analysis of information on infrastructure construction, management and maintenance will shed light on the relative importance of these components in generating gains at the farm level. The potential implications of the research are threefold: 1) results will provide evidence on the gains from irrigation that policymakers can compare to other potential investments to increase food security; 2) results will inform the importance of construction, particularly management and maintenance, in ensuring sustainable gains; and 3) results will highlight how future irrigation projects could use impact assessments to gain further valuable evidence on the importance of beneficiary targeting, irrigation management mechanisms and maintenance activities.

Most of the empirical evidence regarding yield and household income gains from irrigation indicates large increases, at least when infrastructure is well built and governance of the irrigated areas functions well (Hussain & Hanjra, 2004). In the case of Madagascar, Jacoby and Minten (2005) documented a large, statistically significant increase in yields and net revenue per hectare on irrigated lands compared with non-irrigated lands—an increase of approximately 30% for both. This study also found a 30% increase in rice yields (we considered only the main season rice yields and net revenues, so annual increases in net revenue could well be higher if the off season were taken into account). Thus, the empirical literature supports the hypothesis that having access to irrigated land should lead to increases in yield, net crop revenues and marketed surpluses. Oddly, though irrigation is often seen as a way to reduce risks associated with rain-fed agriculture, the empirical literature for developing countries, particularly outside of Southeast Asia, is less thorough in quantifying the benefits of more stable crop income, though Nakano and colleagues (Nakano, Bamba, Diagne, Otsuka, & Kajisa, 2013) present some evidence on yield and income stability in six sub-Saharan African countries. We add to the body of literature with this study, finding that irrigation caused an increase of roughly $45 in crop income over the previous year.

The purpose of this evaluation is to provide evidence on the effectiveness of irrigation in promoting more stable crop production and improved farmer livelihoods. This goal is particularly relevant for AD2M because a second phase of AD2M is to be implemented in new areas. Key AD2M staff have expressed great interest in using the results of this evaluation to better understand how they can improve their upcoming work.

We use quasi-experimental matching techniques to quantify the impacts of AD2M irrigation on beneficiaries. We compare AD2M beneficiaries to comparison farmer households identified using inter-temporal geographic information system (GIS) analysis. We find that the total value of production increased by 25% to 30%, and the value of the rice harvest increased by about roughly as much. At the same time, our findings raise concerns about the longevity of these impacts after the AD2M project is completed.

Section II discusses the theory underlying the AD2M intervention and the focus of the evaluation. Section III outlines the evaluation methodology. Section IV gives the key findings of the study. Section V discusses the validity of the findings. Section VI discusses policy implications and concludes the report.

II. Research Focus

Context

Agriculture is the most common livelihood for residents of Madagascar, employing 75.3% of the rural population and accounting for 28.2% of the gross domestic product.[1] The AD2M project implemented irrigation, land titling, trainings, and related rural development programmes in 19 communes (groupings of villages) throughout five districts in western Madagascar: Belo sur Tsiribihina, Mahabo and Miandrivazo in the Menabe region and Antsalova and Maintirano in the Melaky region. Agricultural terrain in these areas is typically either flat coastal delta valleys or terraced hillsides. The valleys are well suited for agricultural exploitation, whereas the hillsides are subject to erosion. The months of November to March bring warm temperatures and increased rainfall, and the months of April to October are drier and cooler. The west of Madagascar is generally considered a dry area because storms from the Indian Ocean deposit their rain on the eastern slopes of Madagascar's highlands. The regions of Menabe and Melaky are similar to rest of the country, which has an overall poverty rate of 76.5%, with 50% of the population affected by climate-related shocks and environmental degradation. However, the two regions differ from the rest of the country in that they are subject to far less rainfall.

Agriculture in Menabe and Melaky resembles agriculture in much of the rest of the country. The typical farmer grows primarily for subsistence and exploits a small area of land. Many of the techniques the farmers use are sub-optimal either in terms of yields or in terms of environmental impact. For example, farmers rarely employ SRI ("system of rice intensification"), a method of transplanting and spacing seedlings, despite its improved output. Farmers also employ slash-and-burn methods for increasing the land available to them for crops—a practice that is

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[1] World Bank, WDI 2012.

counterproductive in both the short and long term. AD2M promoted improved agricultural practices and provided irrigation to 5,508 hectares: 3,313 hectares of new irrigation and 2,195 hectares of rehabilitated irrigation.

The AD2M programme arrived at a time of political turmoil in Madagascar. A sudden change in the presidency in 2009 led to turmoil that effectively halted government development activities. Furthermore, a number of donors withdrew funding for programmes in Madagascar until democratic rule was re-established. This led to a paucity of other interventions during the period from 2008 to 2014. However, even though foreign aid increased after presidential elections, economic growth has remained low, at a rate of 3.3% in 2014 and 3.4% in 2015. To summarise, AD2M began when there was a great need for interventions that would spur improved livelihoods.

In the mid-2000s, the government of Madagascar began adopting laws and implementing policies aimed at empowering the poor and decentralising administration and public services. Land reforms and decentralisation of land offices were a strong focus of this process, beginning in 2005. Project activities began in 2007. The political crisis in 2009 delayed activities significantly, but the land reform and other decentralisation plans were continued under the new government. At the same time, despite relatively generous rainfall and water resources within the country, many farm households remained mired in poverty and vulnerable to the vagaries of weather. This situation was particularly intense in the two regions of Menabe and Melaky, where farmers focus heavily on rice production but many also undertake a range of other income-generating activities, including agricultural wage labour, raising livestock, and the production of some cash crops (for example, groundnuts and sugarcane). The project's goals were to support the government's land decentralisation and certification process and to increase the ability of poor farm families to increase agricultural production sustainably and market their produce. Irrigation was seen as a key activity, particularly as it leads to not only higher production but also more stable production.

Intervention

The AD2M project is organised around three components (and eight subcomponents): component 1, support for local governance and land tenure security; component 2, support for sustainable development of the productive base; and component 3, project management and monitoring and evaluation. Its implementation was planned to take place over a period of 8 years beginning in 2007.

The intervention itself focused on tenure security and more productive, stable and sustainable agricultural incomes. The first component included activities directly related to local land governance and tenure security. With respect to land governance, activities included land use diagnostics, the development of local land use plans, and the establishment of 14 land offices, as well as numerous trainings on land administration and legal rights related to land for land office staff, local leaders and community members. With respect to tenure security, through support to the land offices, 8,840 land certificates were issued. The second component focused on promotion of technologies and practices to increase agricultural production, including increasing access to irrigation, introduction of new seed varieties, promotion of additional cash

crops (e.g., onions), increasing access to agricultural equipment, and increasing access to markets through road construction, waterway infrastructure and micro-finance kiosks. With respect to irrigation specifically, the project hired consultants to perform detailed irrigation feasibility studies to identify irrigated areas in need of rehabilitation and sites for new irrigation infrastructure. The feasibility studies included detailed information on hydrological and topographical features, rainfall, the size of the irrigable area and cost estimates for irrigation infrastructure, and basic information about socioeconomic characteristics of potential beneficiaries. Of 62 sites considered, 36 were considered feasible; of these 36, 18 sites received new or rehabilitated infrastructure.

The project targeted 57,000 households in five groups, including, in order of priority, (a) landless agricultural wage earners with no productive assets and no cattle, (b) households with small, non-irrigated landholdings (less than two hectares) and no cattle, (c) households primarily dependent on fishing the regions' watersheds, (d) households with small irrigated landholdings (less than two hectares) and fewer than 10 cattle, and (e) households primarily dependent on raising cattle. AD2M anticipated that this programme would affect 40% of the rural population of the Menabe and Melaky regions. The number of beneficiaries was estimated at 342,000, out of a total estimated population of 586,000 in the intervention area (i.e., 58%).

The project involved co-financing and strategic partnerships (technical and financial) with the Millennium Challenge Account, the European Union's ACORDS programme and the SAHA programme of the Swiss Agency for Development and Cooperation. Implementation of these activities were entrusted to partner organisations or specialised service providers (non-governmental organisations, consulting firms, private companies, de-concentrated technical service providers, etc.) from the Menabe and Melaky regions.

Theory of change

The evaluation focused on the household-level outcomes and impacts from access to certificated irrigation land. We used information collected on other project activities as control variables to account for regional variation in other AD2M interventions. Although the evaluation focused on irrigated land, below we present the theory of change for the entire project, including both the certification and irrigation activities that were the focus of this evaluation, as well as all other project inputs for which we collected data (and which we controlled for in the analysis).

The figure reads left to right, in order of events. First we identify the initial conditions that made the AD2M intervention necessary. Then we briefly describe the activities that would initiate change. Next we identify the immediate outcomes that follow from the program's activities. Finally we show the ultimate impacts of the AD2M interventions.

Figure 1: Theory of change

Initial conditions	Activities/Inputs	Intended outcomes	Impacts

Initial conditions

- Low rice yields despite favourable water sources
- Low adoption of new crop varieties
- Heavy household reliance on rice as staple
- Sustained degradation of natural resource base
- Transportation and market infrastructure

Activities/Inputs

- New and rehabilitated irrigation infrastructure
- Increase local organization capacity through workshops
- Demonstration sites and trainings on sustainable land management
- Construction of rural roads and water transport infrastructure
- Construction of market infrastructure
- Development of community land use maps and agricultural development plans

Intended outcomes

- Implementation of agricultural development plans to improve communal natural resource management
- Farmers increase investment in sustainable land management practices
- More farmers participate in second and third crop season, intensifying land use
- Households have more diverse agricultural production and income
- Households have greater marketable surplus
- Increase in land productivity through better soil quality, reduced erosion and better water management

Impacts

Support local governance

- Improved community-level land use and management
- Increase yields from certified land
- Increase in soil and land management practices under certified land
- Higher and more stable farmer incomes

Support for the sustainable development of the productive base

- Higher and more stable famer incomes
- Present and future household welfare gains

Assumptions

- Land administration offices are created.
- Financial support and trainings are sufficient to ensure sustainable land management.
- Training and land use tools are adapted to existing and new institutions.
- Information campaigns inform farmers on how to obtain certificates.
- Quality of irrigation infrastructure and regulating irrigated areas leads to stable irrigation water and increases rice yields.
- Trainings provide farmers with sufficient information to profit from wider range of crop outputs and markets.
- Increases in yields and production are enough to cover household needs, and farmers are incentivized to increase their marketed surplus through marketing infrastructure.
- Tree seedlings are protected through re-forestation activities, trainings increase knowledge of the benefits of sustainable land management and certification and communal management incentivize farmers to adopt soil and land management practices on the farm.

Research questions

Given that AD2M is a complex project with many activities, we could not separately evaluate the impact of individual activities. Because many of the activities were related to increasing crop production and land productivity, we focused on these variables as key measures of project impact. Because there is pre-existing irrigation infrastructure throughout this area of Madagascar—meaning that control households were likely to have access to irrigation as well—we precisely selected controls for our analyses to ensure similar levels of access to irrigation at the beginning of the AD2M project. The distinguishing impacts of AD2M on crop production are hypothesized to occur through three main channels: 1) expanded irrigation plots with certificated rights, 2) higher quality irrigation infrastructure, and 3) other project activities, such as trainings, aimed at increasing crop productivity and overall farm incomes.

The key crop production research questions are as follows:

1. Did treatment lead to increases in 1) rice yields, 2) quantity of rice produced per capita, 3) total value of irrigated crop production, and 4) value of crop production per capita? Our analyses assessed the extent to which crop income increased. These outcomes are closely associated with higher average yields and crop income.

2. Did treatment enable farmers to increase the number of cropping seasons within the year and to have a more diversified crop portfolio? These outcomes are closely related to stability in income, both within the year (greater production throughout) and across years (more diversified crop portfolio).

Answering the above research questions enables us to draw conclusions about the extent to which farmers obtained higher and more stable incomes. We can also assess whether AD2M households were more likely to adopt crop productivity-enhancing practices and inputs, which helps us understand how higher and more stable crop production is generated. This leads to the following key research question:

3. Did treatment lead to an increase in sustainable land management practices or adoption of cash inputs?

Additionally, for the subset of households with access to plots in an irrigation scheme, we can evaluate the extent to which treatment induced better performance of WUA's in maintaining and governing the irrigation system, as follows:

4. Given the importance of well-functioning WUAs in maintaining irrigation infrastructure and regulating water use, did treatment lead to better WUA performance?

Finally, though the dataset is not powered to evaluate whether different subgroups exhibit heterogeneous impacts, we can use estimated coefficients and standard errors from our estimations to determine whether estimated treatment effects are different for certain control variables. We perform this type of heterogeneity-of-impact analysis on three variables: 1)

whether any plot managers in the household were women, 2) whether any plot managers had any schooling, and 3) the proportion of households within a village that accessed any source of credit. Interpreting these results must be done with care, as they are only suggestive, given the power of the sample.

AD2M Project Activities and Timeline

Table 1 illustrates the timeline of AD2M project implementation.

Table 1: IFAD Madagascar AD2M Project timeline

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016/17
Administrative Activities											
Approval of the project by the IFAD Executive Board	▓										
Signature of loan agreement	▓										
Establishment of the regional and national Steering and Follow-Up Committees	▓										
Start-up workshop	▓										
Entry into force of IFAD Loan No. 689-MG and Grant 849-MG	▓										
Technical Activities											
Component I: Support for local governance and land tenure security											
I.A Support to producers organization and strengthening local actors				▓	▓	▓	▓	▓	▓	▓	
a. Mobilizing producers and supporting their organizations				▓	▓	▓	▓	▓	▓	▓	
b. Support to rural communities and regions					▓	▓	▓	▓			
c. Functional literacy					▓	▓			▓	▓	
d. Boosting projects for the most vulnerable					▓	▓	▓	▓	▓		
I.B Support for land security		▓	▓	▓	▓	▓	▓	▓	▓	▓	
a. Construction and rehabilitation of buildings		▓	▓	▓	▓	▓	▓	▓			
b. Delivering land certificates		▓	▓	▓	▓	▓	▓	▓	▓	▓	
c. Micro-projects for the most vulnerable		▓	▓	▓	▓	▓	▓	▓	▓	▓	
Component II: Support for the sustainable development of the productive base											
II.A Rural development				▓	▓	▓	▓	▓	▓	▓	

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016/17
a. Hydro-agricultural development				■	■	■	■	■	■		
b. Rural road track development				■	■		■	■	■		
II.B Agricultural development and preservation of natural resources				■	■	■	■	■	■		
a. Agro-ecological sites and reforestation					■	■	■	■	■	■	
b. Agricultural intensification and diversification				■	■	■	■	■	■	■	
II.C Commercialization and rural financing					■	■	■	■	■	■	
a. Providing and installing farming tools workshops					■	■	■	■	■	■	
b. Commercialization activities					■	■	■	■	■	■	
c. Rural financing activities					■	■	■	■	■	■	
Component III: Monitoring, evaluation and learning											
III.A Internal Program Monitoring and Evaluation					■	■	■	■	■	■	
III.B Independent External Evaluation											■

Rice cultivation/multi-cropping/row cropping trainings

In order to dispense these trainings the project put in place farmer fields schools ("champs écoles paysans," or CEPs). This was the project's main tool regarding agricultural intensification and diversification activities. The CEPs consisted of workshops/classes organised to train participants on farming techniques for various types of crops (rice, beans, lentils, onions, peanuts and apiculture). By the end of 2014, the project had held 863 CEPs (compared with an original target of 590), affecting 18,007 beneficiary farmers (122% of the targeted 14,750). Farmers put the CEP techniques in place on 6,135 hectares of land (104% of the target of 5,900 hectares).[2]

WUA trainings

As of December 2014, 992 members in 161 WUAs had received training. Participants were trained on irrigation management and systems for recovering maintenance fees for WUAs. Participants also received training on group governance.

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[2] Rapport de supervision, 2014

III. Evaluation: Design, Methods and Implementation

This evaluation uses matching techniques to study the impact of the AD2M program using surveys with 1,454 households. Qualitative research used 18 key informantant interviews and 16 focus groups discussions. Data were collected in Mahabo and Belo Sur Tsiribihina during November and December 2016.

Sample selection

In collaboration with IFAD and AD2M local officers, and through the observation-based and criteria-based targeting approach, we identified potential treatment and comparison areas for inclusion in the study. Including comparison areas helped address concerns about not capturing the true impacts because of spillover effects into neighboring areas. One of the key criteria for comparison areas was that they be potentially irrigable sites that were nonetheless not selected to receive irrigation infrastructure under the programme's first phase. AD2M provided detailed feasibility studies it had performed for every site; of the sites studied, 36 were considered feasible, and the project undertook activities in 24 irrigated areas ("perimeters") at 18 sites. The feasibility studies also included basic information on predominant crop practices and other characteristics that further aided us in selecting control areas.

The evaluation aimed to survey 1,950 households, split between 650 treated households and 1,300 controls (see calculation below). The AD2M project also provided data from household questionnaires it had administered in 2007 and 2015; the 2007 questionnaires had also been augmented with further information in 2009. The 2007 and 2015 data sets were not longitudinal. In both cases, some information was collected from non-treated villages, though the number of potential control households was very small (245 of 1,450 households in 2015). Nonetheless, the data sets enabled us to triangulate evidence from the extant literature on rice crop yields and annual crop incomes, enabled us to calculate village-level intra-cluster correlation coefficients (household-level outcomes on rice yields, value of rice production and value of total crop production, clustered at the village level), and allowed us to explore the extent to which household covariates explained rice yields.

Analysis at project inception also enabled us to design a better filter questionnaire. The filter questionnaire ensured that only those potential comparison group farmers who were most similar to the treated farmers remained in the final sample. By including a filter questionnaire that eliminated dissimilar farmers, we ensured that project resources spent on the full household survey were allocated to those farmers most relevant to the study, and reduced the overall time burden associated with the survey (because we administered the survey only to the relevant farmers).

The evaluation study's sample was designed to provide enough statistical power to identify impacts above a reasonable threshold. Using the data collected for this study, we conducted power calculations to determine what size of impact we could expect to detect; the study is sufficiently powered to detect a 0.348 standardised-mean-difference impact. Appendix E further explains the details of the power underlying the evaluation's analysis.

The research team maintained careful processes to ensure accurate data. ATW implemented data collection activities under the supervision of AIR and Lead Analytics. Quantitative surveys were administered on pre-programmed tablets. Prior to data collection, ATW provided the research team templates for data collection. There were extensive discussions to revise survey instruments to minimise the challenges that would arise in the field. Dr. Morey, the research team's quanitative researcher, travelled to Madagascar to assist in data collector training. During data collection, ATW communicated regularly about successes and challenges encountered in the field. Throughout the roughly six-week data collection, ATW sent the research team batches of completed surveys. AIR and Lead Analytics conducted rigourous and systematic data checks to verify data quality.

Qualitative data collection followed similar quality assurance processes. Ms. Ring, the co-PI, travelled to Madagascar to assist with data collection training. She also travelled with the data collection team to Mahabo to participate in the first week of focus group discussions and key informant interviews. ATW used digital voice recorders to enable professional transcription and translation of all interviews and focus groups. As ATW completed and processed qualitative transcripts, they sent them to the research team in batches. Two researchers then reviewed the transcripts and coded them on the basis of the established analytical framework. In addition to the triangulation between researchers that occurs during the data coding and analysis phase, responses from individual participants in the AD2M evaluation were also triangulated with those of other respondents. Protocols were designed in such a way to document the experience and perspectives of those impacted by the program (e.g., program implementers, government stakeholders, local leaders, and groups of WUA members and non-WUA farmers across two districts) on shared topics, events, and issues related to the AD2M program. By asking similar questions about common themes and issues across these groups, researchers were able to identify areas of convergence and divergence among participants.

Quantitative estimation strategy

Given the complexity of the project, we focused on the parts of the programme promoting irrigation in Menabe. Households in Menabe all received ownership certificates to their irrigated plots, whereas those in Melaky did not; resources prevented us from evaluating two different treatments. Although we controlled for benefits of other project activities in the analyses, we were not be able to evaluate these activities separately, as different activities were undertaken in different areas (e.g., transportation infrastructure projects). Our impact estimates, therefore, measure the impact of irrigation only for those whose land was titled.

All of the analysis results reported here and in the appendixes use a double-robust estimator specification. Specifically, we use Wooldridge's inverse-probability-weighted regression adjustment (IPWRA) estimator (Wooldridge, 2010), implemented with the IPWRA command in STATA. This estimator models both the treatment probability and the outcome, and is considered double robust because consistent estimates of the treatment effects are obtained even if one of the two models is mis-specified (Bang & Robins, 2005; Scharfstein, Rotniztky, & Robins, 1999). Given limited data on household characteristics for the period preceding project implementation, we might expect that our treatment specification would be more noisy than a

longitudinal sample, and, indeed, our estimated propensity scores exhibited a fair amount of variability. As pointed out by Sloczynski and Wooldridge (2016), the Wooldridge (2010) weighted estimator is less sensitive to relatively high variation in the propensity score, which led to the choice of IPWRA over other double-robust estimators (such as the augmented inverse-probability-weighted estimator). Though double-robust estimators do have advantages, there remains the possibility that relevant variables that have been omitted from both of the model equations can cause biased estimates.

For continuous outcome variables, we specify a linear regression for the outcome equations and specify probits for dichotomous outcome variables. To model the average treatment effect on the treated (ATET) within the context of the IPWRA model, we followed Hirano and Imbens (2001). The weighted least squares regression capturing ATETs and allowing for additional covariates can be written as follows:

$$Y_i = \alpha_0 + \tau T_i + \alpha_1 Z_i + \alpha_2 (Z_i - \bar{Z}) T_i + \varepsilon_i, \qquad [1]$$

where Y_i is our outcome variable of interest, T_i is our indicator for treatment, Z_i is a vector of co-variates in the outcome equation, $\bar{Z}$ is the sample average of Z for the subsample of treated households, ε_i is the error term, and τ, α_1 and α_2 are parameters to be estimated. Our weights are given by:

$$\omega(t, x) = t + (1 - t) \frac{\hat{p}(x)}{1 - \hat{p}(x)}, \qquad [2]$$

where $\omega(t, x)$ is the weight applied, t represents $T_i = 1$, $\hat{p}(x)$ is the estimated propensity score and x is a vector of covariates.

Finally, the ATET is estimated using the comparison of average predicted outcome values ($\hat{Y}$) for treatment households to average predicted values for comparison households:

$$ATET = E[\hat{Y}|T_i = 1] - E[\hat{Y}|T_i = 0], \qquad [3]$$

Qualitative estimation strategy

After transcription, all qualitative data collected during the AD2M evaluation were imported into the NVivo qualitative software program. Then a series of steps were followed by two qualitative researchers from AIR to sort, code, analyze and interpret the data. The analysis team created a preliminary coding scheme on the basis of the original research questions, interview protocols, and field notes regarding themes that emerged during data collection. This thematic coding outline served as the tool to initially index, sort and organise the data gathered from interviews and focus group discussions.

Once the data were organised in this way, the analysts reviewed the data extracts to identify and compare patterns and emerging findings within and among themes and cases, examining

differences in perspectives among groups, contradictions, and any key findings and themes related to the research questions. At the beginning of the coding process, the two analysts selected a sample of interviews to both code so they could then compare and discuss their findings, ensuring inter-coder reliability. During the process of coding and analysis, researchers met to discuss new themes that had emerged and any other necessary revisions to the coding scheme (e.g., deletions, recategorizations, clarifications) and to compare similarities and differences in thematic analysis.

Both qualitative researchers separately coded the first two full focus group discussion transcripts and then performed a coding comparison query through NVivo to determine their level of agreement. The comparison query revealed an overall agreement percentage of 98.1%, indicating a high level of consistency between the two researchers in the interpretation of data and indicating clarity of the coding scheme.

Evaluation timeline

Table 2 illustrates the timeline of the AD2M impact evaluation.

Table 2: Evaluation study timeline

Activity	Project Year (August 2016 – August 2017)												
	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Inception		X											
Finalising research design		X	X										
Developing survey instruments and interview protocols		X	X										
Quantitative evaluation													
Selection of treatment and control areas			X										
Piloting instruments			X	X									
Data collection			X	X	X								
Data entry and cleaning				X	X	X	X	X	X				
Geographic information system (GIS) analysis				X				X					
Quantitative analysis						X	X	X	X	X			
Qualitative evaluation							X	X	X	X	X		
Key informant interview, national level				X	X				X				
Key informant interview, regional level				X	X								
Key informant interview, commune level				X	X								
Focus group discussions, commune level				X	X								
Analysis of qualitative data						X	X	X	X				
Reporting									X	X	X	X	
Presentation													X

The above schedule was at times disrupted or deviated from because of unanticipated events. Our data collection team was unable to access one of the irrigated perimeters in the town of Belinta because of a mix of security issues, poor roads and inclement weather. Our timeline also had to be modified to allow for a GIS analysis that had not been planned for during the evaluation's inception phase.

IV. Impact Analysis and Results

All findings are based on data collected in late 2016. We collected quantitative data on tablets using Open Data Kit technology to provide safeguards against errors in recording survey responses. The programme would provide real-time error messages if households answered questions in a way inconsistent with their prior responses. The data collection firm's staff provided data to the research team as they collected it to allow AIR and Lead Analytics to conduct data checks. We received qualitative data from 34 sources in total, coded by two qualitative researchers using NVivo software. We drafted coding nodes with input from both qualitative analysts on the basis of knowledge of the project and the questions being asked of individuals and focus groups. Both researchers coded the data from the first two focus groups. Once a high level of agreement (98.1%, discussed above) was confirmed, the analysts individually coded the remaining 32 data sources. The analysts met frequently to discuss their findings to make sure consistent themes were being uncovered, and asked questions related to coding as they arose.

Outcome variables

Our primary outcome variables included the annual value of production per hectare cultivated, the annual value of production per capita, annual rice yields and annual quantity of rice harvested per capita. In addition, we evaluated project impacts on crop input and crop management variables, measures of household welfare outcomes and measures of the performance of the irrigation system. With respect to crop input and management variables, we considered whether the household received any agricultural extension advice, whether they attended a training on any agricultural topic, whether they invested in any mechanical soil and water conservation measures, whether they invested in any biological soil and water conservation measures, the number of cattle held and the number of oxen held, the proportion of plots on which they applied inorganic fertiliser, whether they used pesticides on any plot, whether they used herbicides on any plot, and whether they cultivated any plot in the second or third seasons.

With respect to household welfare measures, we included whether the household reported having worried about adequate food during the prior 7 days, whether the household had faced a situation of too little food in the past 12 months, the number of consumer durables owned, education expenditures, and whether any member of the household had been ill in the past 2 weeks.

For irrigation performance, we were able to run the statistical tests only for respondents who had access to plots in a gravity-based system, which reduced the sample to 995, comprising 418 treated households and 577 control households. Households in this subset were more likely

to be located in areas where it was relatively less costly to construct and maintain gravity-based systems (i.e., areas with topographical, hydrological and other environmental characteristics that lower the cost of constructing and operating such systems). However, despite this shortcoming, these tests allowed us to explore the impact of the project on irrigation performance, going beyond the mere existence of irrigation construction/rehabilitation. Irrigation performance outcomes included whether the household generally received water on time, whether they received their full allocation and whether water quality was deemed good (as opposed to brackish or somewhat brackish).

Control variables

We included a set of controls covering biophysical characteristics, plot management characteristics, and household characteristics and a set of spatial dummies. For the treatment model, we included only control variables that we expected not to have been impacted by the AD2M programme.

The main measure of the land's fertility that we included is the normalized difference vegetation index (NDVI) from August 2011 satellite imagery. The degree of greenness captured by the NDVI is a useful measure of fertility that we expected to increase as a result of irrigation, although the measure is too coarse to capture irrigation at the level of a farmer's plot. We used the August 2011 NDVI because this should capture greenness in the second season, when irrigation may be more useful than during the primary rainy season. We used data from 2011 primarily because they are the earliest available observation for this month and because few, if any, irrigation perimeters were fully up and running by that time.

To account for differences in each household's plots and thus in their production potential, we included variables capturing the proportion of households' plot area where the primary soil type was sand and where the primary soil type was loam, with the excluded category being soil that was primarily clay. We also controlled for the proportions of plot area that were flat, slightly sloped and moderately sloped, with the excluded category being steeply sloped plots.

To account for production decisions that might affect household output, we controlled for whether the household had any plots managed by a female family member, whether there were any plots managed by a family member with any education, and the proportion of the household's plots that were owned by the household. We used "any education at all" as a variable because of the low education levels across our sample. Female managers were considered because they might use different decision-making priorities than male managers. The correlation between having any plot managed by a female managers and having a female head of household was high, at 82%, so this variable also may capture other information about the household. Plots were considered owned by the household if the household did not rent, borrow or squat without permission.

We included the natural logarithm of total hectares cultivated in any season, or the natural logarithm of hectares of cultivated rice in any season, for the dependent variables that were

specific to rice production. We also captured whether the household used organic and inorganic fertiliser.

In the outcome equations, we included two specifications in the results reported below. One specification included a dummy for whether the household irrigated any of their plots, irrespective of the type of irrigation (e.g., pumped groundwater and stream diversion, as well as gravity-based irrigation systems), and a second specification did not include this dummy. On the one hand, having irrigated plots will have a positive impact on crop production, irrespective of the type of irrigation. On the other hand, having access to any type of irrigation is clearly correlated with being treated. Specifically, for the sample used in our main results, the simple correlation coefficient was 0.14; nearly 73% of treatment households had at least one plot with irrigation, but nearly 60% of comparison households also had at least one plot with irrigation. These households gained water access outside the context of AD2M. Because there is no simple way to address this statistically, we present results from both specifications.

The irrigation that exists in comparison areas means that we are presenting conservative estimates of the impacts of irrigating a farm. With such a high rate of irrigation among comparison households, the effect of irrigation we estimate is relative to a mix of no irrigation and partial irrigation. However, the irrigation in comparison areas formed organically and are not a case of contamination. Less than 3% of comparison households reported participating in AD2M trainings and they did not receive interventions from other projects either. The Projet Bas Mangoky is irrigating part of the Atsimo Andrefana region in the South, a consortium of donors is irrigating the Boeny region of the Northwest, and a small World Bank project is irrigating an area of Mahabo that was not part of our study. Therefore, there is little concern that the comparison area has been contaminated by any exogenous irrigation.

Household characteristics related to productive capacity were the number of adult equivalents in the household and the ratio of adults to dependents. We included the natural logarithm of the household head's age and dummy variables for whether the household head was literate in French and in Malagasy. We captured household wealth by including the number of rooms in the household's dwelling and a dummy for whether the household had an improved toilet in the dwelling. Income diversification was proxied by dummies for whether the household had any members receiving regular wages and whether any members were engaged in casual employment. We also included the number of children of the household head and spouse who were living elsewhere. These children living elsewhere may represent an important risk-coping mechanism; they may be far enough away to be unaffected by shocks that threaten the household's well-being. Figure 2 shows the gender distribution of AD2M beneficiaries in our study as well as the distribution of household size. The left side of the figure shows that there is relative gender parity; the right side shows the distribution of household size, reflecting an average of 5.2 members per household.

Figure 2: Beneficiary demographics
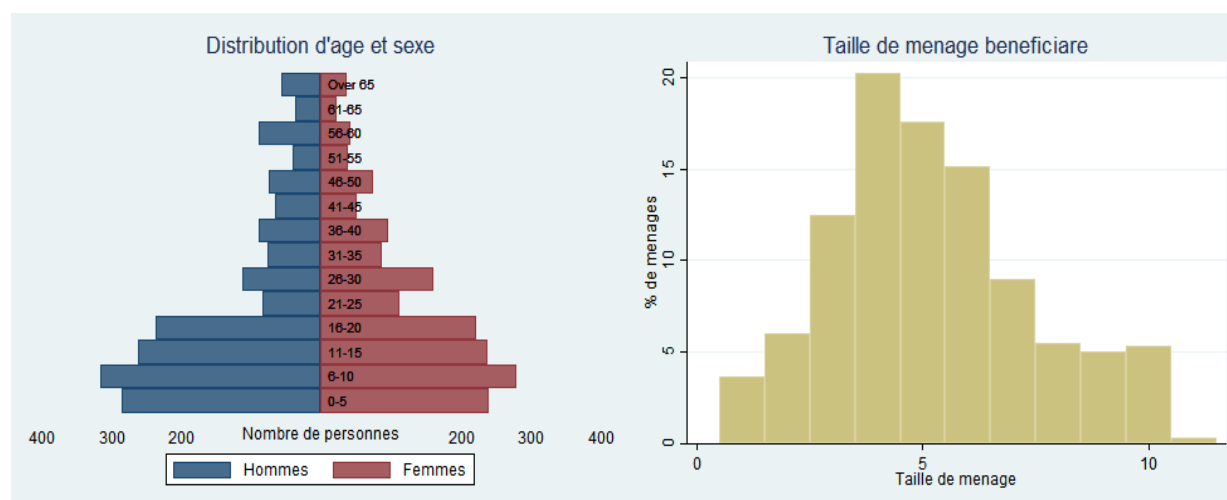
Finally, we were not able to collect data at the village level to control for location-specific characteristics. Instead, we used the proportion of households in the village that had accessed any source of credit and the average time to collect drinking water. Both of these variables help to control for more favourable local conditions (in this case, access to greater financial resources and easier access to drinking water). We also included a district dummy, noting here that households were in one of two districts.

Observations used in analysis

Table 3 below summarizes the observations used for analysis. We collected data from 1,743 households—1,126 control and 617 treated. We first restricted our analysis to the 1,713 households that reported having any crop cultivation, since these are the subset where an irrigation programme might directly affect household outcomes. There were 259 comparison households in areas that had higher NDVI values in August 2011 than any treatment areas. August is a month in the secondary rainy season in which the presence of irrigation can have tangible effects on the NDVI. We believe the observations in 2011 would be prior to the AD2M project having an effect on greenness, as most perimeters were still being constructed or rehabilitated. Since the 259 control households started with higher NDVI than any of our treated households, they represented a problem for our counterfactual, and we omitted them from our analysis. The balance plot and test results suggested that matching on the subsample significantly improved the balance. In Appendix I.A, we provide the balance plot and the balance test for the full sample; results showed that we rejected the null hypothesis that covariates were balanced. Thus, below we present results for this subsample of 1,454 households rather than the full sample; full results are in Appendix I.B. In a third specification, we also dropped the 98 treatment households that did not have any plots in the irrigation perimeter and therefore definitely did not receive the full treatment. This increased the potential for biased estimates, but provided a cleaner comparison between treatment and control households. For the third specification, we report results only for our four crop production variables; full results are in

Appendix I.C. Finally, we note that the number of observations differs when we consider rice production, since not all of the included households produced rice.

Table 3. Numbers of households in analyses

	Total	Treatment	Control
Full Sample			
Households	1,743	617	1,126
Restricting to households that cultivated any crop			
Households	1,713	614	1,099
Rice Producers	1,582	597	985
Restricting to areas where August 2011 NDVI < 0.46			
Households	1,454	614	840
Rice Producers	1,401	597	804
Removing treatment households without access to irrigation			
Households	1,356	516	840
Rice Producers	1,318	514	804

Quality of counterfactual

Below we present the balance test results for the subsample of 1,454 households. The balance plot in Figure 3 shows that the two distributions skew toward relatively high propensity scores for the treatment households, which supported use of IPWRA. Although the densities are rather different just above 0.5, the balance test, where the null hypothesis is that covariates are balanced, gives a chi-square value of 29.6 and a *p* value of .160, so we failed to reject the null hypothesis. Furthermore, the weights do a good job in balancing on the August 2011 NDVI values, which is a particularly important variable on which to achieve balance, as shown in Table 4. Table 4 presents the values of key outcomes for treatment, comparison, and a test of equivalence between the two. The ratio of the difference and the standard error of the difference provides a test of equivalence. The results show good balance, with none of the outcomes statistically significantly different.

Figure 3: Balance summary
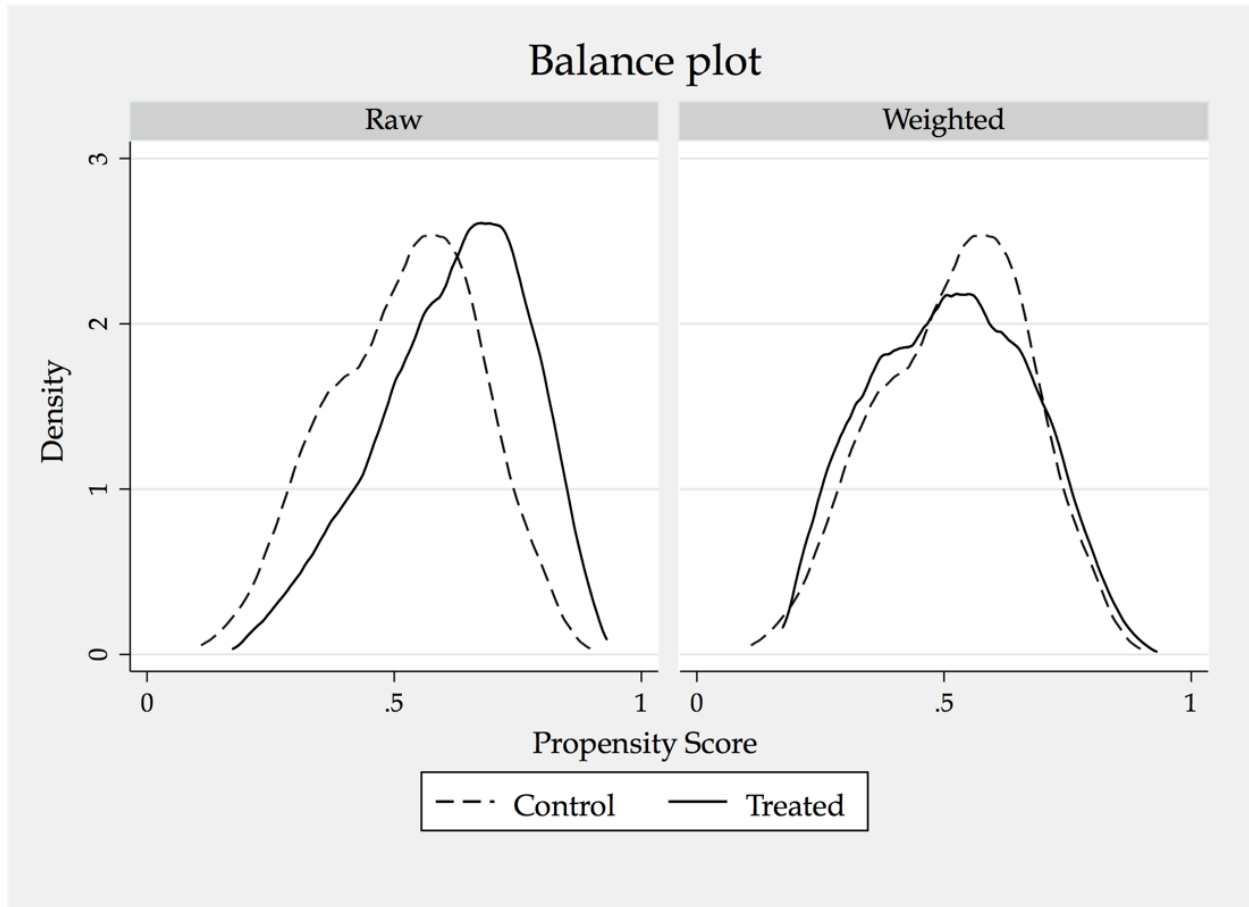
Table 4: Test of covariate balance

Variable	Comp. Mean	Treated Mean	Difference	Std Err of Difference
NDVI (August 2011)	0.370	0.370	0.000	0.003
ln(hectares cultivated)	0.060	0.062	0.002	0.060
Plot manager is female	0.188	0.168	-0.020	0.024
Plot manager has any education	0.524	0.515	-0.009	0.029
Plot is held on a permanent or semi-permanent basis	0.855	0.863	0.008	0.020
Plot primary soil type is sand	0.199	0.193	-0.007	0.021
Plot primary soil type is loam	0.337	0.314	-0.023	0.026
Plot slope is flat	0.708	0.723	0.015	0.025
Plot slope is slight	0.243	0.226	-0.016	0.024
Plot slope is moderate	0.027	0.027	0.000	0.008
Plot is marsh/wetland	0.485	0.490	0.006	0.027
Organic fertiliser used on any plot	0.106	0.101	-0.005	0.019
Household adult equivalents	4.604	4.624	0.021	0.121

Variable	Comp. Mean	Treated Mean	Difference	Std Err of Difference
Dependency ratio (age < 15 | > 60):(15 ≤ age ≤ 60)	1.071	1.080	0.009	0.053
ln(household head age)	3.792	3.788	-0.003	0.018
Household has a member with wage employment	0.570	0.547	-0.023	0.029
Household has a member with part-time employment	0.594	0.565	-0.028	0.029
Household head can read and write French	0.187	0.182	-0.005	0.026
Household head can read and write Malagasy	0.425	0.419	-0.007	0.030
Separate rooms of dwelling	1.532	1.471	-0.061	0.122
Household dwelling has improved toilet	0.119	0.124	0.004	0.022
N of children of head or spouse > 15 living elsewhere	0.457	0.461	0.004	0.057

Note: Total observations = 1,454; treatment N = 614; control N = 840

AD2M impacts on crop production

Tables 5 through 8 give results for four sets of outcome variables. For the first three sets of outcome variables, we give results for two different specifications: with and without a dummy for any type of irrigation on any plot in the outcome equation. The tables give estimates of the ATET, the corresponding t statistic and p value, the estimated control mean, the estimated treated mean and the number of observations. Given the fact that we are using a cross-sectional data set with only NDVI values that predate project activities, it is likely that the more restrictive assumptions on conditional independence and overlap may not be met (Wooldridge, 2010). Therefore we present ATET estimates instead of average treatment effects. We have highlighted results that are statistically significant at 10% or lower in bold.

Looking first at our annualised crop production variables for the subsample of 1,454 (all crops) or 1,401 (rice) in Table 5, the estimated impacts are positive and significant for all four production variables when there is no irrigation dummy in the outcome equation. When we control for any type of irrigation in the outcome equation, the impacts disappear for value of production per hectare and per capita. However, impacts remain positive and significant for rice production per hectare and per capita. In the final column of the table, we present the percent difference between treatment and control means, by transforming the natural logarithm values reported in the previous two columns. When we do not control for irrigation, the value of crop production per hectare is 13% higher for treatment households than for control households, and the value per capita is 15% higher for treatment vs. control households. Rice yields are estimated to be 25% higher when we control for irrigation and 30% higher when we do not control for irrigation. The difference in rice production per capita is statistically significant with and without controlling for irrigation; production is 19% higher for treatment households than for control households when not controlling for irrigation and 25% higher with the irrigation control.

Table 5: Annualised crop production outcomes

Variable	Irrigation dummy	ATET	t stat	p value	Control mean	Treated mean	*% Diff.*
Value, crop production per hectare	Yes	0.034	0.58	(.564)	13.78	13.81	3%
	No	**0.124**	2.04	(.041)	13.69	13.81	13%
Value, crop production per capita	Yes	0.050	0.85	(.394)	12.27	12.32	5%
	No	**0.142**	2.33	(.020)	12.18	12.32	15%
Rice yields	Yes	**0.157**	2.74	(.006)	7.51	7.67	25%
	No	**0.203**	3.51	(.000)	7.47	7.67	30%
Kgs of rice per capita	Yes	**0.187**	3.21	(.001)	5.86	6.05	19%
	No	**0.235**	3.98	(.000)	5.81	6.05	25%

Note: N = 1,454 for value of crop production per hectare and per capita; all variables in natural logarithmsN = 1,401 for rice yields and kgs. of rice produced per capita. ATET values in bold are statistically significant at the 10% level or lower.

Table 6 shows the same production outcomes, using the sample that excludes the 98 (93 for rice) treatment households without access to irrigation. The results in the two tables are similar, though the estimated impacts are higher for Table 5's more inclusive sample, as we would expect.[3] Excluding households that were only partially treated reduces possible biases that may arise when only a fraction of treated households actually receive full treatment (impacts would be expected to be biased downward, given that these households did not have irrigated plots). However, treated households with access to irrigated plots appear to have been relatively better off at project inception, so dropping treated households with no irrigated plots is likely to lead to an upward bias. Taken together, we believe that the estimated impacts from these two specifications provide reasonable lower and upper bounds for overall project impacts on these variables.

Table 6: Annualised crop production outcomes

Variable	Irrigation dummy	ATET	*t* stat	*p* value	Control mean	Treated mean	*%Diff.*
Value, crop production per hectare	Yes	0.068	1.07	(.285)	13.82	13.88	6%
	No	**0.181**	2.79	(.005)	13.70	13.88	20%
Value, crop production per capita	Yes	0.078	1.21	(.228)	12.30	12.38	8%
	No	**0.194**	2.96	(.003)	12.18	12.38	22%
Rice yields	Yes	**0.192**	3.07	(.002)	7.54	7.74	26%
	No	**0.250**	4.01	(.000)	7.48	7.74	30%
Kgs of rice per capita	Yes	**0.216**	3.36	(.001)	5.86	6.08	25%
	No	**0.276**	4.31	(.000)	5.80	6.08	32%

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[3] When we drop these 98 households, our balance test and summary statistics indicate this smaller subsample is well balanced; results are in Appendix I.D.

These results align with the data from the qualitative focus group discussions. A number of respondents of all types (farmers, community leaders, AD2M implementers and WUA members) from Mahabo commented that rice production increased significantly as a result of AD2M. One Mahabo farmer attributed the greater yields to better land maintenance: "Since [AD2M] came, we learned about land maintenance, which we did not do before, and so we took better care of our rice croppings. And our harvests increased as a result." This corresponds with the survey, in which AD2M farmers reported a higher rate of erosion control than comparison farmers (35.7% versus 26.6%, $t = 2.39$). In a Mahabo focus group, one farmer attributed greater rice yields to the row-cropping method introduced by AD2M: "This is what really convinced us to adopt the row cropping method, because it was easier to plant the seeds and we could harvest a higher amount." Other farmers added that once the new techniques were adopted, fewer seeds were required to yield greater harvests. A key informant from Ankilizato (Mahabo) corroborated the farmer's focus group comments, saying that improved farming techniques led to better harvests: "Since the project's existence, the rice production has increased for each family. The cultivated surface of the land has not changed. … It was due to the introduction of the improved agricultural techniques." Several community leaders also commented that rice was grown more frequently (two or more times per year), which also resulted in greater production.

Qualitative respondents from Belo also maintained that rice production increased, although according to one farmer the increase in rice harvests was "not so huge." Interestingly, farmers from Belo were more likely to attribute the increase in rice yields to irrigation, as opposed to the "land maintenance" or row cropping mentioned by Mahabo farmers. One Belo farmer commented, "The harvests improved mostly thanks to the improved water supply." Also of note, one farmer from Belo commented that higher rice yields had not been sustained since the AD2M project ended: "Crop production decreased since AD2M left the town. Some farmers went back to traditional agricultural practices."

Heterogeneity of impacts on crop production outcomes

We examine heterogeneity in the treatment effects by using the coefficients and standard errors generated in the two outcome equations, provided in Table 7. It is worth noting that the sample framework was not designed to separately analyze the impact of various subgroups by treatment and control. That is, we cannot separately run the treatment effects analysis on households with a female manager and without a female manager and compare the difference in difference between the two.

Instead, we can examine the coefficients from the treatment and control outcome equations resulting from the inverse-probability-weighted regressions. Under the assumptions that the coefficient on the covariate of interest is the same across treatment and control households, that the distribution of covariates across treatment and control households are independent and normally distributed, and that the regression equations are correctly specified, the estimated impact of treatment by the covariate of interest is given by the difference of the coefficient on the

covariate in the treatment equation minus the coefficient in the control equation. Then, using the standard errors, one can easily compute the t-test and corresponding p-values, where the null is that there is no heterogeneity of treatment effects.

We consider three covariates in our heterogeneity analysis. The first is a dummy for whether any plots are managed by a woman, the second is whether any adult in the household has had any education, and the third is whether there are any sources of financing within the village. We present results for two of our four main outcomes: 1) value of production per capita in logs and 2) rice production per capita in logs. (The analyses by hectare yielded similar results.)

Starting with the value of crop production per capita, Table 7 shows that households with female plot managers have worse outcomes in both control and treatment households, and that the difference between genders is negative and significant. It also shows that the treatment effects on the value of production per capita are greater for households with any educated adults, and for households located in villages with financial services; these two results suggest that better-off households were better able to capitalize on the project's activities.

Impacts look a bit different when we instead consider rice production per capita. Here, treatment effects on households with female plot managers are positive. Combined with the negative impact on value of crop production per capita discussed above, these results suggest that these households reduced land allocated to non-rice crops, and/or that yields of non-rice crops were lower. Treatment effects on rice production per capita were higher for households with any education, similar to the total value of crop production per capita. However, there is no heterogeneous treatment effect from having access to a financial source in the village; this suggests that having access to financial services enables households in treatment villages to increase profitability from non-rice crops.

Table 7: Heterogeneous impacts on production per capita

	Production value (MGA) per capita			Rice production (kgs) per capita		
	Female plot manager	**Any education**	**Finance source in village**	**Female plot manager**	**Any education**	**Finance source in village**
Control Mean	-0.038	-0.105	-0.104	-0.209	-0.042	0.747
Control Std. Error	0.111	0.107	0.479	0.109	0.096	0.463
Treated Mean	-0.153	0.187	0.779	-0.086	0.161	0.728
Treated Std. Error	0.096	0.088	0.405	0.086	0.082	0.395
Treated Mean - Controlled Mean	-0.114	0.292	0.883	0.123	0.203	-0.019
Sum Std. Errors	0.206	0.195	0.884	0.194	0.178	0.859
t-statistic	21.100	57.100	38.090	24.180	43.490	0.850
Difference p-value	<.0001	<.0001	<.0001	<.0001	<.0001	0.399

Note: Outcomes are measured in log.

There are three key points from the analysis of heterogeneity of impacts:

1. Households with female plot managers in treatment areas may be shifting too much focus to rice crops, to the detriment of non-rice-crop profits.

2. Those with greater education are more able to leverage the benefits from treatment, indicating there is greater need to continue focusing efforts on households where no adult has been to school.

3. Access to finance—which was seen as critical in the first phase of AD2M—does indeed enable households to gain more from the treatment.

Crop input and management outcomes

In terms of our crop input and management variables, we see a number of significant and positive impacts, and the difference between the ATET impacts when including or not including an irrigation dummy in the outcome equation is far less pronounced than for the crop production variables. In particular, treatment households were more likely to receive extension guidance from any source and were also more likely to have attended trainings. In terms of inputs, there were limited impacts on land conservation efforts, livestock and fertiliser, but treatment households were more likely to have applied pesticides and herbicides.

Table 8: Crop input and management outcomes

Variable	Irrigation dummy	ATET	t stat	p value	Control mean	Treated mean	*% Diff.*
Extension from any source	Yes	**0.076**	2.02	(.044)	0.289	0.365	8%
	No	**0.090**	2.52	(.012)	0.275	0.365	9%
Whether attended any trainings	Yes	**0.076**	2.02	(.044)	0.289	0.365	8%
	No	**0.090**	2.52	(.012)	0.275	0.365	9%
Mechanical soil & water conservation	Yes	0.028	0.99	(.320)	0.249	0.277	3%
	No	**0.047**	1.77	(.077)	0.230	0.277	5%
Biological soil & water conservation	Yes	**-0.019**	-1.02	(.308)	0.099	0.080	-2%
	No	-0.012	-0.71	(.479)	0.093	0.080	-1%
Number of cattle held	Yes	0.614	0.97	(.332)	4.340	4.950	14%
	No	0.011	0.02	(.987)	4.940	4.950	0%
Number of oxen held	Yes	**0.406**	1.84	(.066)	1.800	2.200	0%
	No	**0.381**	1.66	(.096)	1.820	2.200	0%
Proportion of plots with inorganic fertiliser	Yes	-0.008	-0.82	(.409)	0.027	0.019	-1%
	No	-0.005	-0.60	(.551)	0.024	0.019	-1%
Used pesticide or herbicide on any plot	Yes	**0.097**	4.65	(.000)	0.151	0.248	10%
	No	**0.100**	4.82	(.000)	0.148	0.248	10%
Cropped more than one season	Yes	**0.138**	4.23	(.000)	0.470	0.608	14%
	No	**0.179**	5.91	(.000)	0.428	0.607	18%

Note: N = 1,454. ATET values in bold are statistically significant at the 10% level or lower.

Perhaps most importantly, treatment households are much more likely to crop more than one season (61% versus 43%). This provides a partial explanation for why annualised crop production figures were higher for treatment versus control households. As shown in Appendix I.E, if we look at value of crop production and rice yields only in the primary season, we see that for most specifications, there are no statistically significant impacts; in two specifications, estimated impacts are actually negative. This provides further evidence of the importance of access to improved irrigation infrastructure, particularly in the second season.

New crops

From the quantitative data, there is extremely limited evidence of expansion into new crops in treatment areas. Just one household reported growing tomatoes, and that person was located in a control area. Similarly, in treatment areas, just five households reported cultivating onions or beans, versus 12 households in control areas. Finally, 45 households in treated areas cultivated peanuts, versus 167 households in control areas. Given these low adoption figures, we did not perform further quantitative analyses.

Both in surveys and in qualitative interviews and focus group discussions with beneficiaries, many respondents indicated that AD2M encouraged farmers to cultivate new crops (other than rice) such as onions, beans, peanuts and tomatoes, and that farmers in Mahabo and Belo continue to harvest these crops today. The average AD2M household grew 0.05 more types of crops on his or her main plot during the main growing season (1.00 versus 0.95, $t = 2.36$), so AD2M impacts extended not only to the number of seasons cultivated but also to the number of crops cultivated. According to a community leader from Ankilizato Nord (Mahabo), "Onions and beans are the main alternative crops that AD2M has introduced here. Now, they have a warehouse where the onions are stored here." A community leader from Antrobiky corroborated this, and indicated that these new crops were still being harvested today: "We continued growing peanuts and onions. We have truly continued!"

In addition to the direct benefit of harvesting new crops, several respondents also commented that multi-cropping improved the quality of their soil and ultimately the quality of their rice. A Mahabo WUA member said,

> In the Menabe area, we were only used to our rice cropping on the rice fields. We had never heard about the multi-cropping. Then AD2M brought technical training to show us that we could also grow beans, tomatoes, onions and other crops on our rice fields. In fact, because we only grew rice, the soil was left to rot. With the multi-cropping, we even saw improvements in the quality of our rice, after the harvesting of the beans, because the soil had actually improved thanks to the fertilisers.

A respondent from the Ministry of Agriculture in Ankilizato echoed this sentiment, saying that the introduction of other non-rice crops such as onions and beans served to fertilise the soil better.

Experiences harvesting new crops in Belo were slightly less positive, and both farmers and WUA members here seemed more reluctant to focus on cultivating crops other than rice. One WUA member commented, "Our experience with the peanuts was that we had insects, so we

could not save much. We didn't get the insecticides on time, so we . . . could only save a little."
Similarly, a Belo farmer also said that he tried to grow onions on his field but was unsuccessful.
Another Belo WUA member maintained that the primary focus remains on rice cultivation: "All of
us do the same thing; we all cultivate rice. That's our principal activity. Rice is the basis of our
alimentation; that's why we focus on this." This message was corroborated by other WUA
members as well, who said, "People here prefer rice instead of onions and beans," and "We
were focused on growing rice, [not] on growing onions nor peanuts."

Changes in household welfare

Farmers and programme implementers from both districts reported that incomes increased as a
result of farming practices and irrigation schemes introduced or improved by AD2M. For the
most part, respondents indicated that increases in income resulted from bigger rice harvests.
One farmer from Mahabo said that because of the increase in volume of rice production as a
result of the row-cropping method introduced by AD2M, farmers were able to produce sufficient
amounts of rice to begin selling outside of Mahabo: "Yes, we are able to produce in excess and
have [rice] to sell outside our region." A key informant from Mahabo commented, "If looking at
Ankilizato, it was obvious that there were some very important changes, especially in terms of
the farmers' income." This point was echoed by a respondent from the Ministry of Agriculture in
Morondava, who said that "people who did not have money before had money afterwards, and
they could grow things; their livelihoods had improved." When discussing changes in income
they believed resulted from AD2M, respondents primarily referenced increased rice production
leading to greater profits as opposed to sales of other crops. One WUA member from Mahabo
shared that he had tried to sell onions, but that the profit margin was such that it was not
worthwhile to do so with the amount of onions he had harvested. A fellow Mahabo WUA
member agreed, saying he had suffered a financial loss when he tried to sell onions.

Table 9 presents quantitative findings on household welfare outcomes that echo the qualitative
findings. Treatment households were less likely to report they had worried about securing
enough food in the past 7 days, but there were no differences between treatment and control
households in the proportion of households who indicated that they had experienced a lack of
food in the past 12 months. It is worth noting that about 75% of both treated and control
households had faced food shortages in the past 12 months, indicating high levels of intra-
annual food insecurity, even for those with access to irrigation. Treatment households were also
more likely to own more consumer durables. The largest differences are in the impacts of
treatment on educational expenditures. The values are in natural logs; transforming these to
dollars gives a percent increase for treated households between 68% and 80%.

Table 9: Household welfare outcomes

Variable	Irrigation dummy	ATET	t statistic	p value	Control mean	Treated mean	*% Diff.*
Food worries, past 7 days	Yes	**-0.109**	-3.33	(.001)	0.556	0.447	-11%
	No	**-0.098**	-3.02	(.003)	0.546	0.447	-10%
	Yes	-0.021	-0.94	(.350)	0.767	0.747	-2%

Variable	Irrigation dummy	ATET	t statistic	p value	Control mean	Treated mean	*% Diff.*
Lacked food, past year	No	-0.021	-0.91	(.363)	0.767	0.747	-2%
N of consumer durables	Yes	**1.080**	3.89	(.000)	4.950	6.030	11%
	No	0.925	3.42	(.001)	5.100	6.030	11%
Any household member ill	Yes	-0.015	-0.43	(.695)	0.308	0.293	-1%
	No	-0.008	-0.23	(.850)	0.300	0.293	-1%
Educational expenditures	Yes	**0.583**	1.89	(.059)	2.510	3.100	80%
	No	**0.520**	1.69	(.091)	2.580	3.100	68%

Note: N = 1,454. ATET values in bold are statistically significant at the 10% level or lower.

Community-level effects

Similar to qualitative respondents' beliefs about whether AD2M was helpful or harmful, there were mixed opinions about whether AD2M had a positive, unifying effect on the local community, had increased tensions, or had no tangible effects at the community level.

According to one WUA member from Belo, AD2M unified the community: "AD2M here unified us because all [activities] were well planned and there [was] sensitization of farmers. It had boosted our cohesion and our unity. We were living peacefully and calmly because there were fewer disputes." Farmers from Mahabo agreed, attributing the positive change in the community dynamic to more regular meetings. One said, "During AD2M's tenure, regular meetings were held in each sector. The fact that people gathered around often created some closer ties and brought more harmony." Similarly, in Belo, one farmer shared his belief that the WUA played a role in bringing people together and enhanced communication between neighborhoods. Farmers from Mahabo also said that AD2M's irrigation support (in particular the repair of the channels) lessened disputes over water supply. This appears to be confirmed by the quantitative survey as well; only one of 10 AD2M WUAs reported there being disputes over the past 12 months.

Other positive community-level effects were associated with changes in rice yields and increased incomes. According to one Mahabo farmer, "The community is also more peaceful; we eat well, our harvests are successful, and even the unemployed get work." A key informant from Mahabo maintained that rice revenues resulting from AD2M increased purchasing power and changed the village economy in Ankilizato:

> They sold the rice and dare then to buy a TV set, they also dare to buy a zebu. In the past, a farmer, one family did not own a zebu working the fields, but now after they harvest the rice, they bought two zebus; . . . this transformed the economy in general in the Ankilizato village.

A respondent from the Country Programme Coordination Team echoed this sentiment, saying that "the landscape in general has changed," with more farmers living in houses made of stone or brick and houses with iron roofs, which were previously only inhabited by foreigners and civil

servants. A former AD2M social facilitator said the installation of a dam in Levaheloka led to its transformation from a small village with only four houses to one with more than 50 houses and "a protestant church, a Catholic church, a Catholic school, [and] a rice machine." Additionally, the social facilitator maintained that members of the Levaheloka community were now able to go to the hospital when they were ill.

On the negative side, a farmer from Ankilizato maintained that AD2M increased tensions within the community: "We were more divided because some would collaborate with AD2M and some would not. Some people were angry with the farmers who collaborated with AD2M." A fellow Mahabo farmer said that it was the changes in water regulation as a result of AD2M that led to community conflicts: "Regarding the water, they imposed themselves on us. This is how conflicts came up in the community." Farmers from Belo also felt that community life had deteriorated as a result of AD2M, referencing disputes over water use and declining harvests.

Key challenges and potential moderating factors

This section explores key challenges faced by the programme (both environmental and social) that may have served as moderating factors to AD2M's impact on the treatment communities. These key challenges primarily emerged through qualitative data collection; wherever we have relevant quantitative data we include that as well. We group these findings in six categories: reluctance to adopt new farming approaches; irrigation infrastructure challenges; local market constraints; safety concerns; communication and lack of trust; and timing, seasonality and weather shocks.

Reluctance to adopt new farming approaches

A number of WUA members and farmers commented during interviews and focus groups that Malagasy farmers are 'set in their ways' and often reluctant to change practices, including those introduced through AD2M. One Mahabo WUA member commented, "People's habits are hard to change." A few respondents added that farmers have reverted to old ways since AD2M has left—according to one Mahabo farmer, "Today the community is divided between those who still use the row technique and those of us who continue to stick to our ancestors' ways." Another Mahabo farmer mentioned that initially some farmers were hesitant to use fertilisers because of rumours that they were harmful to the land: "There are rumors that artificial fertilisers damage your land. . . . That would mess up people's minds and they reject the use of fertilisers just based on these wrong beliefs." The AD2M M&E Officer indicated that while farmers were initially reluctant to adopt new techniques, over time more and more farmers had begun adopting them.

Irrigation infrastructure challenges

On the basis of the quantitative survey, we found that households generally reported receiving better quality irrigation. For the smaller subset of households with plots located in a gravity-based irrigation system, Table 10 demonstrates that treated households were more likely to receive water on time and to receive good quality, non-brackish water. However, they were not more likely to receive their full allocation of water. It is worth noting that even though a higher proportion of treated households reported having received good quality water, the estimated

proportion was still only 40% (the definition of "good water" was left to the farmer's invidual interpretation).

Table 10: Irrigation performance outcomes

Variable	ATET	t statistic	p value	Control mean	Treated mean	*% Diff.*
Received water on time	**0.150**	2.49	(.013)	0.583	0.733	15%
Received full allocation	**-0.054**	-1.87	(.062)	0.712	0.659	-5%
Water quality good	**0.269**	6.14	(.000)	0.129	0.398	27%

Note: N = 893. ATET values in bold are statistically significant at the 10% level or lower.

Although AD2M farmers reported higher quality irrigation, qualitative findings suggest potential areas for improvement in future irrigation programming. The primary issues surrounding irrigation infrastructure according to the qualitative data related to quality, sustainability and the challenge of meeting the demands of farmers who follow different harvesting schedules and have varying water needs based on the elevation of their land. On the issue of quality, channels reinforced with cement appeared to be functioning far better than channels lined with mud. A farmer from Mahabo explained the difference between mud and cement channels:

> They informed us that they would repair the channel all the way from the dam to the channel down here and put cement on these structures. And indeed, they brought in tons of cement. Initially, the work was due to reach until down here but in fact, they barely covered 1 km and now the water is filled with mud…That's why the irrigation system down south is not able to reach the fields because it is filled with mud as it wasn't properly fixed with cement. But the part which has been cemented works well and the water is clean.

Qualitative data suggest that maintaining the infrastructure developed or rehabilitated by AD2M is a challenge in both districts. According to a Mahabo WUA member, "There is no one to properly manage it. So the taps are wide open at the top and the water is overflowing down here." In Belo, farmers mentioned that they were not able to manually clear the debris (garbage and pieces of wood) that fell in the canal, which led to blockages. In Mahabo, some farmers blamed the WUA for failing to maintain channels properly. One said, "If the funds were properly used, the channel would be in a much better state right now and we would have twice [as many] fields benefiting from the irrigation system."

Finally, several qualitative respondents reported that AD2M's irrigation schemes affected higher and lower level plots differently. According to a key informant from Andranovory, AD2M's irrigation schemes created problems at times for farmers with lower level plots: "Those in high lands are well irrigated, while those that are in low lands are flooded, and they don't dry by themselves."

Local market constraints

Qualitative data suggest that local market constraints limited AD2M's positive effect on farmers' income. Specifically, farmers discussed struggling to find sufficient buyers for new crops introduced by AD2M. According to one farmer from Mahabo, "On onions I can truly say we got real results, but the issue was more around where to sell them. There weren't many buyers. Unlike rice—you don't need to go too far to sell all your stock [of rice]." A WUA member from Mahabo agreed, pointing to other difficulties associated with selling onions:

> When we produced rice, collectors buy it rapidly. It was not the same thing with onions because when onions are stored in a warehouse about 15 days, it loses a lot of [its] weight before collectors are coming. [As a result], farmers faced to financial loss.

Safety concerns

During interviews and focus groups, respondents from both districts referenced safety concerns that inhibited their ability to maintain irrigation structures and cultivate their fields, as well as safety concerns emanating from disputes over water. The issue of security was particularly pronounced in Mahabo, where a number of respondents referred to thieves ("Dahalo"). One Mahabo farmer commented, "We should be able to maintain [the channels] but the issue is around the safety. The water is running well and we should be able to also grow onions but we can't because of the thieves." WUA members also referenced safety concerns when maintaining the channels in Ankilizato: "We took risks and worked anyway. There have been fist fights and even threats with knives but we continued anyhow because we have chosen to lead this." Despite these concerns, only 1.2% of households reported violence as one of the top three shocks they faced over the prior year during the survey. This disparity could be due to violence being common but not one of the three most important shocks.

Also during interviews and focus groups, many individuals and WUA members reported various safety issues that occurred when they went out into the area to try to fix or perform maintenance on a water structure or regulate water usage. One individual from Ankilizato (Mahabo) said, "This has not been effective yet, as we have also faced safety issues. Previously, you could be shot even by just walking around with a bag because they would think you are carrying money." Others felt unsafe when going out to regulate the water supply in different areas because farmers and land owners did not understand their function and did not want their water supply managed by other people. Even other governing authorities did not always recognise the authority of the WUA to control and manage water supply, so members did not feel supported in their decisions.

Individuals tampering with the water plugs without the knowledge of the WUAs or diverting water toward or away from their own fields was another issue captured in the qualitative analysis. It seemed that disputes over water and the management of the irrigation infrastructure had the potential to escalate quickly to violence because access to water is so imperative to these farmers' livelihoods.

Communication and lack of trust

A number of concerns emerged from the qualitative data related to communication and decision making under AD2M. Some respondents felt that AD2M made unilateral decisions. Most notably, a number of respondents did not understand why water was shut off for periods of time, and indicated they did not receive proper warning from AD2M before the water supply was cut. One Mahabo farmer commented:

> We were not notified that it would be cut, yet we were all users of the water. It was just cut without any warning. That made people angry. They should have properly communicated that they would cut the channel, or send a paper announcement to our village chief so that he could inform us in turn. If we were aware, it would have made a clear difference.

Similarly, another Mahabo farmer said that poor communication from AD2M extended beyond the issue of the water cuts: "AD2M did not seek to consult the community and went on to take decisions on their own with regard to the work that they needed to implement. . . . They never involved us in any decisions regarding irrigation." A fellow Mahabo farmer added that AD2M misled them as to how long irrigation system repairs would take: "They told us it would only take a month for their work, but then it took 3 whole months, so we stopped trusting them. They fooled us."

During a focus group one Mahabo farmer maintained that AD2M's positive impact was tempered by a lack of proper communication given the high rate of illiteracy locally:

> It is due to lack of awareness and motivation. They just place signs to communicate meeting dates but not everyone can read. Only the people who can read do attend the meetings. That's why you need megaphones. If people can't read, at least they can hear. There was not enough awareness building.

It is important to note, however, that despite criticisms from some farmers, AD2M staff did report conducting what they referred to as a 'social study' prior to programme implementation, during which they engaged the local community and solicited their input on, and agreement with, the proposed approach.

Timing, seasonality and weather shocks

Timing and seasonality

One item that emerged during focus group discussions and is potentially relevant for future irrigation programming is farmers' feelings of frustration that AD2M interventions (specifically repairs) were not well timed in terms of Madagascar's seasons. According to one Mahabo farmer, "[AD2M] hired people to work on the dam during month of December, when it should have been in May. That makes no sense. They brought employees during the rainy season to repair the channels." Similarly, another Mahabo farmer complained that AD2M did not respect the established harvest calendar and interfered with channel irrigation during the cultivation period:

> In fact, their work was not aligned with the farmers. I am [one] of the people who lost my harvests during that time. Usually, when we plant the seeds in January, then we harvest in April, plant seeds again in May, and so on and so forth. But then AD2M did not comply with that and focused directly on the channels while we were busy with our rice fields.

WUA members from Belo made similar statements during focus groups, maintaining that water cuts were poorly timed: "The issue we faced with AD2M [was] with the water shortages. Sometimes, we would plough our land, but then they would interrupt the water for 3 days, so the land goes dry." A key informant from Ankilizato (Mahabo) also noted that there were repeated delays in AD2M's implementation, specifically when it came to construction. According to the rural infrastructure head, construction delays were caused by delays in funding disbursement and difficulty in identifying a contractor to undertake the construction work in Ankilizato:

> The technicians of the project had tried to explain that it was not because of them but [because] of the funding, as the funds came from Rome and it took months before the money arrived here. It is only disbursed then, and that's the reason [for] the delay. Added to that was the selection of the contractor, because they had twice changed the contractor until the project completion.

This key informant also added that the "water digging cut" lasted for one full year, which severely disrupted the livelihoods of farmers in Mahabo. Farmers frequently reported receiving water at the wrong time for their crops; 31.1% said that timing of irrigation did not coincide with their needs. However, we cannot say based on the survey whether the timing mismatch was due to water cuts.

Weather and other shocks

The primary shocks mentioned by respondents during interviews and focus groups were cyclones, flooding (which particularly affected lower level plots), locusts, insects and rats. A key informant from Ankilizato (Mahabo) maintained that cyclones were particularly disruptive to AD2M activities:

> The cyclonic damages hindered the implementation of this project because of the flood that damaged the dam. The entire infrastructure—the dam and the irrigation channels— were blocked by the sand. This fact had somehow caused the delay in the cultivation period. The water decreased which resulted in the crops' decline.

Farmers from Mahabo also added during focus groups that channels were blocked during cyclones, and multiple respondents referenced sand pileups resulting from cyclones. Quantitative results support these findings; 75.6% of survey respondents reported suffering from too little, too much, or too variable rainfall, and 60.9% reported that their crops suffered from pests.

AD2M trainings and changes in farming practices

Farming: SRI, row cropping, crop diversification, off-season planting

According to qualitative respondents, SRI seemed to be the main focus of trainings, and reportedly worked well, especially while trainers remained in the field working with the farmers. The new system of planting, watering and harvesting seemed to work better in some areas than in others, with some individuals commenting on their vulnerability to water fluctuations and reporting that they were hesitant to change their entire planting and harvesting system. To this end one farmer reported,

> In the training, we learn about seeding that requires water, yet our normal practice does not require much water, which is not the same. Then some people might complain that we just cut the water. But if all farmers are properly trained to do their seeding together using the standardised method then it can work. The main issue is that people are not all trained.

Those who followed the instructions of trainers and implemented the SRI system reported increased crop yields and income after planting fewer seeds than they had previously used. To this end a farmer from Ankilizato said,

> We did change our way of working. We were taught new techniques, which we applied. We put fertilisers in the fields which we never did before. We learned how to produce those fertilisers. Then we grew rice seeds following the standardised 8-day seed planting programme.

Similarly, another farmer from Ankilizato attested to the increased profitability associated with adoption of SRI:

> We saw that the 8-day method was much more profitable than our usual random cropping. 5 kilograms of seeds would be sufficient to cover one hectare using this method, whereas we would require at least 5 gallons if we stuck with our old method. So the 8-day method brought real improvement for us. We were able to waste less by using just 5 kilograms of seeds to produce 1 hectare. The SRI was truly beneficial.

AD2M also provided training on the benefits of crop diversification and provided new seeds for farmers to grow additional crops alongside their rice. Beans and onions were the two main crops introduced that served to supplement rice cultivation in many regions of AD2M outreach. In Ankilizato one respondent reported,

> With AD2M, they brought techniques around peanuts cropping, and today, some people have fully moved to growing peanuts. That is the case for some people. So it brings some diversity. Even people opened up their mind to other crops . . . not only rice. In Ankilizato, now we also grow beans.

Additional crops discussed in focus groups and interviews included fruit trees, tomatoes, corn, cassava, sweet potatoes, peanuts, greens and lentils. The addition of multi-cropping not only increased production from the farmers' fields and their income but also served to fertilise the

land better and increase harvests of the rice that farmers were already growing. Crop diversification also allowed for additional off-season planting of additional fruits and vegetables. This increased income for some farmers and allowed for steadier crop production periods rather than fluctuating periods of production and income generation.

Irrigation: water system management, flooding and drying fields

Many farmers indicated during focus groups that they wished AD2M trainers had stayed and helped with the SRI planting techniques for longer periods; they noted that the technique fell out of favour with some farmers once the trainers left: "We are still very keen on getting further training regarding farming, as there are still many things we don't know. What we have learned is insufficient; there is more to add. So yes, we are very interested" (Ankilizato Sud). Others felt that the SRI system did not work well on their farm because of the levels of water they received from the irrigation systems put in place. Although some received appropriate amounts of water for the technique to be effective, others saw their fields routinely flooded or dried out, and felt they had little control over the water levels.

Irrigation

Along with building new irrigation structures such as canals and dams, AD2M also provided various trainings for farmers and members of WUAs. Trainings included how to regulate water access for farmers, how plugs could be used to flood and dry fields to promote crop growth, and how to manage and maintain the structures once they had been built to ensure their use and function after AD2M left:

> Some training was given to the Water Users' Associations, especially the WUA president of the base and the board members; they were trained by the AD2M by a consultant. They hired a consultant to train all the board members—training on leadership. A women's association [Femme Leader] was also trained; they were also given training for women. About the water ditch, the training was done gradually. . . . It was a kind of training that was given gradually by the AD2M. (Ankilizato)

Although irrigation support was widespread, it seems that trainings on management of the infrastructure put in place varied in different areas. Although information about access, use and water schedules seemed to be well communicated in some areas, in others people were very confused and angry about water management and did not understand why some areas received more or less water at certain times. Maintenance and upkeep of the infrastructure that AD2M built also varied widely by level of community buy-in and by degree of assistance and functioning of different WUAs. Trainings seemed to take hold and become more effective in well-established WUAs that focused on communication and sensitisation of their communities, but did not see the same levels of success in other communities.

Reactions to training

Farmers in focus groups tended to have very positive responses to all of the AD2M trainings provided, but the general consensus was that they still wanted the AD2M programme facilitators

to stay longer and provide additional support and even increase the area to which they provided aid. Individuals interviewed talked most about the benefits of the agricultural trainings and practices for their communities, noting that farmers' livelihoods were improved in areas where training occurred. Increased trainings may spread AD2M benefits to more households; only 38.7% of AD2M beneficiaries reported attending a training. However, it seems that the farmers felt they benefitted most when they were receiving the combination of hands-on training from AD2M staff and the continued stream of supplies such as seeds, tools and fertilisers. Some farmers noted that to continue the practices that AD2M had introduced for their trainings they needed basic supplies that were not there before, such as special seeds and pesticides and tools such as ploughs. Some of the practices introduced, such as SRI and row cropping, fell out of favour when the AD2M trainers left in certain areas. This could be because farmers either did not feel they were receiving the support they needed or fell back into old routines.

WUAs

Changes in structure of WUAs during and after AD2M

Where WUAs did not previously exist, they provided a working structure for maintenance and upkeep of dams and canals and water regulation. WUAs already existed in some areas informally but needed a formalised leadership structure, rules and chain of command. In order for WUAs to continue to function and maintain the structures AD2M built, there needs to be a system in place to ensure they keep functioning properly. WUAs need a point of contact if a larger issue arises after AD2M leaves, and leaders need to be trained adequately to ensure that training continues after AD2M leaves the area. Once AD2M leaves, WUAs need to learn to take more responsibility for the structure of their association and maintenance of irrigation structures. There were some reports of groups falling apart or becoming corrupt after AD2M trainers and facilitators left, whereas in other groups, leaders stepped up and took more responsibility. Trusted and well-respected individuals should be voted into WUA leadership positions and trained to sensitise their community members to the fact that the WUA is an organisation run by the community. The WUAs that took this approach seemed to have more community buy-in and verbalised trust for the WUA and its leadership. Areas that saw increased WUA participation from community members should be used as an example of how to build community trust and respect for the project.

Sensitisation (and lack thereof) to WUAs

Although all qualitative respondents reported some level of outreach and sensitisation done by AD2M members, there was a general overall feeling of lack of communication about the functions of the WUAs and what they were doing to benefit the community. Many respondents found the WUAs and their leadership and presidents to be dictatorial or corrupt. There seemed to be a community feeling that the individuals who lived and worked in the area were not consulted and asked about their interest in the programme and its benefits but rather had the WUA forced on them. Many did not understand the goal of the WUA, its function in the region, how the leadership structure worked and how its actions would directly impact them. Indeed,

one key informant expressed his belief that many AD2M communities struggled (at least initially) to accept the WUA structure.

During interviews and focus groups some board members reported receiving leadership training from AD2M staff, which seems to have fostered more effective communication; however, many farmers felt that there still needed to be some level of oversight and assistance from an AD2M member rather than just establishing the WUA and leaving it to function independently.

The greatest concern among WUA members was that the leadership was receiving additional money from AD2M or was keeping the money from fees and dues for themselves rather than putting it back into the irrigation structure and infrastructure maintenance. People were concerned that they did not know where their money was going and that that was never communicated to them. This seemed to stem from a lack of trust in the leadership of a given WUA and believing that the WUA did not have the best interests of the community at heart. For others, lack of trust stemmed from lack of communication about how water would be regulated and when water cuts would occur.

Farmers reported water cuts occurring without warning and resultant crop loss, and even those who understood how the schedule worked urged much more communication before implementation so that all farmers in the community could agree about planning the planting and harvesting of their crops based on the water schedule. They said that better communication with everyone in the area needed to occur before the WUA started enforcing stricter water usage schedules so crops and profits would not be lost by farmers who did not know water cuts were coming. Farmers also wanted input into the schedule because they have knowledge of their land and when things grow best. Many felt that the water regulation schedules coming from WUAs did not take their crop rotations and schedules into account and harmed their production and profits. To avoid this conflict and feeling of imposition, farmers recommended additional training and consultation with farmers who would be impacted by the WUA decisions in each region. They noted that posting signs about meetings and information about the WUAs is not enough outreach because a lot of people cannot read:

> It is due to lack of awareness and motivation. They just place signs to communicate meeting dates, but not everyone can read. Only the people who can read do attend the meetings. That's why you need megaphones. If people can't read, at least they can hear. There was not enough awareness building. (Ankilizato)

Because of the terrain and population of different regions in Madagascar, a lot of areas rely on the same irrigation system, but the people are very spread out. Information still needs to reach all of them so that nobody is caught off guard when water regulation begins.

People did not seem motivated to spend their time maintaining the structures and work without being paid when they were not seeing how they were positively impacted by the upkeep. The WUAs needed community input and buy-in to be successful, and that comes from trusted leadership within the community and trusted individuals elected by everyone. Some areas had trusted leadership in place, and the WUAs in those regions seemed to report more positive impacts and a system that worked smoothly in maintaining dams and canals and enforcing

water regulation. Most of these were in areas that had some sort of association or organised structure in place before AD2M. The purpose of the WUA is to be an association to provide water to farmers and maintain irrigation structures so that all farms in the area can be irrigated, and this is a good cause if it is clearly explained. When farmers and community members using the water are adequately informed of the benefits, it seems that they are much more willing to pitch in and actively participate in WUA activities. For this to happen, AD2M needs to explain the benefit to the people adequately, including how water regulation will occur and why there is a need for flow and maintenance support. The WUA should clearly show that the money being contributed through fee and dues payment is ultimately benefitting the members of the WUA and their community.

Fee collection

All individuals using the irrigation structures built by AD2M thought they were automatically made members of the WUA and were supposed to pay fees. This was not always communicated well, and some farmers could not afford or did not want to pay fees but still needed to use the water. Many of those interviewed felt that the fees were fair and trusted that they were going to maintenance and upkeep of the dams that they all used for farming. However, some felt that fees were imposed on them without discussion and were decided on by AD2M rather than the people living in the areas and participating in the WUAs. "We previously did some calculation and it was found to be expensive; we first went to collect it and people refused to pay" (Ankilizato). There were also reports from different groups about various levels of corruption within some WUAs. Although some groups had leaders who were trusted by the community and functioned well together, others felt that the leaders of the WUA were taking advantage of them. Some felt that the president and other board members of the WUAs were collecting fees and keeping the money for themselves, and noted that fee collection was never well documented and it was not clear where the money went.

Reasons for joining or not joining WUAs

The majority of individuals who spoke about the WUAs felt that their attendance and participation in the organisation was mandatory if they were receiving water from the dams and canals that were built by AD2M:

> The sensitization was a bit forced, it is like something compulsory, i.e. when you are a water user, then you become automatically a member of the association because you use the water managed by the association. So, whether you like it or not, you must be a member. And if you say 'I don't want to join it,' then you don't get water; you should not fetch water there. (Ankilizato)

The majority of the members realised that the organisation was tasked with the upkeep and maintenance of the dams, canals and regulation of water access to farmers. Farmers joined the WUA because they recognised that the water was the source of their livelihood and that they needed to all pitch in in its maintenance in order to continue receiving benefits. Any farmer working within the perimeter and using the irrigation structure was integrated because they were called upon to contribute whenever the channel needed repair, for example. Reports from

different WUAs drove home the same message: If everyone is informed about the function of the WUA and pitches in, it is successful; if not, there is animosity between members and non-members because of non-members' lack of participation and help.

> Everyone uses the water, so we think a minimum contribution is needed to anticipate any future necessary repairs. Unfortunately, many think they don't owe anything despite our explanations. And this kind of situation makes me really sad. This means the association is doomed to fail if people do not want to contribute. (Ankilizato)

Those who did not participate in the WUAs seemed very skeptical about what the organisation was trying to accomplish, what they were doing with the fees that were collected, and how joining would benefit them. Again, the issue of how things were communicated to the WUAs was critical in their success or failure in different regions, and installing a trusted community member to head the local WUA played a large role in others joining and buying into the system.

V.   Discussion

Internal validity

To conduct a valid assessment of the impact of AD2M on smallholder farmers, it is necessary to establish a clear counterfactual. This requires using a rigourous methodology that enables us to address the question of what would have happened to programme participants had they not received the intervention. In the absence of an experimental design, comparison groups can be constructed using quasi-experimental identification strategies. However, estimating programme impacts by comparing a treatment group with a non-experimental comparison group may be biased because participants self-select into the programme or implementing partners specifically target beneficiaries who are more likely to experience the largest programme impacts. In this section, we describe in detail how AD2M targeted programme beneficiaries, and, on the basis of this information, we discuss our strategy for constructing a credible comparison group for AD2M beneficiaries to estimate the causal effects of interest. Although we discuss some of the key data sources that we planned to use in the evaluation, the full instruments are in Appendix C.

Programme targeting

The irrigation component of the AD2M programme targeted areas that were well suited to agricultural activity and would benefit from improved water access. Individuals were targeted based on their degree of agricultural vulnerability. In order of the degree of vulnerability, the project targeted the landless, farmers with unirrigated land, poor fishermen, farmers with irrigated land and those raising livestock. The programme aimed to affect 16,000 households.

We planned to sample randomly from beneficiary households only in the 14 irrigated communes out of the 16 communes of Menabe targeted by the larger AD2M intervention. AD2M selected these communes on the basis of their suitability for irrigation. These communes were selected from a larger set of candidates, some of which were also suitable for irrigation and will benefit from a future AD2M programme. In consultation with local AD2M staff, we selected control

communes and villages to provide us our counterfactual observations. We viewed the communes eligible but not selected for AD2M programmes as control group candidates. However, we intended a systemised and rigourous study of feasibility reports. Only non-selected communes similar to the treatment communes would qualify for the control group. AD2M officials helped us select additional control communes if the non-selected group did not provide enough for statistical power. We improved the quality of the control group by using the matching techniques described below.

Dealing with key sources of bias

An obvious concern in this evaluation was that respondents in the treatment group might offer answers that they believed the research team sought as a way of thanking the program (i.e., the Hawthorne effect). Although it is difficult to rule this out entirely, enumerators were trained to introduce the goal of the survey in such a way that beneficiary households would not be aware of the AD2M evaluation. In addition, comparison farmers did not know much about the AD2M programme because they were drawn from similar geographical areas that did not share irrigation infrastructure. We therefore do not believe this evaluation exhibits John Henry effects (i.e., non-treated farmers reacting to overcome the disadvantage of being in the control group). Our procedures for selecting comparison areas also allowed us to reduce concerns regarding programme externalities and spillover effects.

External validity

The results of the evaluation of the AD2M programme will inform the design and implementation of similar irrigation policies, both elsewhere in Madagascar and in other developing counties. First, AD2M is entering a second phase; the results of this study can be used to inform and improve the upcoming implementation. AD2M has expressed to us in preliminary discussions that one of the most important uses of this evaluation will be to inform AD2M-2, so the results of this study will inform that intervention at a minimum. Second, many of the features and challenges in accessing water that rural farmers face in Madagascar are shared by farmers throughout sub-Saharan Africa. In the face of climate change, many farmers must cope with insufficient rainfall. The results of an AD2M study will provide timely and policy-relevant evidence for other irrigation projects.

The AD2M sample largely reflects the larger population of Madagascar. The average household in the AD2M population had 5.2 people in it. The average household in Madagascar has 4.5 members.[4] Both the national population and AD2M sample have near gender parity. Households in the AD2M sample reporting lacking food over the previous week was 75%, which is similar to nationwide food security: 76% of people do not meet their minimum daily caloric intake. AD2M study households were quite likely to be involved in agriculture (92%), which is primarily a result of the targeting scheme that focused on agricultural regions. Nationwide, households have 1.7 hectares of cultivated land. AD2M farmers have an average farm of 1.6

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[4] All statistics for the nationally representative sample come from the Enquête Nationale sur le Suivi des indicateurs des Objectifs du Millénaire pour le Développement survey. All statistics are means and do not provide statistical comparisons with our sample; they are provided simply as context.

hectares. These similar sizes suggest that the average Malagasy farmer and the average AD2M farmer are both smallholders. A minority of households hold livestock: 22% of AD2M households had any form of ruminant livestock, and 19% of households hold cattle nationwide.

VI. Specific Findings for Policy and Practice

Increasing access to irrigation is already a policy priority for the government of Madagascar, but climate change coupled with the high level of food insecurity in this region of Madagascar adds impetus to the need to expand irrigation infrastructure.

The canals and dams that were built by AD2M and the additional irrigation infrastructure that was introduced allowed much greater water access for communities that previously lacked it. Regulation of use allowed most communities to increase their crop yields, and, when properly maintained, the irrigation infrastructure worked well and made their lives easier.

Our results are directly relevant to practice for irrigation interventions. Specifically, for projects implementing small-scale gravity-based irrigation systems in Madagascar, such as the next phase of AD2M, the primary lessons from this impact assessment are as follows:

Continue to promote second-season cropping

Value of crop production and rice yields in the primary season were similar between treatment and control households, so annual differences are primarily due to cultivating a second season. The program's focus should be on training and practices to improve second-season cropping. However, there should still be trainings and information dissemination to achieve higher crop production in the primary season. This is backed by the qualitative research findings that many farmers stopped practicing SRI/SRA techniques after AD2M project staff left the area, for instance.

Sustainability of irrigation infrastructure

Individuals and groups interviewed also emphasised the need for sustainable structures that will last and can be maintained once AD2M leaves the region and staff engineers are no longer available. They wanted permanent structures built with cement rather than mud and sand to allow proper functionality and decrease the amount of maintenance and upkeep by the communities in which they are located. Because the success of the AD2M project depends on how farmers and communities that received assistance function once trainers, technicians and engineers are gone, a system needs to be put in place to allow the management of the irrigation structures built, including groups such as the WUA that are established in part to maintain them. Multiple individuals need the training to continue upkeep and organisation of the group to ensure that none of the structures fall into disrepair and that the management methods do not fall out of favour or use.

Benefits depend on maintenance and management of irrigation infrastructure, especially in the medium to long term. Maintaining resulting increases in crop production throughout the year requires a well-functioning WUA. Both quantitative and qualitative results suggest that the ability

to generate significant crop production benefits are already compromised by the inability of at least some treatment WUAs to manage and maintain the irrigation infrastructure.

There is ample opportunity to learn from WUA functioning and performance in both treatment and control areas, in order to strengthen WUA activities in the second phase of AD2M. Collecting information on WUAs, as well as beneficiaries, should be explicitly incorporated into AD2M phase 2 monitoring and evaluation strategies if they are not yet planned for.

Increased communication

Along with the reported benefits of the irrigation arm of AD2M support there were additional requests and recommendations for improving irrigation support in the future. As has been mentioned elsewhere in this report, communication with farmers is key. Many farmers interviewed were wary of the flooding schedules implemented by AD2M and did not understand why some fields were flooded but others were dried out. Equality among farmers and the perception of fairness were very important to these individuals and communities. Getting information out about how the irrigation infrastructure will benefit each home, sensitising farmers to how water regulation will increase their crop yield, and constantly communicating with and listening to those who will be affected by changes to the irrigation structure are key to the success of any programme in this area.

Teach about climate change

Beneficiaries may be more willing to embrace changes if they learn about the potential risks of climate change. In rural areas, many farmers have a mentality of minimizing risks rather than maximizing profit. If households are warned about the risks posed by climate change, they may better appreciate the challenges they will likely face in upcoming years. This knowledge of future climate risk may lead households to adopt better practices, especially regarding irrigation, line cultivation, fertilisers and crop rotation.

Sustained financing

Future programming must incorporate lasting financial support to help farmers access the improved but more expensive methods AD2M promoted. Acquiring higher quality seeds, fertilisers, tools, and marketing of non-rice products requires farmers to commit significant funds over a long period of time. The project should therefore include a reliable micro-finance system. Eventually, the government could implement an insurance system to protect farmers from largescale crop losses due to natural disasters, plagues of pests, or other widespread shocks. Without these financial supports, many farmers will return to their traditional methods of farming.

VII. References

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Appendix A: Field Notes and Other Information from Formative Work

Quantitative

Dr. Morey travelled to Madagascar over the period from October 26, 2016, to November 2, 2016, to observe and participate in data collection training and piloting. His activities can be summarised as follows:

Table A.1: Quantitative field notes

Date	Location	Activity
October 27, 2016	ATW headquarters	Dr. Morey met with ATW research staff to review instruments and finalise sampling. Discussions centred on details of the data and how to ask survey questions most effectively. The team went through the translated survey instruments and verified the fidelity of the French/Malagasy version of the document.
October 28, 2016	ATW headquarters	Data collection supervisors (n = 12) attended training at ATW headquarters. During this day, the research coordinator went through the surveys item by item and held a discussion about each question. Supervisors would ask questions about the intent and the wording. Dr. Morey participated in the training to describe the purpose or intent of questions whenever there was uncertainty. Survey questions were revised as needed based on supervisor feedback.
October 31, 2016	Southern outskirts of Antananarivo	ATW, supervisors and Dr. Morey travelled to the southern outskirts of Antananarivo to survey farmers to pilot survey instruments. Supervisors were placed into teams of three or four to conduct the survey with each farmer. Surveys took place in the farmers' fields and lasted approximately 2.5 hours. ATW researchers and Dr. Morey floated among survey groups to observe and verify that proper survey techniques were followed.
November 1, 2016	ATW headquarters	This day was spent debriefing data collection supervisors to understand better what worked and what did not work as they applied the survey during piloting. Feedback was used to finalise the survey.
November 2, 2016	Antananarivo school	Data collection enumerators (three per supervisor) attended training at a local school that rented its theatre to ATW for training. During the training, Dr. Morey did a presentation on AD2M's background. Thereafter, ATW led enumerators through the survey to explain each survey question carefully and how to use the tablets.

Qualitative

Ms. Ring travelled to Madagascar from November 10, 2016, through November 19, 2016. Her activities are summarised as follows:

Table A.2: Qualitative field notes

Date	Location	Activity
November 11, 2016	ATW headquarters, Antananarivo, Madagascar	Ms. Ring met with ATW leadership and qualitative research staff to review instruments and finalise plans for qualitative fieldwork. The team reviewed procedures for obtaining consent and adhering to ethical standards for research and went through the translated instruments to verify the fidelity of the French/Malagasy documents.

Date	Location	Activity
November 14-18, 2016	Mahabo, Madagascar	Ms. Ring joined the research team for the first few days of qualitative data collection in Mahabo. Ms. Ring observed focus group discussions and key informant interviews held at the Ankilizato WUA and discussed preliminary results with the research teams. The research team debriefed daily to discuss emerging themes, difficulties encountered and what could be improved during the duration of the qualitative data collection.

Focus group discussion at Ankilizato WUA in Mahabo, Madagascar.

Appendix B: Sample Design

Evaluation design

We proposed using a matching design to construct a credible counterfactual to estimate programme impacts. Matching involves pairing treatment and comparison units that are similar in terms of their observable characteristics (Rosenbaum & Rubin, 1983). When the relevant differences between any two units are captured in the observable (pre-treatment) covariates, matching methods can yield an unbiased estimate of the treatment impact. A key implication of the AD2M targeting process is that participants were selected for the programme mostly on the basis of regional and farm-level observable characteristics. Heckman, Ichimura and Todd (1997) and Heckman, Ichimura, Smith and Todd (1998) argue that social programmes can be evaluated using matching methods as long as there is access to a rich set of variables that determine programme participation and that the non-experimental comparison group is drawn from the same local region as the participants.

We proposed to use the following series of steps to construct the comparison group for the evaluation. Our overall strategy was to replicate the targeting process that was used in 2007 by using the same or similar available historic data sources. For this process, we used both observation-based and criteria-based targeting as proposed by Ouma *et al.* (2007). Observation-based targeting involved determining where the AD2M programme was adopted, plotting those sites on a map and identifying the common characteristics the sites shared. We then used this information to determine a group of potential non-programme areas that had characteristics similar to AD2M areas before the programme started. From conversations with both the AD2M team and IFAD, we were confident that the original data sources used for programme targeting were available and that we would be able to obtain access to them. Ideally, we would be able to find comparison areas within the same programme communes that, despite being similar to AD2M targeted areas, were ultimately not selected because of capacity constraints of programme management.

Once the first group of potential areas was selected, we used criteria-based targeting to refine the selection of the comparison sites. Criteria-based targeting is based on expert opinions to determine to what extent non-targeted areas could have been chosen for the programme. These expert opinions relied on historic variables likely to be associated with the uptake of the intervention in 2007 such as climate, population density and other agro-ecological conditions. We consulted closely with local AD2M implementing staff to determine the best areas to target.

We conducted a full survey with 666 treatment and 1,334 comparison rural farm households (see sample size section in Appendix E), through which we collected key information to map out the causal chain among inputs, activities, outputs, outcomes and impacts, as well as the underlying assumptions (White, 2009). We included a short filter questionnaire at the beginning of the household survey to capture key time-invariant characteristics, as well as retrospective information on farming activities, so that we could improve the matching process between each household in the treatment group and a similar farm household in a comparison area. We included only farmers who operated potentially irrigable land in 2007, even if they did not farm

that land today. We included treatment households that directly benefitted from the programme or control households that expressed interest in irrigation activities. This ensured our control group was motivated to seek assistance in a way similar to that of the treatment beneficiaries. These steps collectively allowed us to increase the comparability of treatment and comparison groups at programme inception.

Quantitatively, we surveyed beneficiary and non-beneficiary households. This allowed us to conduct our analysis at the household level. Our outcomes of interest, therefore, were household livelihood measures, such as crop yields, crop profits and total income.

We collected one survey in each commune to focus on commune-level variables. This survey provided village-level control variables to improve the precision of the estimates. We selected a person of knowledge, such as a mayor or community leader, to provide information applying to all residents of the commune. We designed a separate instrument to capture these data in a systematic way. We collaborated with implementing partners to ensure we were targeting all key topics.

To estimate programme impacts, we compared the intermediate and final impacts (see theory of change section) between treatment and comparison farmers by using a weighted least squares method, where the weights were given by the inverse of the probability of being part of the programme (i.e., propensity score), a method that has been demonstrated to achieve covariate balance and, in contrast to matching, uses all observations in the sample (Sacerdote, 2004). Moreover, as indicated by Imbens and Wooldridge (2009), the combination of regression and weighting—known as a double-robust estimator in the literature— leads to additional robustness to mis-specifications of the parametric models.

We are aware that our proposed approach relies on the assumption that programme participation is exogenous to potential outcomes conditional on observable characteristics. Nevertheless, we are confident that our proposed empirical strategy allowed us to estimate the causal effect of the AS2M programme on rural farmers. First, our design exploits the fact that programme targeting was largely based on observable agro-ecological characteristics that we are confident we also were able to observe. Second, we discussed potential control communities with experts and stakeholders who had local knowledge, to determine whether these control communities were indeed comparable to the treatment communities at project inception.

Appendix C: Survey Instruments

Quantitative

Household Survey

PROJET AD2M PARRAINÉ PAR IFAD, QUESTIONNAIRE MENAGE, 2016

LES INFORMATIONS SONT STRICTEMENT CONFIDENTIELLES ET NE SERONT UTILISÉE QUE POUR DES BUTS STATISTIQUES SEULEMENT.

MODULE A : IDENTIFICATION DU MENAGE

Code questionnaire		Code enquêteur E		Cadre enquêteur	
Code enquête E /				Nom enquêteur	
				Date	/ / 2016
Code PDA				Heure de début	H
				Heure de fin	H

		Code	Nom	
A1.	DISTRICT	☐ MAHABO	☐ BELO SUR TRIRIBIHINA	
A2.	PERIMETRE	!__!__!	……………………………………………………………………	
A3.	COMMUNE	!__!__!	……………………………………………………………………	
A4.	FOKONTANY	!__!__!	……………………………………………………………………	
A5.	RELATION AD2M	☐ BENEFICIAIRE	☐ NON BENEFICIAIRE	
A6.	ID DU MENAGE (LISTE)	!__!__!__!__!__!		
A7.	NOM DU CHEF DE MENAGE		……………………………………………………………………	
A8.	COORDONNEES GPS DE L'HABITATION	Latitude (S)	° .	
		Longitude (E)	° .	

A9.	CONDITION METEOROLOGIQUE (MOMENT DE L'ENQUETE)	Clair / ensoleillé	1
		Principalement Clair / Principalement Ensoleillé	2
		En partie Nuageux / En partie Ensoleillé	3
		Principalement Nuageux / Considérablement nuageux	4
		Complètement Nuageux	5
		Pluvieux	6

Cadre superviseur		Commentaires / Accompagnement :	Signature Superviseur :
Code superviseur S			
Nom superviseur			
Contrôle quotas	1		
Contrôle cohérence	2	Commentaires / Contrôle terrain :	Signature Contrôleur :
Codification	3		
Accompagnement	4		
Contrôle terrain	5		
Le : _____ / _____ / 2016			

COCHER LA CASE SI LE MENAGE REFUSE DE FOURNIR DES DETAILS

MODULE B : COMPOSITION DU MENAGE

REMPLIR D'ABORD LE SHOWCARD #1 (LISTE DES MEMBRES DU MENAGE) AVANT DE REMPLIR LE QUESTIONNAIRE

1- **FAMILLE DIRECTE (MARI/FEMME, FILS/FILLE)**
2- **AUTRES MEMBRES DE LA FAMILLE**
3- **FAMILLE LOINTAINE**
4- **AUTRES INDIVIDUS**
5- **ENFANTS BIOLOGIQUES RESIDANT AILLEURS**

B1. De combien d'individus est composé votre ménage ? *Firy ny isan'ny olona ao an-tokantranonareo ?*

REPONSE NUMERIQUE : NOMBRE D'INDIVIDU(S) COMPOSANT LE MENAGE

NE PAS COMPTER LES ENFANTS RESIDANT AILLEURS

B2. Code ID du membre du ménage. *Code ID-n'ilay olona ao antokatrano.*

SE REFERER AU SHOWCARD #1

B3. Nom du membre du ménage. *Anarany.*

REPONSE LITERALE

SE REFERER AU SHOWCARD #1

B4. Sexe du membre du ménage. *Lahy sa vavy.*

SE REFERER AU SHOWCARD #1

Masculin. *Lahy.*	1		NSP.	3
Féminin. *Vavy.*	2		Refuse.	4

B5. Relation du membre de foyer au chef du ménage. *Fifandraisany @ loham-pianakaviana.*

SE REFERER AU SHOWCARD #1

Chef de foyer. *Loham-pianakaviana.*	1.
Mari/femme. *Vady.*	2.
Enfant (adopté inclus). *Zanaka, na ireo natsangana aza.*	3.
Petit fils/Petite fille. *Zafikely.*	4.
Neveu/nièce. *Zana-drahalahy/Zanak'anabavy.*	5.
Père/mère. *Ray/reny.*	6.
Frère/sœur. *Rahalahy/anabavy.*	7.
Beau-fils/Belle-fille. *Vinanto.*	8.
Beau-frère/Belle-sœur. *Zoadahy/zoabavy.*	9.
Grand-père/Grand-mère. *Ray be/renibe.*	10.
Beau-père/Belle- mère. *Rafozana.*	11.
Autres (avec lien de parenté). *Hafa (misy rohim-pianakaviana).*	12.
Autres (sans lien de parenté). *Hafa (tsy misy rohim-pianakaviana).*	13.

Autre. *Hafa.* (**A SPECIFIER**)	...
NSP.	98
Refuse.	99

B6. Age du membre du ménage. *Taonany.*

REPONSE NUMERIQUE : AGE DU MEMBRE DU MENAGE

SI 6 ANS OU PLUS, SEULEMENT ANNÉE – NOTER « 998 » SI NSP / NOTER « 999 » SI REFUSE

SI MOINS DE 6 ANS, DEMANDER LE MOIS – NOTER « 13 »SI NSP / NOTER « 14 » SI REFUSE

POSER LES QUESTIONS B7 A B9 POUR CHAQUE MEMBRE DU MENAGE

B7. ... (**NOM DU MEMBRE DU MENAGE)** était-il/elle né(e) : ... (**CITER 1 A 1 LES REPONSES**) ? *Taiza i ...* (**NOM DU MEMBRE DU MENAGE)** *no teraka : ...* (**CITER 1 A 1 LES REPONSES**) *?*

Au village. *Teto @ ity tanàna ity.*	1	*Tanàn-dehibe teto @ ity distrika ity.*		
Autre village du district. *Tanàna hafa teto @ ity distrika ity.*	2	Ville ou centre urbain d'un autre district. *Tanàn-dehibe ivelan'ity distrika ity.*	5	
Autre village d'un autre district. *Tanàna hafa ivelan'ity distrika ity.*	3	En dehors de Madagascar. *Ivelan'ny Madagasikara.*	6	
		NSP.	7	
Ville ou centre urbain du district.	4	Refuse.	8	

B8. Ces 7 derniers jours, combien de fois … (**NOM DU MEMBRE DU MENAGE)** mange-t-il/elle dans ce ménage ? *Tao anatin'izay 7 andro farany izay, impiry i …* (**NOM DU MEMBRE DU MENAGE)** *no nisakafo tato @ ity tokantrano ity ?*

REPONSE NUMERIQUE : NOMBRE DE JOUR(S)

NOTER « 8 » SI NSP / NOTER « 9 » SI REFUSE

NE POSER B9 ET B10 QUE POUR LES MEMBRES DU MENAGE AGES DE 12 ANS ET PLUS

B9. Quelle religion pratique … (**NOM DU MEMBRE DU MENAGE)** ? *Inona no antokom-pinoan'i …* (**NOM DU MEMBRE DU MENAGE)** *?*

Aucune. *Tsy misy.*	1	Islam. *Slamo.*	4
Traditionnelle. *Fivavahana nentim-paharazana.*	2	Autres … (**A SPECIFIER**). *Hafa.*	...
		NSP.	8
Christianisme. *Kristianina.*	3	Refuse.	9

B10. Quel est la situation matrimoniale de … (**NOM DU MEMBRE DU MENAGE)** ? *Ary manao ahoana ny satam-panambadian'i …* (**NOM DU MEMBRE DU MENAGE)** *?*

Marié(e) monogame (formel ou non). *Manambady tokana (na ara-dalàna na tsia).*	1
Marié(e) polygame (formel ou non). *Manambady maro (na ara-dalàna na tsia).*	2
Séparé(e). *Nisara-panambadiana tsy ara-dalàna.*	3
Divorcé(e). *Nisara-panambadiana ara-dalàna.*	4
Veuf(ve). *Maty vady.*	5
Jamais marié(e). *Mbola tsy nanambady mihitsy.*	6
NSP.	7
Refuse.	8

B11. De quel groupe ethnique venez-vous ? *Foko avy aiza moa no niavianareo ?*

Antaifasy	1	Mahafaly	12
Antaimoro	2	Merina	13
Antaisaka	3	Sakalava	14
Antakarana	4	Sihanaka	15
Antambahoaka	5	Tanala	16
Antandroy	6	Tsimihety	17
Antanosy	7	Vezo	18
Bara	8	Zafimaniry	19
Betsileo	9	Zafisoro	20
Betsimisaraka	10	NSP	21
Bezanozano	11	Refus	22

B12. En quelle année vous êtes-vous mariés ? *Tamin'ny taona firy ianao no nanambady ?*
REPONSE NUMERIQUE : ANNEE DE MARIAGE (4 CHIFFRES)
NOTER « 9998 » SI NSP / NOTER « 9999 » SI REFUSE

B13. Quelles études avez-vous effectuées ? Et votre mari/femme ? *Azoko fantarina ve azafady oe kilasy fahafiry moa ianao no nijanona farany ? Ary ny vadinao ?*

Sans instruction. *Tsy nianatra.*	1	Supérieur + 2 (LICENSE).	5
Primaire (CEPE).	2	Supérieur + 3 et plus (+++)	6
Secondaire 1er cycle (BEPC).	3	NSP.	7
Secondaire 2nd cycle (BACC).	4	Refuse.	8

MODULE C : EDUCATION

NE DEMANDER QUE POUR LES MEMBRES DU MENAGE AGES DE 5 ANS ET PLUS.

C1. Combien d'individus âgés de 5 ans et plus y a-t-il dans votre ménage ? *Firy ny isan'ny olona 5 taona no miakatra ao an-tokatranonareo ?*
REPONSE NUMERIQUE : NOMBRE D'INDIVIDU(S)
SE REFERER AU SHOWCARD #1

C2. Code ID du membre du ménage. *Code ID-n'ilay olona ao an-tokantrano.*
SE REFERER AU SHOWCARD #1

C3. Qui rapporte l'information pour l'individu ? *Iza no mitatitra ny mombamomba ilay olona ?*
SE REFERER AU SHOWCARD #1

C4. … **(NOM DU MEMBRE DU MENAGE)** est-il/elle capable de parler la langue … **(CITER 1 A 1 LES LANGUES)** ? … **(NOM DU MEMBRE DU MENAGE)** *ve mahay miteny …* **(CITER 1 A 1 LES LANGUES)** *?*

C5. … **(NOM DU MEMBRE DU MENAGE)** est-il/elle capable de lire et écrire la langue … **(CITER 1 A 1 LES LANGUES)** ? … **(NOM DU MEMBRE DU MENAGE)** *ve mahay mamaky sy manoratra ny teny … ?*

		C4.				C5.			
		Non	Oui	NSP	Refuse	Non	Oui	NSP	Refuse
A	Malgache. *Malagasy.*	0	1	2	3	0	1	2	3
B	Française. *Frantsay.*	0	1	2	3	0	1	2	3

NE PAS POSER C6 A C11 POUR LE CHEF DE MENAGE ET SON CONJOINT

C6. … (NOM DU MEMBRE DU MENAGE) <u>a-t-il/elle déjà été</u> scolarisé(e) ? *Nandia fianarana ve i …* (NOM DU MEMBRE DU MENAGE) *?*

Oui. *Eny.*	1	**CONTINUER**
Non. *Tsia.*	0	**ALLER A C10**

NSP.	2	**ALLER A C10**
Refuse.	3	

C7. Quelles études … (NOM DU MEMBRE DU MENAGE) a-t-il/elle effectuées ? *Azoko fantarina ve azafady hoe kilasy faha-firy moa i … (NOM DU MEMBRE DU MENAGE) no nijanona farany ?*

Sans instruction. *Tsy nianatra.*	1
Primaire (CEPE).	2
Secondaire 1er cycle (BEPC).	3
Secondaire 2nd cycle (BACC).	4

Supérieur + 2 (LICENSE).	5
Supérieur + 3 et plus (+++)	6
NSP.	7
Refuse.	8

C8. Ces 12 derniers mois, … (NOM DU MEMBRE DU MENAGE) a-t-il/elle déjà été temporairement retiré de l'école deux semaines consécutives ou plus ? *Tao anatin'izay 12 volana farany izay, … (NOM DU MEMBRE DU MENAGE) ve efa nisy fotoana tsy nalefa tany an-tsekoly nandritry ny 2 herinandro na mihoatra ?*

Oui. *Eny.*	1	**CONTINUER**
Non. *Tsia.*	0	**ALLER A C10**

NSP.	2	**ALLER A C10**
Refuse.	3	

C9. Quelle était la raison principale du retrait de … (NOM DU MEMBRE DU MENAGE) de l'école ? *Inona no tena anton'ny tsy nandefasana an'i … (NOM DU MEMBRE DU MENAGE) tany an-tsekoly ?*

Manque d'argent. *Tsy fahampian'ny vola.*	1
Maladie. *Aretina.*	2
Besoins du foyer. *Nilaina tato an trano.*	3
Suspension. *Nahazo fampiatoana.*	4
Enseignants en grève.*Fitokonan'ny mpanabe.*	5

Enseignants absents.*Tsy nisy mpampianatra.*	6
Enterrement. *Fandevenana.*	7
Autre. *Hafa.* (**A SPECIFIER**)	…
NSP.	98
Refuse.	99

C10. … (NOM DU MEMBRE DU MENAGE) est-il/elle <u>actuellement</u> scolarisé(e) ? *@ izao fotoana izao, mianatra ve i … (NOM DU MEMBRE DU MENAGE) ?*

Oui. *Eny.*	1
Non. *Tsia.*	0

NSP.	2
Refuse.	3

C11. La dernière année scolaire, quel montant a été dépensé par le ménage, la famille ou les amis, dans l'éducation de … (NOM DU MEMBRE DU FOYER) pour … (CITER 1 A 1 LES ITEMS) ? *Nandritry ny taom-pianarana farany teo, ohatrinona eo ho eon y vola lanin'ny tokantrano, ny fianakaviana na ireo namana, t@ fampianarana an' i … (NOM DU MEMBRE DU FOYER) t@ … (CITER 1 A 1 LES ITEMS) ?*

REPONSE NUMERIQUE : MONTANT EN ARIARY (6 CHIFFRES)

NOTER « 000000 » AR SI AUCUN MONTANT N'A ETE DEPENSE / « 999998 » SI NSP / « 999999 » SI REFUS

A.	Frais de scolarité (droit d'inscription, écolage, papeterie, uniforme …). *Saram-pianarana (droit d'inscription, écolage, fitaovam-pianarana, fanamiana …).*
B.	Autres frais de scolarité (cours, pension alimentaire…). *Saram-pianarana hafa (cours, pension alimentaire…).*
C.	Dépenses autres que les frais de scolarité (contribution à la construction/maintenance de l'établissement, frais de pension, associations diverses, transport …). *Fandaniana hafa ankoatr'ireo saram-pianarana ireo (fanamboarana/fikarakarana ny sekoly, saran-tsakafo, fikambanana isan-karazany, fivezivezena…).*
D.	TOTAL

MODULE D : SANTE

DEMANDER POUR TOUS LES MEMBRES DU FOYER

D1. Rappeler le nombre des individus du ménage. *Isan'ny olona ao an-tokantrano.*
REPONSE NUMERIQUE : NOMBRE D'INDIVIDU(S)
SE REFERER A B1 ET AU SHOWCARD #1

D2. Code ID du membre du foyer. *Code ID-n'ilay olona ao antokatrano.*
SE REFERER AU SHOWCARD #1

D3. Qui rapporte l'information pour l'individu ? *Iza no mitatitra ny mombamomba ilay olona ?*
SE REFERER AU SHOWCARD #1

D4. Ces 2 dernières semaines, … **(NOM DU MEMBRE DU MENAGE)** a-t-il/elle souffert d'une maladie ou d'une blessure ? *Tao anatin'izay 2 herinandro farany izay, nisy aretina ve na ratra nahazo an'i … **(NOM DU MEMBRE DU MENAGE) ?***

Oui. *Eny.*	1	**CONTINUER**
Non. *Tsia.*	0	**ALLER A D9**

NSP.	2	**ALLER A D9**
Refuse.	3	

D5. Quelle était la maladie/blessure de … **(NOM DU MEMBRE DU MENAGE)** ? *Inona avy ireo aretina/ratra nahazo an'i … **(NOM DU MEMBRE DU MENAGE) ?***
LISTER JUSQU'A 2 MALADIES/BLESSURES PAR INDIVIDU

Fièvre, MALARIA. **Tazo, MALARIA.**	1		Evanouissement. *Safotra.*	11
Diarrhée. *Aretin-kibo.*	2		Problème de peau. *Areti-koditra.*	12
Douleur de l'estomac. *Aretim-bavony.*	3		Problème dentaire. *Areti-nify.*	13
Vomissement. *Mandoa.*	4		Problème de vue. *Areti-maso.*	14
Mal de gorge. *Areti-tenda.*	5		Oreille/nez/gorge. *Sofina/orona/tenda.*	15
Voie respiratoire supérieure (sinusites). *Taovam-pisefoana ambony (sinusites).*	6		Problème de dos. *Aretin-damosina.*	16
			Problème cardiaque. *Aretim-po.*	17
Voie respiratoire inférieure (poitrine, poumons). *Taovam-pisefoana ambany (tratra, avokavoka).*	7		Tension. *Tosi-drà.*	18
			Douleur en urinant. *Marary/manaintaina rehefa mivalan-drano.*	19
Grippe. *Gripa.*	8		Diabète. *Diabeta.*	20
Asthme. *Asma.*	9		Trouble mental. *Aretin-tsaina.*	21
Mal de tête. *Aretin'andoha.*	10		Tuberculose. *Tiberikilaozy.*	22

Maladie sexuellement transmissible. *Aretina azo avy @ firaisana ara-nofo.*	23	Grossesse. *Bevohoka.*	28
Brûlure. *May.*	24	Maladie à long terme non spécifiée. *Areti-mitaiza tsy voafaritra mazava*	29
Fracture. *Tapaka.*	25	Autre (**A SPECIFIER**). *Hafa.*	…
Blessure. *Ratra.*	26	NSP.	98
Empoisonnement. *Voapoizina.*	27	Refuse.	99

D6. Qui a diagnostiqué **… (CITER 1 A 1 LES MALADES/BLESSURES)** de **… (NOM DU MEMBRE DU MENAGE)**? *Iza no nitily ny … (CITER 1 A 1 LES MALADES/BLESSURES) nahazo an'i … (NOM DU MEMBRE DU MENAGE) ?*

Corps médical à l'hôpital (docteur, infirmière…). *Mpitsabo tany @ hopitaly (dokotera, rasazy …)*.	1
Corps médical d'autres centres de santé (cliniques, CSB …). *Mpitasabo tany @ toeram-pitsaboana hafa (clinique, CSB…)*	2
Assistant de surveillance de santé. *Mpanara-maso ara-pahasalamana.*	3
Guérisseur traditionnel. *Mpitsabo nentim-paharazana.*	4
Soi-même. *Izy tenany ihany.*	5
Autres membres du foyer. *Olona hafa tao an-tokantrano.*	6
Autres non membres du foyer (non médical). *Olona hafa tsy ao an-tokatrano (tsy mpitsabo)*	7
Autres (**A PRECISER**). *Hafa.*	…
NSP.	98
Refuse.	99

D7. Ces 2 dernières semaines, combien de jours **… (NOM DU MEMBRE DU MENAGE)** a-t-il/elle dû arrêter ses activités normales à cause de ces maladies/blessures ? *Tao anatin'izay 2 herinandro farany izay, nandritry ny firy andro i … (NOM DU MEMBRE DU MENAGE) no voatery nanajanona ny asa/fianarana fanaony andavanandro noho ireo aretina/ratra nahazo azy ireo ?*

REPONSE NUMERIQUE : NOMBRE DE JOURS

NOTER « 0 » SI AUCUN / « 98 » SI NSP / « 99 » SI REFUSE

D8. Ces 4 dernières semaines, au total, quel montant avez-vous dépensé pour les maladies et blessures de **… (NOM DU MEMBRE DU MENAGE)**, y compris les médicaments (même sans ordonnance), analyses, consultation, et autres dépenses s'il y n avait ? *Tao anatin'izay 4 herinandro farany izay, raha totaliana, ohatrinona ny vola lany t@ aretina/ratra nahazo an'i … (NOM DU MEMBRE DU MENAGE), ao anatin'izany ny fanafody (naha tsy nahazoana taratasy tany @ dokotera aza), ny fitiliana, ny fizahana, sy izay mety ho fandaniana hafa ?*

REPONSE NUMERIQUE : MONTANT EN ARIARY (6 CHIFFRES)

NOTER « 000000 » AR SI AUCUN MONTANT N'A ETE DEPENSE / « 999998 » SI NSP / « 999999 » SI REFUS

D9. Ces 12 derniers mois, **… (NOM DU MEMBRE DU MENAGE)** a-t-il/elle été hospitalisé(e) ou a-t-il/elle passé des nuits dans un centre médical ? *Tao anatin'izay 12 volana farany izay, efa nisy fotoana ve i … (NOM DU MEMBRE DU MENAGE) niditra hôpitaly na nijanona natory t@ toeram-pitsaboana iray ?*

Oui. *Eny.*	1	**CONTINUER**	NSP.	2	**ALLER A D11**
Non. *Tsia.*	0	**ALLER A D11**	Refuse.	3	

D10. Au total, quel montant avez-vous dépensé pour l'hospitalisation/nuits passées dans un centre médical de **… (NOM DU MEMBRE DU MENAGE)** ? *Raha totaliana, ohatrinona ny vola lany t@ fampidirana hôpitaly/fijanoana t@ toeram-pitsaboana an'i … (NOM DU MEMBRE DU MENAGE) ?*

REPONSE NUMERIQUE : MONTANT EN ARIARY (6 CHIFFRES)

NOTER « 000000 » AR SI AUCUN MONTANT N'A ETE DEPENSE / « 999998 » SI NSP / « 999999 » SI REFUS

D11. Ces 12 derniers mois, **… (NOM DU MEMBRE DU MENAGE)** a-t-il/elle passé des nuits chez un médecin traditionnel ou chez le foyer d'un médecin ? *Tao anatin'izay 12 volana farany izay, efa nisy fotoana ve i … (NOM DU MEMBRE DU MENAGE) nijanona tany @ mpitsabo nentim-paharazana, na tao an-tokantranon'ny mpitsabo iray ?*

Oui. *Eny.*	1	**CONTINUER**		NSP.	2	**INDIVIDU/MODULE SUIVANT**
Non. *Tsia.*	0	**INDIVIDU/MODULE SUIVANT**		Refuse.	3	

D12. Au total, quel montant avez-vous dépensé pour ces nuits passées par **… (NOM DU MEMBRE DU MENAGE)** chez un médecin traditionnel ou chez le foyer d'un médecin ? *Raha totaliana, ohatrinona ny vola lany nandritry ny fotoana natorian'i … (NOM DU MEMBRE DU MENAGE) tamin'ireo toerana ireo ? (Mpitsabo nentim-paharazana/dokotera)*

REPONSE NUMERIQUE : MONTANT EN ARIARY (6 CHIFFRES)

NOTER « 0 » AR SI AUCUN MONTANT N'A ETE DEPENSE / « 999998 » SI NSP / « 999999 » SI REFUS

MODULE E : EMPLOI & TRAVAIL

NE DEMANDER QUE POUR LES MEMBRES DU MENAGE AGES DE 10 ANS ET PLUS.

E1. Combien d'individus âgés de 10 ans et plus y a-t-il dans votre ménage ? *Firy ny isan'ny olona 10 taona no miakatra ao an-tokatranonareo ?*

REPONSE NUMERIQUE : !__!__! INDIVIDU(S)

SE REFERER AU SHOWCARD #1

E2. Code ID du membre du foyer. *Code ID-n'ilay olona ao antokatrano*

SE REFERER AU SHOWCARD #1

E3. Qui rapporte l'information pour l'individu ? *Iza no mitatitra ny mombamomba ilay olona ?*

SE REFERER AU SHOWCARD #1

E4. Ces 12 derniers mois, **… (NOM DU MEMBRE DU MENAGE)** a-t-il/elle travaillé pour l'activité agricole familiale (y compris élevage, pêche, si à vendre ou pour nourriture du foyer) même si c'était seulement pour une journée ? *Tao anatin'izay 12 volana farany izay, i … (NOM DU MEMBRE DU MENAGE) ve efa nanampy t@ asa fambolena sahanin'ny tokantrano (voaray avokoa na fiompiana, na jono, raha toa ka amidy na atao sakafon'ny tokantrano), eny na dia 1 andro fostiny aza ?*

E5. Ces 12 derniers mois, **… (NOM DU MEMBRE DU MENAGE)** a-t-il/elle entrepris toute autre activité non-agricole pour son propre compte ou pour le ménage, même si c'était seulement pour une journée ? *Tao anatin'izay 12 volana farany izay, na azy irery na an'ny tokantrano, nisy fotoana ve i … (NOM DU MEMBRE DU MENAGE) nisahana asa tsy misy ifandraisany @ fambolena/fiompiana/jono sahanin'ny tokantrano, eny na dia 1 andro fotsiny aza ?*

E6. Ces 12 derniers mois, **… (NOM DU MEMBRE DU MENAGE)** a-t-il/elle aidé dans toute autre activité non-agricole entreprise dans le ménage même si c'était seulement pour une journée ? *Tao anatin'izay 12 volana farany izay,*

nisy fotoana ve i … (NOM DU MEMBRE DU MENAGE) nanampy t@ asa tsy misy ifandraisany @ fambolena/fiompiana/jono nosahanina tao an-tokantrano, eny na dia 1 andro fotsiny aza ?

E7. Ces 12 derniers mois, **… (NOM DU MEMBRE DU MENAGE)** a-t-il/elle travaillé comme salarié, reçu des commissions ou tout paiement de ce genre, même si c'était seulement pour une journée ? *Tao anatin'izay 12 volana farany izay, nisy fotoana ve i … (NOM DU MEMBRE DU MENAGE) nikarama, na nandray tambin-kasasarana na tambin'asa sns… (vola), eny na dia 1 andro fotsiny aza ?*

E8. Ces 12 derniers mois, **… (NOM DU MEMBRE DU MENAGE)** a-t-il/elle pris part à des activités occasionnelles, à mi-temps, même si seulement pour une journée ? *Tao anatin'izay 12 volana farany izay, nisy fotoana ve i … (NOM DU MEMBRE DU MENAGE) nanao asa an-tselika eny na dia 1 andro fotsiny aza ?*

	E4.	**E5.**	**E6.**	**E7.**	**E8.**
Oui. *Eny.*	1	1	1	1	1
Non. *Tsia.*	0	0	0	0	0
NSP	2	2	2	2	2
Refus	3	3	3	3	3

POSER E9 POUR CHAQUE MEMBRE DU MENAGE AYANT AU MOINS UNE REPONSE « OUI - 1 » POUR L'UNE DES QUESTIONS E4 A E8

E9. Ces 12 derniers mois, dans quel type d'activité économique **… (NOM DU MEMBRE DU MENAGE)** passe-t-il/elle la majorité de son temps ? *Tao anatin'izay 12 volana farany izay, inona ireo sehatr'asa ara-toekarena tena nandanian'i … (NOM DU MEMBRE DU MENAGE) ny fotoanany betsaka indrindra ?*

LISTER JUSQU'A 2 ACTIVITES PAR INDIVIDU

Salarié (emploi occasionnel exclus). *Mikarama (tsy asa an-tselika).*	1
Emploi occasionnel, à mi-temps. *Asa an-tselika.*	2
Activités non agricoles du ménage. *Asa ankoatry ny fambolena sahanin'ny tokatranano.*	3
Activités agricoles du ménage, non rémunéré. *Asa fambolena sahanin'ny tokatranano, tsy andraisam-karama.*	4
Tâches domestiques du ménage, non rémunéré. *Asa an-trano ao an-tokatrano, tsy andraisan-karama.*	5
Apprentissage non rémunéré. *Fiofanana arak'asa tsy andraisan-karama.*	6
A l'école. *Any ampianarana.*	7
Autres (**A PRECISER**). *Hafa.*	…
NSP.	98
Refus.	99

MODULE F : LOGEMENT

F1. Comment avez-vous obtenu cette habitation ? *Aona no nahazoanareo io trano io ?*

Propriété. *Fananana (tranon-drazana, natsangana).*	1
Achetée. *Novidiana.*	2
Fournie par les employeurs. *Natolotry ny mpampiasa.*	3
Gratuitement avec autorisation. *Maimaim-poana, nahazo alalana.*	4
Gratuitement sans autorisation. *Maimaim-poana, tsy nahazo alalana.*	5
Location. *Manofa.*	6
NSP.	7
Refus.	8

F2. A quel montant s'élève votre loyer ? *Azo fantarina ve hoe ohatrinona ny hofan'io trano io ?*

REPONSE NUMERIQUE : MONTANT DU LOYER EN ARIARY (6 CHIFFRES)

NOTER « 000000 » AR SI AUCUN MONTANT N'A ETE DEPENSE / « 999998 » SI NSP / « 999999 » SI REFUS

UNITE DE MESURE DU TEMPS : « *1 – Jour ; 2 – Semaine ; 3 – Mois ; 4 – Année* »

MONTANT (ARIARY)	UNITE
!__ !__ !__ !__ !__ !__ !	

F3. Depuis combien d'années cette maison est-elle construite ? *Firy taona izay no niorenan'ity trano ity ?*

REPONSE NUMERIQUE : !__ !__ !__ ! ANNÉE(S)

NOTER « 000 » SI MOINS D'UN AN / NOTER « 998 » SI NSP / NOTER « 999 » SI REFUS

F4. De quelle matière sont essentiellement faits les murs externes de votre habitation ? *Inona no akora fototra nanamboarana ny rindrina ivelan'ity trano ipetrahanareo ity ?*

CITER 1 A 1 LES REPONSES

Herbe. *Bozaka.*	1	Bétons. *Bétons.*	6
Boue. *Fotaka.*	2	Bois. *Hazo.*	7
Terre compact. *Tany voavolavola.*	3	Tôles. *Tôles.*	8
Briques de terre (non brûlées). *Biriky tsy voadoro*	4	Autres (**A SPECIFIER**). *Hafa.*	…
		NSP.	98
Briques brûlées. *Biriky voadoro.*	5	Refus.	99

F5. Combien de pièces séparées y a-t-il dans votre habitation ? *Mizara efitra firy ity trano ipetrahanareo ity ?*

REPONSE NUMERIQUE : !__!__! NOMBRE DE PIECE(S)

NOTER 98 SI NSP / NOTER 99 SI REFUS

F6. Quelle est votre principale source de lumière ? *Inona no akora fototra entina manazava (jiro) ity trano ity ?*

Bois rassemblés. *Kitay angonina.*	1	Batterie/piles (torche). *Batterie/piles (torche).*	7
Bois rassemblés achetés. *Kitay vidiana.*	2	Bougie. *Labozia.*	8
Herbe. *Bozaka.*	3	Autres (**A SPECIFIER**). *Hafa.*	…
Paraffine. *Paraffine.*	4		
Electricité. *Herin'aratra.*	5	NSP.	98
Gaz. *Gaz.*	6	Refus.	99

F7. Quelle est votre principal combustible pour cuisson ? *Inona no akora fototra entina mahandro ny sakafo ?*

Bois rassemblés. *Kitay angonina.*	1	Résidu de culture. *Sisam-bokatra.*	7
Bois rassemblés achetés. *Kitay vidiana.*	2	Sciure. *Taim-bakona.*	8
Paraffine. *Paraffine.*	3	Déchets d'animaux. *Malotom-biby.*	9
Electricité. *Herin'aratra.*	4	Autres (**A SPECIFIER**). *Hafa.*	…
Gaz. *Gaz.*	5	NSP.	98
Charbon de bois. *Arina.*	6	Refus.	99

F8. Combien de téléphones portables actifs possède votre ménage ? *Firy ny isan'ny finday mandeha ampiasainareo ao an-tokatrano ?*

REPONSE NUMERIQUE : !__!__! TELEPHONE(S) PORTABLE(S) ACTIF(S)

NOTER « 0 » SI AUCUN / NOTER « 98 » SI NSP / NOTER « 99 » SI REFUSE

F9. Quelle est votre principale source d'eau potable ? *Avy aiza no ahazoanareo rano fisotro madio ?*

Eau courante à la maison. *Rano tonga ao an-trano.*	1	*Rano voaaro tsara, eo an-tokotany.*	
Eau courante dans la cour. *Rano tonga eo an-tokotany.*	2	Eau publique bien protégée. *Rano voaaro tsara, itambarana @ vahoaka.*	7
Pompe communale. *Fatsakàna.*	3	Forage. *Lava-drano.*	8
		Rivière/fleuve. *Renirano.*	9
Puits dans la cour. *Vovo eo an-tokotany.*	4	Etang/lac. *Kamory/farihy.*	10
		Barrage. *Tohan-drano.*	11
Puits communales. *Vovon'ny kaominina.*	5	Eau de pluie. *Ranon'orana.*	12
		Autres (**A SPECIFIER**). *Hafa.*	…
		NSP.	98
Eau dans la cour bien protégée.	6	Refus.	99

F10. Combien de temps prend-il pour atteindre votre principale source d'eau ? *Maharitra hafiriana eo ho eo ny lalana ahatongavana any @ izany rano izany ?*

REPONSE NUMERIQUE : !__!__! Heure(s) !__!__! Minute(s)

NOTER « 0 » SI LA SOURCE D'EAU EST SUR LES LIEUX / NOTER « 98 » SI NSP / NOTER « 99 » SI REFUSE.

F11. De quel genre de toilette dispose votre habitation principale ? *Toy ny ahoana ny toerana fivoahana (WC) ato @ ity trano ity?*

Aucune toilette. *Tsy misy toeram-pivoahana.*	1
Toilette avec chasse d'eau. *WC misy rano manondraka.*	2
Latrines traditionnelles avec toit. *Lava-piringy misy tafo.*	3
Latrines traditionnelles sans toit. *Lava-piringy tsy misy tafo.*	4
Autres (**A SPECIFIER**). *Hafa.*	…
NSP.	98
Refus.	99

Un membre de votre ménage utilise-t-il une moustiquaire pendant son sommeil pour se protéger contre les moustiques à une certaine période de l'année ? *Mandritry ny taona, misy olona mampiasa lay fiarovana @ moka ve ato @ ity tokantrano ity ?*

Oui. *Eny.*	1	**CONTINUER**		NSP	2	**MODULE SUIVANT**
Non. *Tsia.*	0	**MODULE SUIVANT**		Refus.	3	

F12. Ces 6 derniers mois, les moustiquaires étaient-elles traitées avec de l'insecticide ? *Tao anatin'izay 6 volana farany izay, nasiana fanafody miaro @ bibikely ve ireo lay ireo ?*

SI CE SONT DE NOUVELLES MOUSTIQUAIRES DE MOINS DE 6 MOIS, CONSIDERER « OUI »

Oui, toutes. *Eny, izy rehetra.*	1
Oui, quelques-unes. *Eny, ny ampahany.*	2
Non, aucune. *Tsia, tsy misy.*	3
NSP.	4
Refus.	5

MODULE G : FINANCE

G1. Actuellement, un membre de votre ménage possède-t-il, personnellement ou avec un autre membre du ménage ou quelqu'un d'autre non issu du ménage, un compte en banque, institution de crédits, institution de microfinance, bureau de poste, organisation économique du village, ou une autre institution financière ? *@ izao ankehitriny izao, @ ireo olona ao an-tokantranonareo, na izy irery, na ikambanany @ olon-kafa, misy manana petra-bola any @ Banky, na orinasa fampindramam-bola, na paositra, na tahirim-bola iraisan'ny mpiara-monina, na toerana fametraham-bola hafa ?*

Oui. *Eny.*	1	**CONTINUER**		NSP.	2	**ALLER A G3**
Aucun. *Tsy misy.*	0	**ALLER A G3**		Refus.	3	

G2. Qui sont ces membres du foyer ? *Iza avy ireo olona ireo ?*
SE REFERER AU SHOWCARD #1
LISTER JUSQU'A 3 INDIVIDUS AU MAX

Code ID #1	Code ID #2	Code ID #3

G3. Ces 12 derniers mois, vous-même ou un membre de votre ménage a-t-il emprunté du crédit chez une institution (banque, microfinance) pour les affaires ou les activités rurales rémunérées ? *Tao anatin'izay 12 volana farany izay, ianao na olona ao @ tokatranonareo, efa nisy nihindram-bola tany @ orinasa fampindramam-bola ve ianareo ho an'ny asa fambolena na asa hafa fampidiram-bola ?*

Oui. *Eny.*	1	**CONTINUER**		NSP.	2	**ALLER A G5**
Aucun. *Tsy misy.*	0	**ALLER A G5**		Refus.	3	

G4. Qui sont ces membres du foyer ? *Iza avy ireo olona ireo ?*
SE REFERER AU SHOWCARD #1
LISTER JUSQU'A 3 INDIVIDUS AU MAX

Code ID #1	Code ID #2	Code ID #3

G5. Ces 12 derniers mois, vous-même ou un membre de votre ménage a-t-il emprunté du crédit chez un particulier (parents, membre de la communauté) pour les affaires ou les activités rurales rémunérées ? *Tao anatin'izay 12 volana farany izay, ianao na olona ao @ tokatranonareo, efa nisy nihindram-bola tany @ olona tsotra (havana, mpiray tanàna) ve ianareo ho an'ny asa fambolena na asa hafa fampidiram-bola ?*

Oui. *Eny.*	1	**CONTINUER**		NSP.	2	**MODULE SUIVANT**
Aucun. *Tsy misy.*	0	**MODULE SUIVANT**		Refus.	3	

G6. Qui sont ces membres du foyer ? *Iza avy ireo olona ireo ?*
SE REFERER AU SHOWCARD #1
LISTER JUSQU'A 3 INDIVIDUS AU MAX

Code ID #1	Code ID #2	Code ID #3

MODULE H : SECURITE ALIMENTAIRE

H1. Ces 7 derniers jours, aviez-vous été inquiété que votre ménage n'aurait pas assez de nourriture ? *Tao anatin'izay 7 andro farany izay, nisy fotoana ve ianao niahiahy hoe tsy ho ampy sakafo ny tokatranonareo ?*

Oui. *Eny.*	1	NSP.	2
Non. *Tsia.*	0	Refus.	3

H2. Ces 7 derniers jours, vous-même ou un membre de votre ménage, combien de jours aviez-vous dû … (**CITER 1 A 1 LES ITEMS**) ? *Tao anatin'izay 7 andro farany izay, ianao na ny olona ao antokatranonareo, impiry ianareo no voatery…* (**CITER 1 A 1 LES ITEMS**) *?*

REPONSE NUMERIQUE : NOMBRE DE JOUR(S)

NOTER « 0 » SI JAMAIS / NOTER « 8 » SI NSP / NOTER « 9 » SI REFUSE.

A.	Manger des aliments moins chers. *Nihinana sakafo mora vidy.*	!__!
B.	Limiter la quantité d'aliments mangés aux heures de repas. *Nametra ny abetsaky ny sakafo hoanina.*	!__!
C.	Réduire le nombre de repas prix par jour. *Nametra ny isan'ny sakafo hoanina isan'andro*.	!__!
D.	Restreindre la consommation des adultes afin que les petits enfants puissent en avoir assez. *Nametra ny sakafon'ny lehibe mba ho ampy ny anjaran'ny ankizy kely.*	!__!
E.	Emprunter de la nourriture chez un ami ou un parent. *Nihindrana sakafo tany @ namana na havana.*	!__!

H3. Combien de repas par jour, y compris le petit déjeuner, prennent les adultes dans votre foyer ? et les enfants (6 mois à 5 ans) ? *Ao anatin'ny andro iray, miaraka @ sakafo maraina, impiry ny lehibe no misakafo ? ary ny ankizy kely (6 volana hatr@ 5 taona) ?*

REPONSE NUMERIQUE : NOMBRE DE REPAS PAR JOUR

LAISSER VIDE SI PAS D'ENFANT / NOTER « 8 » SI NSP / NOTER « 9 » SI REFUSE

A.	Adulte. *Lehibe.*	!__!
B.	Enfant. *Ankizy kely.*	!__!

H4. Ces 12 derniers mois, aviez-vous déjà été dans une situation où vous n'aviez pas assez de nourriture pour nourrir votre ménage ? *Tao anatin'izay 12 volana farany izay, efa nisy fotoana ve tsy ampy sakafo ny tokatranonareo ?*

Oui. *Eny.*	1	**CONTINUER**	NSP.	2	**ALLER A H7**
Non. *Tsia.*	0	**ALLER A H7**	Refus.	3	

H5. Quand est-ce que vous avez été dans cette situation ? *Oviana io fotoana io no nitranga ?*

COCHER TOUS LES MOIS DE 2015 ET 2016 QUAND LE MENAGE N'AVAIT PAS ASSEZ DE NOURRITURE

2015			2016											
Oct.	Nov.	Déc.	Janv.	Fév.	Mars	Avril	Mai	Juin	Juil.	Août	Sept.	Oct.	Nov.	Déc.

H6. Quelle était la cause de cette situation ? *Inona no anton'io tranga io ?*

LISTER JUSQU'À 3 CAUSES PAR ORDRE D'IMPORTANCE

Réserves alimentaires inadéquates dues à la sécheresse/manque de pluies. *Tsy fahampian'ny tahirin-tsakafo nohon'ny ain-tany/tsy fahampian'ny orana.*	1

Réserves alimentaires inadéquates dues à des cultures ravagées. **Tsy fahampian'ny tahirin-tsakafo nohon'ny fahasimban'ny voly.**	2	
Réserves alimentaires inadéquates dues à la petite dimension de la terre. **Tsy fahampian'ny tahirin-tsakafo noho ny akelin'ny tany fambolena.**	3	
Réserves alimentaires inadéquates dues à la faiblesse des intrants agricoles. **Tsy fahampian'ny tahirin-tsakafo noho ny akelin'ny vokatra.**	4	
Les aliments sur le marché coûtent trop chers. **Lafo loatra ny vidin-tsakafo eny an-tsena.**	5	
Il est difficile d'atteindre le marché à cause des frais de transport. **Lafo ny saran-dalana mankany an-tsena.**	6	
Il n'y a pas d'aliments sur le marché. **Tsy misy sakafo eny an-tsena.**	7	
Inondation. **Tondra-drano.**	8	
Autres (**A SPECIFIER**). **Hafa.**	…	
NSP.	98	
Refus.	99	

Cause #1	Cause #2	Cause #3

H7. Ces dernières 24 heures, vous-même ou un membre de votre foyer a-t-il consommé **… (CITER UN A UN LES ALIMENTS)** ? *Tao anatin'izay 24 ora farany izay, ianao na ny olona ao antokatranonareo ve nihinana ... (CITER 1 A 1 LES ALIMENTS) ?*

Oui. *Eny.*	1	NSP.	2
Non. *Tsia.*	0	Refus.	3

H8. Ces 7 derniers jours, combien de fois (nombre de jours) vous-même ou un membre de votre foyer, avez-vous consommé du **… (CITER 1 A 1 LES ALIMENTS)** ? *Tao anatin'izay 7 andro farany izay, impiry ianao na ny olona ao antokatranonareo nihinana ... (CITER 1 A 1 LES ALIMENTS) ?*

REPONSE NUMERIQUE : NOMBRE DE JOUR(S)

NOTER « 0 » SI AUCUN / NOTER « 8 » SI NSP / NOTER « 9 » SI REFUSE

		H7	H8
A1	Riz. *Vary.*		!__!
A2	Céréales, grains et produits céréaliers (grains/farine de maïs ; maïs vert ; millet commun ; millet à grappes ; sorgho ; farine de blé ; pain ; pâtes ; autres). *Voa madinika, na sakafo vita @ voa madinika (koba ; katsaka ; varim-bazaha ; mofo ; paty ; sns).*		!__!
B	Racines, tubercules et plantains (tubercule/farine de manioc ; patate douce ; pomme de terre, autres). *Hanikotrana (mangahazo ; vomanga ; saonjo ; ovy ; sns).*		!__!
C	Noix et graines (haricot ; petit pois ; pois de cap ; arachide ; lentille ; autres). *Voa isan-karazany (tsaramaso ; petit pois ; kabaro ; voanjo ; tsiasisa ; sns).*		!__!
D	Légumes (ognion ; chou ; aubergine, tomates, légumes vertes ; autres). *Legioma (tongolo ; laisoa ; voatabia ; baranjely ; sns).*		!__!
E	Viande, poissons et produits animaliers (œuf ; poisson frais/seché/fumé ; bœuf ; porc ; chèvre ; volaille ; autres). *Hena, trondro sy sakafo azo avy @ biby (atody ; omby ; kisoa ; ondry ; akoho amam-borona ; sns).*		!__!
F	Fruits (mangue ; banane ; citron ; ananas ; papaye ; goyave ; avocat ; pomme ; autres). *Voankazo (manga ; akondro ; voasary ; papay ; goavy ; zavoka ; paoma, sns).*		!__!
G	Lait et produits laitiers (fromage ; yaourt ; autres) *Ronono na vokatra azo avy @ ronono (fromage ; yaourt ; sns).*		!__!

H	Matière grasse et huile (huile de cuisine ; beurre ; margarine ; autres). ***Tavy na menaka (menaka fandrahoana ; dibera ; sns).***		!__!
I	Sucre, produits sucrés et miel (bonbons ; chocolats ; gâteaux ; autres). ***Siramamy sy vokatra azo avy aminy na tantely (vatomamy, sôkôla, mofo mamy ; sns).***		!__!
J	Epices (sel ; poivres ; sauce/poudre pour grillade ; tomate en boîte ; chilli sauce ; sauce/poudre poisson ; autres) et condiments (thé ; café ; cacao ; autres). ***Zava-manitra (sira ; dipoivatra ; saosy isan-karazany) na zava-pisotro mafana (dité ; kafé ; kakao ; sns).***		!__!
K	Boisson alcoolisée, tabac, cigarettes. ***Zava-pisotro misy alkaola, sigara, paraky sns.***		!__!

MODULE I : BIENS POSSEDES

I1. Votre ménage possède-t-il actuellement les biens suivants : … (**CITER 1 A 1 LES BIENS**) ? *Manana ireto zavatra manaraka ireto ve ny tokatranonareo : …* (**CITER 1 A 1 LES BIENS**) **?**

Oui. *Eny.*	1	NSP.	2
Non. *Tsia.*	0	Refus.	3

POSER I2 POUR CHAQUE BIEN POSSEDE

I2. Combien de **… (CITER 1 A 1 LES BIENS POSSEDES)** possédez-vous ? *Firy ny isan'ny …* **(CITER 1 A 1 LES BIENS POSSEDES)** *anananareo ?*
REPONSE NUMERIQUE : NOMBRE DE BIEN POSSEDE
NOTER « 0 » SI AUCUN / NOTER « 98 » SI NSP / NOTER « 99 » SI REFUSE

I3. Ces 12 derniers mois, votre ménage a-t-il vendu … (**CITER 1 A 1 LES BIENS**) ? *Tao anatin'izay 12 volana farany izay, efa nivarotra …* (**CITER 1 A 1 LES BIENS**) *ve ny tokatranonareo ?*

Oui. *Eny.*	1	NSP.	2
Non. *Tsia.*	0	Refus.	3

POSER I4 POUR CHAQUE BIEN POSSEDE VENDU

I4. Combien de **… (CITER 1 A 1 LES BIENS VENDUS)** avez-vous vendu ? *Firy ny isan'ny …* **(CITER 1 A 1 LES BIENS VENDUS)** *efa lafonareo ?*
REPONSE NUMERIQUE : NOMBRE DE BIENS VENDUS
NOTER « 0 » SI AUCUN / NOTER « 98 » SI NSP / NOTER « 99 » SI REFUSE

CODE	BIENS	I1.	I2.	I3.	I4.
501	Pilon et mortier. *Laona sy fanoto.*		!__!__!		!__!__!
502	Lits. *Fandriana.*		!__!__!		!__!__!
503	Tables. *Latabatra.*		!__!__!		!__!__!
504	Chaises. *Seza*.		!__!__!		!__!__!
505	Ventilateur. *Ventilateur.*		!__!__!		!__!__!
506	Radio. *Onjam-peo.*		!__!__!		!__!__!
507	Lecteur CD-DVD. *Lecteur CD-DVD.*		!__!__!		!__!__!
508	Télévision. *Fahita lavitra.*		!__!__!		!__!__!
509	Machine à coudre. *Milina fanjairana.*		!__!__!		!__!__!
510	Bicyclette. *Bisikileta.*		!__!__!		!__!__!

511	Véhicule à moteur. *Fitaterana misy motera (fiara, moto, sns).*		!__!__!	!__!__!
512	Tambour de brassage de bière.*Fanodinana labiera.*		!__!__!	!__!__!
513	Canapé, sofa (chaise rembourrée).*Canapé, sofa (seza voafono).*		!__!__!	!__!__!
514	table basse (pour salon). *Latabatra iva (fandraisam-bahiny).*		!__!__!	!__!__!
515	Armoire, tiroirs, bureau. *Vata, vatasarihana, birao.*		!__!__!	!__!__!
516	Lanterne (paraffine). *Fanala.*		!__!__!	!__!__!
517	Horloge. *Famataranandro.*		!__!__!	!__!__!
518	Fer à repasser. *Fera fipasohana.*		!__!__!	!__!__!
519	Panneau solaire. *Herin'aratra azo avy @ masoandro.*		!__!__!	!__!__!

MODULE J : EQUIPEMENTS AGRICOLES

J1- Votre ménage possède-t-il actuellement les équipements suivants : … (**CITER 1 A 1 LES EQUIPEMENTS**) ? *Manana ireto fitaovana manaraka ireto ve ny tokantrononareo : …* (**CITER 1 A 1 LES EQUIPEMENTS**) *?*

Oui. *Eny.*	1	NSP.	2
Non. *Tsia.*	0	Refus.	3

POSER J2 POUR CHAQUE EQUIPEMENT POSSEDE

J2- Combien de … (**CITER 1 A 1 LES EQUIPEMENTS POSSEDES**) possédez-vous ? *Firy ny isan'ny …* (**CITER 1 A 1 LES BIENS POSSEDES)** *anananareo ?*
REPONSE NUMERIQUE : NOMBRE D'EQUIPEMENT POSSEDE
NOTER « 0 » SI AUCUN / NOTER « 98 » SI NSP / NOTER « 99 » SI REFUSE

J3- Ces 12 derniers mois, votre ménage a-t-il vendu … (**CITER 1 A 1 LES EQUIPEMENTS**) ? *Tao anatin'izay 12 volana farany izay, efa nivarotra …* (**CITER 1 A 1 LES EQUIPEMENTS POSSEDES)** *ve ny tokatranonareo ?*

Oui. *Eny.*	1	NSP.	2
Non. *Tsia.*	0	Refus.	3

POSER I4 POUR CHAQUE EQUIPEMENT POSSEDE VENDU

J4- Combien de … (**CITER 1 A 1 LES EQUIPEMENTS VENDUS**) avez-vous vendu ? *Firy ny isan'ny …* (**CITER 1 A 1 LES EQUIPEMENTS VENDUS)** *efa lafonareo ?*
REPONSE NUMERIQUE : NOMBRE D'EQUIPEMENT VENDU
NOTER « 0 » SI AUCUN / NOTER « 98 » SI NSP / NOTER « 99 » SI REFUSE

CODE	EQUIPEMENT	J1-	J2-	J3-	J4-
601	Houe/binette manuelle. *Angady.*		!__!__!		!__!__!
602	Scie. *Tsofa.*		!__!__!		!__!__!
603	Hâche. *Famaky.*		!__!__!		!__!__!
604	Vaporisateur. *Famafazana rano.*		!__!__!		!__!__!
605	Machette. *Antsy be.*		!__!__!		!__!__!
606	Faucille. *Antsim-bary, antsim-bilona.*		!__!__!		!__!__!
607	Pompe à pédale. *Paompy vohizina.*		!__!__!		!__!__!
608	Arrosoir. *Fanondrahana.*		!__!__!		!__!__!

		MACHINES				
609	Charrette de bœufs. *Saretin'omby.*		!__!__!		!__!__!
610	Charrue de bœufs. *Angadin'omby.*		!__!__!		!__!__!
611	Machine pour strier.		!__!__!		!__!__!
612	Motoculteur. *Kibôta.*		!__!__!		!__!__!
613	Générateur. *Mpamokatra herin'aratra.*		!__!__!		!__!__!
614	Pompe à moteur. *Paompy misy motera.*		!__!__!		!__!__!
615	Moulin à grains. *Fitotoana voa.*		!__!__!		!__!__!
616	Autres (**A SPECIFIER**)		!__!__!		!__!__!
		STRUCTURES				
617	Poulailler. *Tranon'akoho.*		!__!__!		!__!__!
618	Enclos pour bétails. *Tranom-biby (omby, ondry, sns).*		!__!__!		!__!__!
619	Enclos pour volailles. *Tranom-borona.*		!__!__!		!__!__!
620	Maison de stockage. *Trano fanangonana vokatra.*		!__!__!		!__!__!
621	Grenier. *Trano fitahirizana vokatra.*		!__!__!		!__!__!
622	Grange. *Trano fitahirizana vilona.*		!__!__!		!__!__!
623	Porcherie. *Tranon-kisoa.*		!__!__!		!__!__!

MODULE K : ENFANTS RESIDANT AILLEURS

K1. Avez-vous ou votre conjoint des fils et/ou filles biologiques, âgés de 15 ans et plus, qui ne résident pas dans ce ménage ? *Ianao ve, na ny vadinao, manana zanaka nateraka, 15 taona no mihoatra, tsy mipetraka ato @ ity tokantrano ity ?*

Oui. *Eny.*	1	**CONTINUER**	NSP.	2	**MODULE SUIVANT**
Non. *Tsia.*	0	**MODULE SUIVANT**	Refus.	3	

POSER K2 A K15 POUR CHAQUE ENFANT RESIDANT AILLEURS

K2. Combien d'enfants résidant ailleurs avez-vous ? *Firy ny isan'ny zanakareo monina any an-toeran-kafa ?*
REPONSE NUMERIQUE : NOMBRE D'ENFANTS
SE REFERER AU SHOWCARD #1

K3. Pourriez-vous me donner leur(s) nom(s) ? *Afaka lazainao ve ny anaran'izy ireo ?*
REPONSE LITTERALE
SE REFERER AU SHOWCARD #1

K4. Quel âge a … (NOM DE L'ENFANT) ? *Firy taona moa i … (NOM DE L'ENFANT) ?*
REPONSE NUMERIQUE : AGE DE L'ENFANT
SE REFERER AU SHOWCARD #1

K5. De quel sexe est … (NOM DE L'ENFANT) ? *Lahy sa vavy i … (NOM DE L'ENFANT) ?*

Masculin. *Lahy.*	1	NSP.	3
Féminin. *Vavy..*	2	Refus.	4

K6. Quelles études … **(NOM DE L'ENFANT)** a-t-il/elle effectué ? *Azoko fantarina ve azafady hoe kilasy fahafiry moa i … (NOM DE L'ENFANT) no nijanona farany ?*

Sans instruction. ***Tsy nianatra.***	1		Supérieur + 2 (LICENSE).	5
Primaire (CEPE).	2		Supérieur + 3 et plus (+++)	6
Secondaire 1er cycle (BEPC).	3		NSP.	7
Secondaire 2nd cycle (BACC).	4		Refuse.	8

K7. … **(NOM DE L'ENFANT)** a-t-il/elle déjà résidé dans votre ménage ? *Efa nipetraka tato @ ity tokantrano ity ve i … (NOM DE L'ENFANT) ?*

Oui. ***Eny.***	1	**CONTINUER**	NSP.	2	**ALLER A K9**
Non. ***Tsia.***	0	**ALLER A K9**	Refus.	3	

K8. En quelle année … **(NOM DE L'ENFANT)** a-t-il/elle quitté le foyer ? *T@ taona firy i … (NOM DE L'ENFANT) no nandao ny tokatranonareo ?*

REPONSE NUMERIQUE : ANNEE DE DEPART DE L'ENFANT (4 CHIFFRES)

NOTER « 9998 » SI NSP / NOTER « 9999 » SI REFUSE.

K9. Où … **(NOM DE L'ENFANT)** habite-t-il/elle actuellement ? *@ izao ankehitriny izao, aiza i … (NOM DE L'ENFANT) no mipetraka ?*

REPONSE LITERALE.

SI A MADAGASCAR, DEMANDER LE DISTRICT / SI A L'ETRANGER, DEMANDER LE NOM DU PAYS

K10. Depuis combien de temps … **(NOM DE L'ENFANT)** habite-t-il/elle dans ce district/pays ? *Afiriana izay i … (NOM DE L'ENFANT) no nipetrahany tany ?*

REPONSE NUMERIQUE : NOMBRE DE MOIS/ANNES

UNITE DE MESURE DU TEMPS : *1 – Mois ; 2 – Année*

NOTER « 98 » SI NSP / NOTER « 99 » SI REFUSE.

K11. Quelle est sa principale occupation ? *Inona no tena ataony/sahaniny any ?*

Salarié. ***Mikarama***.	1		Etudiant. ***Mianatra***.	5
Auto-entrepreneur. ***Miasa-tena***.	2		Travail domestique. ***Miasa an-trano.***	6
Travail à mi-temps. ***Miasa an-tselika***.	3		Handicapé. ***Sembana.***	7
Sans emploi. ***Tsy miasa***.	4		Autres (**A SPECIFIER**). ***Hafa.***	…

K12. Ces 12 derniers mois, … **(NOM DE L'ENFANT)** a-t-il/elle envoyé de l'argent cash pour votre ménage ? *Tao anatin'izay 12 volana farany izay, nandefa vola ho an'ity tokantrano ity ve i … (NOM DE L'ENFANT) ?*

NE PAS CONSIDERER LES AIDES ALIMENTAIRES OU TOUTE AUTRE AIDE EN NATURE

Oui. ***Eny.***	1	**CONTINUER**	NSP.	2	**ALLER A K14**
Non. ***Tsia.***	0	**ALLER A K14**	Refus.	3	

K13. A quelle fréquence … **(NOM DE L'ENFANT)** envoie-t-il/elle cet argent ? *Impiry i … (NOM DE L'ENFANT) no mandefa izany vola izany ?*

2 fois ou plus par mois. ***In-2 isam-bolana na mihoatr'izay***.	1		Une fois par an. ***Isan-taona.***	5
Une fois par mois. ***Isam-bolana.***	2		Quand il/elle en a envie. ***Rehefa te andefa.***	6
Tout les 3 mois. ***Isaky ny 3 volana.***	3		NSP.	7
Tous les 6 mois. ***Isaky ny 6 volana.***	4		Refus.	8

K14. Ces 12 derniers mois, **… (NOM DE L'ENFANT)** a-t-il/elle envoyé des aides/assistances pour votre ménage ? *Tao anatin'izay 12 volana farany izay, nandefa fanampiana ho an'ity tokantrano ity ve i … (NOM DE L'ENFANT) ?*

NE CONSIDERER QUE LES AIDES ALIMENTAIRES OU TOUTES AUTRES ASSISTANCES EN NATURE

Oui. *Eny.*	1	**CONTINUER**	NSP.	2	**ENFANT/MODULE SUIVANT**
Non. *Tsia.*	0	**ENFANT/MODULE SUIVANT**	Refus.	3	

K15. Ces 12 derniers mois, à quelle fréquence **… (NOM DE L'ENFANT)** envoie-t-il/elle cet argent ? *Impiry i … (NOM DE L'ENFANT) no mandefa izany fanampiana izany ?*

2 fois ou plus par mois. ***In-2 isam-bolana na mihoatr'izay***.	1	Une fois par an. ***Isan-taona.***	5
Une fois par mois. ***Isam-bolana.***	2	Quand on en a besoin. ***Rehefa ilaina izany.***	6
Tout les 3 mois. ***Isaky ny 3 volana.***	3	NSP.	7
Tous les 6 mois. ***Isaky ny 6 volana.***	4	Refus.	8

MODULE L : AUTRES SOURCES DE REVENU

L1. Ces 12 derniers mois, vous-même ou un membre de votre ménage a-t-il/elle reçu **… (CITER 1 A 1 LES ITEMS)** ? *Tao anatin'izay 12 volana farany izay, nisy fotoana ve ianao na ny olona ao @ tokantranonareo nandray … (CITER 1 A 1 LES ITEMS) ?*

CODE	SOURCES	Oui	Non	NSP	Refuse
	ARGENTS CASH / AIDES **NE PAS INCLURE CEUX OBTENUS DES PERSONNES LISTEES DANS LE MODULE K**				
101	Transfert d'argents de la part d'autres individus (amis, parents …). *Vola nalefan'olon-kafa (namana, fianakaviana …).*	1	0	2	3
102	Aides alimentaires de la part d'autres individus (amis, parents …). *Fanampiana ara-tsakafo avy @ olon-kafa (namana, fianakaviana …).*	1	0	2	3
103	Aides en nature de la part d'autres individus (amis, parents …). *Fanampiana isan-karazany avy @ olon-kafa (namana, fianakaviana …).*	1	0	2	3
	PENSION / REVENU D'INVESTISSEMENTS				
104	Intérêts d'épargne ou d'investissement. *Zana-bola avy @ tahiry na fandraharahana.*	1	0	2	3
105	Pension. *Pension*.	1	0	2	3
	LOYERS ET AUTRES IMMOBILISATIONS				
106	Loyer de terres non agricoles. *Ofan-tany tsy fambolena*.	1	0	2	3
107	Loyer d'appartement/maison. *Ofan-trano*.	1	0	2	3
108	Bail commercial. *Ofan-trano fivarotana*.	1	0	2	3
109	Location voiture, camion et autres engins. *Ofana fiara fitaterana sns.* **NE PAS INCLURE LES REVENUS NON ISSUS DE L'ACTIVITE AGRICOLE**	1	0	2	3
	RECETTE DES VENTES D'ACTIFS				
110	Vente d'immobilier. *Fivarotana tany, trano, fanaka, sns.*	1	0	2	3
111	Vente d'actif non agricole du foyer. *Fivarotana fitaovana tsy famokarana.*	1	0	2	3

112	Vente d'actif agricole (culture, élevage, pêche) du foyer. **_Fivarotana fitaovam-pamokarana._**	1	0	2	3
	AUTRES RECETTES				
113	Héritage. **_Lova._**	1	0	2	3
114	Lotterie. **_Loka._**	1	0	2	3
...	Autres (**A SPECIFIER**). **_Hafa._**	1	0	2	3

MODULE M : ASSISTANCES/AIDES OCTROYEES

M1. Ces 12 derniers mois, vous-même ou un membre de votre ménage a-t-il/elle donné … (**CITER 1 A 1 LES AIDES**) à un individu (ami, parent …) n'appartenant pas à votre ménage (incluant les contributions à diverses activités sociales : organisation festival, funérailles …) ? **_Tao anatin'izay 12 volana farany izay, ianao na ny olona ao an-tokantranonareo, … (CITER 1 A 1 LES AIDES) ho an'olon-kafa (namana, havana …) ivelan'ny tokantranonareo (tafiditra ato ny hetsika ara-tsosialy isan-karazany : fikarakana hetsika/fety, fandevenana …) ?_**

CODE	AIDES	Oui	Non	NSP	Refuse
201	Transfert d'argents. **_Nandefa vola._**	1	0	2	3
202	Aides alimentaires. **_Nanome sakafo._**	1	0	2	3
203	Aides en nature. **_Nanome fanampiana hafa._**	1	0	2	3

MODULE N : AIDES ET ASSISTANCES SOCIALES

NE PAS INCLURE LES PENSIONS ET DE DONS JUSTIFIES D'ENGRAIS ET DE SEMENCES

N1. Ces 12 derniers mois, vous-même ou un membre de votre ménage a-t-il/elle reçu de l'argent, de la nourriture, ou autre aide venant de … (**CITER 1 A 1 LES PROGRAMMES**) ? **_Tao anatin'izay 12 volana farany izay, ny tokatranonareo ve nahazo fanampiana avy @ … (CITER 1 A 1 LES PROGRAMMES) ?_**

Oui. **_Eny._**	1	NSP.	2
Non. **_Tsia._**	0	Refus.	3

POSER N2 ET N3 POUR CHAQUE AIDE/ASSISTANCE SOCIALE OBTENUE

N2. L'assistance était-elle pour tous les membres du ménage ou pour des membres spécifiques ? **_Ny tokatrano iray manontolo ve no nahazo io fnampiana io sa olona efa voatendry ?_**

Tout le ménage. **_Tokantrano iray manontolo._**	1
Membre(s) spécifique(s). **_Olona efa voatendry._**	2
NSP.	3
Refus.	4

N3. Ces 12 derniers mois, pour combien de mois aviez-vous bénéficié de l'aide ? **_Tao anatin'izay 12 volana farany izay_**, **_firy volana no faharetan'io fanampiana azonareo t@ io ?_**

REPONSE NUMERIQUE : NOMBRE DE MOIS

NOTER « 98 » SI NSP / NOTER « 99 » SI REFUSE.

N4. Quand était la dernière fois que votre ménage a bénéficié d'une aide ? **_Oviana ny tokatranonareo no nahazo fanampiana farany ?_**

REPONSES NUMERIQUES : MOIS (2 CHIFFRES) ET ANNEE (4 CHIFFRES)

CODE	PROGRAMME	N1.	N2.	N3.	N4. 1	N4. 2
101	Nourriture gratuite (**A SPECIFIER**). *Sakafo maimaim-poana.*			!__!__!	!__!__!	!__!__!__!__!
102	Travaux publics. *Asa iombonana*.			!__!__!	!__!__!	!__!__!__!__!
103	Revenu des travaux. *Valin'ny asa iombonana.*			!__!__!	!__!__!	!__!__!__!__!
104	Programme alimentaire de l'école. *Fanampiana ara-tsakafo avy any an-tsekoly.*			!__!__!	!__!__!	!__!__!__!__!
105	Alimentation supplémentaire pour Enfants mal-nourris à chez une Union de Réhabilitation Alimentaire. *Fanampiana ho an'ny zaza tsy ampy sakafo avy @ fikambanana misahana ny fahampian-tsakafo.*			!__!__!	!__!__!	!__!__!__!__!
106	Bourses d'étude scolaire. *Vatsim-pianarana.*			!__!__!	!__!__!	!__!__!__!__!
107	Argents obtenus directement du Gouvernement. *Famatsiam-bola mivantana avy @ fanjakana.*			!__!__!	!__!__!	!__!__!__!__!
108	Argents obtenus d'autres Institutions (Partenaires de développement, ONG) (**A SPECIFIER**). *Famatsiam-bola avy @ fikambanana tsy miankina samihafa.*			!__!__!	!__!__!	!__!__!__!__!
…	Autres (**A SPECIFIER**). *Hafa.*			!__!__!	!__!__!	!__!__!__!__!

MODULE O : CHOCS ET STRATEGIES ADOPTEES

O1. Ces 12 derniers mois, votre ménage a-t-il été affecté négativement par les chocs suivants : … **(CITER 1 A 1 LES CHOCS)** ? *Tao anatin'izay 12 volana farany izay, niharan'iray amin'ireto voina ireto ve ny tokantranonareo : … (CITER 1 A 1 LES CHOCS) ?*

Oui. *Eny.*	1	NSP.	2
Non. *Tsia.*	0	Refus.	3

O2. Parmi ces chocs qui vous ont affecté **(RAPPELER LES CHOCS),** classez par ordre d'importance les 3 chocs les plus considérables que vous avez subis. *@ ireo voina efa nahazo ny tokantranareo* **(RAPPELER LES CHOCS)***, afaka alahatrao ve ireo voina 3 tena nanan-danja indrindra ?*

IMPORTANCE : « *1 – Premier ; 2 – Second ; 3 – Troisième »*

CODE	CHOCS	O1.	O2.
101	Sécheresse. *Hain-tany.*		
102	Pluies irrégulières. *Tsy fahampian'ny orana.*		
103	Inondations. *Tondra-drano*.		
104	Glissements de terrain. *Fihotsahan'ny tany.*		
105	Tremblements de terre. *Orohoron-tany.*		
106	Abondance exceptionnelle d'animaux nuisibles aux récoltes. *Fahamaroan'ireo biby kely mpanimba sy mpamotika ny vokatra.*		
107	Abondance exceptionnelle des maladies des bétails.		

	Fahamaroan'ireo aretina mandringana ny biby fiompy.		
108	Baisse exceptionnelle des prix des produits agricoles. *Fihenan'ny vidin'ny vokatra.*		
109	Hausse exceptionnelle des intrants agricoles. *Fiakaran'ny vidin'ny akora na ny fitaovam-pamokarana.*		
110	Fin des aides, assistances et subventions extérieures. *Fahataperan'ny fanampiana azo ivelan'ny tokantrano.*		
111	Diminution du revenu non-agricole du foyer (non due aux maladies et accidents). *Fihenan'ny fidiram-bola hafa tsy avy @ fambolena (tsy vokatry ny aretina na loza nitranga).*		
112	Echec des affaires non-agricoles (non due aux maladies et accidents). *Tsy fandehanan'ny asa tsy fambolena (tsy vokatry ny aretina na loza nitranga).*		
113	Réduction des rémunérations des salariés du ménage (non due aux maladies et accidents) *Fihenan'ny karaman'ireo mpiasa ao an-tokatrano (tsy vokatry ny aretina na loza nitranga).*		
114	Perte d'emplois des salariés du ménage (non due aux maladies et accidents). *Fahaverezan'asan'ireo mpiasa ao an-tokantrano (tsy vokatry ny aretina na loza nitranga).*		
115	Maladie/accident grave d'un membre du ménage. *Aretina na loza goavana nahazo ny olona ao antokatrano.*		
116	Naissance au sein du ménage. *Fahaterahana teo anivon'ny tokantrano.*		
117	Décès d'un membre de foyer participant au revenu du ménage. *Fahafatesana olona iray mampidi-bola ho an'ny tokantrano.*		
118	Décès d'un autre membre du foyer. *Fahafatesana olona hafa ao an-tokantrano.*		
119	Ménage rompu. *Fisarahan'ny tokantrano.*		
120	Vols d'argent, objets précieux/de valeur, actifs, produits agricoles. *Halatra vola, zavatra saro-bidy/manan-danja, fitaovam-pamokarana, vokatra.*		
121	Conflit, violence. *Ady, herisetra.*		
…	Autres (**A SPECIFIER**). *Hafa.*		

NE POSER O3 ET O4 QUE SEULEMENT POUR LES 3 CHOCS IMPORTANTS DEFINIS DANS O2.

O3. Suite à ce/cette **… (CITER 1 A 1 LES 3 CHOCS IMPORTANTS)**, votre **… (CITER 1 A 1 LES ITEMS)** a-t-il/elle augmenté, diminué ou n'a pas changé ? *Vokatrin'ny* **… (CITER 1 A 1 LES 3 CHOCS IMPORTANTS),** *nitombo ve, sa nihena, sa tsy nisy fiovana ny* **… (CITER 1 A 1 LES ITEMS) ?**

REPRENDRE LES CODES DES 3 CHOCS IMPORTANTS

Augmenté(e). *Nitombo.*	1
Diminué(e). *Nihena.*	2
N'a pas changé. *Tsy nisy fiovana.*	3
NSP.	4
Refuse.	5

	ITEMS	CHOC #1	CHOC #2	CHOC #3
A	**CODE CHOC**			
B	Revenu. *Vola miditra.*			
C	Actifs. *Fitaovam-pamokarana.*			
D	Production de nourritures. *Famokarana sakafo.*			
E	Stockage de nourritures. *Tahirin-tsakafo.*			
F	Achat de nourritures. *Fividianana sakafo.*			

O4. Qu'est-ce que votre ménage a fait en réponse à ce/cette … **(CITER 1 A 1 LES 3 CHOCS IMPORTANTS)** pour essayer de regagner votre niveau de vie d'avant ? *Inona no nataon'ny tokantranonareo nanoloana ny …* **(CITER 1 A 1 LES 3 CHOCS IMPORTANTS)** *mba hiverenan'ny fari-piainanareo teo aloha ?*

POUR CHAQUE CHOCS, LISTER JUSQU'A 3 STRATEGIES PAR ORDRE D'IMPORTANCE.

SI LE MEME CHOC S'EST PRODUIT PLUS D'UNE FOIS CES 12 DERNIERS MOIS, SE RENSEIGNER SUR LE PLUS RÉCENT.

Utilisation des propres épargnes du ménage. *Fampiasana ny tahirin'ny tokantrano.*	1
Aide inconditionnelle des amis, parents. *Fanampiana tsy misy tambiny avy @ namana, ny havana.*	2
Aide inconditionnelle du gouvernement. *Fanampiana tsy misy tambiny avy @ fitondrana.*	3
Aide inconditionnelle des ONG et des institutions religieuses. *Fanampiana tsy misy tambiny avy @ fikambanana tsy miankina sy ny relijiozy.*	4
Modification des habitudes de consommation (diminuer la quantité/nombre de repas par jour, opter pour des nourritures moins préférées et moins chères …). *Fanovàna ny fomba fisakafoana mahazatra (ny karazana sakafo nohanina, ny fatrany, ny vidiny sns).*	5
Les membres du foyer actifs travaillent beaucoup plus. *Nampitombo ny asa fanaony na nanao asa hafa fanampiny ireo izay efa miasa.*	6
Les membres du foyer au chômage ont cherché du travail. *Nitady asa ireo izay tsy an'asa.*	7
Immigration du ménage. *Fifindra-monin'ny tokantrano.*	8
Réduction des dépenses santé et éducation. *Fanenana ny fandaniana ara-pahasalamana sy ny fampianarana.*	9
Obtention de crédit. *Fihindramam-bola.*	10
Vente d'actifs agricoles. *Fivarotana fitaovam-pamokarana.*	11
Vente des biens possédés. *Fivarotana fananana.*	12
Vente de terrains/bâtiments. *Fivarotana trano/tany.*	13
Vente des stocks de récoltes. *Fivarotana tahirim-bokatra.*	14
Vente de bétails. *Fivarotana biby fiompy.*	15
Intensification de la pêche. *Fanjonoana mihoatry ny mahazatra.*	16
Envoi des enfants ailleurs. *Fandefasana zanaka hipetraka any @ toeran-kafa.*	17
Engagement spirituel (prière, sacrifice, consultation de devin …). *Ezaka ara-panahy (vavaka, sorona, fangalana mpanandro …).*	18
Rien du tout. *Tsy nanao na inona na inona.*	19
Autres (**A SPECIFIER**). *Hafa.*	…

	ITEMS	CHOC #1	CHOC #2	CHOC #3
A	**CODE ID CHOC**			
B	Stratégie #1			
C	Stratégie #2			
D	Stratégie #3			

MODULE P : CARTE DES TERRAINS

P1. Dessiner l'emplacement approximatif de chaque parcelle de terrain(s) par rapport à votre habitation. Marquer approximativement la distance parcourue en minutes. *Raha mihoatra @ trano fonenanareo : ataovy sary tsotsotra ireo tany rehetra anananareo, mariho hoe firy minitra eo ho eo ny alavirany.*

CROQUIS SUR PAPIER

MODULE Q : DETAILS DE TOUS LES TERRAINS

S'ASSURER DE COLLECTER DES INFORMATIONS SUR LES RÉCOLTES DE NOURRITURES, PAR EXEMPLE HERBES
POSER LE MODULE ENTIER AVANT DE PASSER AU TERRAIN SUIVANT
REMPLIR D'ABORD LE SHOWCARD #2 (LISTE DES TERRAINS) AVANT DE REMPLIR LE QUESTIONNAIRE
  1- **NOMBRE DE TERRAINS**
  2- **SUPERFICIE DES TERRAINS**
  3- **NOMBRE DE SAISON DE PLANTATION PAR TERRAIN**
  4- **NOMBRE DE RECOLTES PAR TERRAIN**
  5- **NOMS DES RECOLTES**

Q1. Combien de terrains possédez-vous ? *Firy ny isan'ny tany anananareo ?*
REPONSE NUMERIQUE : NOMBRE DE TERRAINS
SE REFERER AU SHOWCARD #2

Q2. Code ID du/des terrains. *Code ID-n'ny tany.*
REPRENDRE LES CODES UTILISES SUR LA CARTE
SE REFERER AU SHOWCARD #2

Q3. Quelle est la superficie de ce terrain ? *Firy ny velaran'ity tany ity ?*
REPONSE NUMERIQUE : SUPERFICIE DU TERRAIN
UNITE DE MESURE : *1 – m^2 ; 2 – are ; 3 – hectare ; 4 – acre*
SE REFERER AU SHOWCARD #2

DEMANDER LES QUESTIONS SUIVANTES POUR CHAQUE TERRAIN DE 1000 m^2 (= 10 are = 0,1 hectare = 0,25 acre) DE SUPERFICIE OU PLUS
ALLER AU MODULE S SI AUCUN TERRAIN DE 1000 m^2 OU PLUS

Q4. Qui rapporte l'information pour le terrain **… (CITER 1 A 1 LES TERRAINS DE 1000 m^2 OU PLUS)** ? *Iza no mitatitra ny mombamomba ny tany … (CITER 1 A 1 LES TERRAINS DE 1000 m^2 OU PLUS) ?*
SE REFERER AU SHOWCARD #1

Q5. Qui est le propriétaire de ce terrain **… (CITER 1 A 1 LES TERRAINS DE 1000 m^2 OU PLUS)** ? *Iza no tompon'ny tany … (CITER 1 A 1 LES TERRAINS DE 1000 m^2 OU PLUS) ?*
SE REFERER AU SHOWCARD #1

Q6. Dans votre ménage, qui décide principalement des plantes à cultiver, l'usage des intrants, et le timing des activités agricoles sur ce terrain **… (CITER 1 A 1 LES TERRAINS DE 1000 m^2 OU PLUS)** ? *Iza ao @ tokantranonareo no manapakevitra ny @ voly ho volena, ny fomba fambolena, ny vokatra azo, ary ny fotoana ambolena eto amin'ity tany … (CITER 1 A 1 LES TERRAINS DE 1000 m^2 OU PLUS) ity ?*
SE REFERER AU SHOWCARD #1
LE DECIDEUR PEUT NE PAS ETRE LE PROPRIETAIRE DU TERRRAIN

Q7. Comment votre ménage a-t-il acquis ce terrain … **(CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS)** ? *Toa ny ahoana no nahazoan'ny tokatranonareo ity tany … (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS) ity ?*

SI TERRAIN ACHETE, DEMANDER SI AVEC OU SANS TITRE

Accordé par les chefs locaux. *Natolotry ny sefom-pokotany.*	1
Héritage. *Lova.*	2
Dot. *Fanomezana azo t@ fampiakarana zanaka vavy*	3
Acheté avec titre. *Novidiana, misy titre.*	4
Acheté sans titre. *Novidiana, tsy misy titre.*	5
Bail commercial. *Nanaraka Bail.*	6
Loué à courts termes. *Hofaina mandritry ny fotoana voafetra*	7
Loué pour activités agricoles. *Hofaina ho an'ny fambolena.*	8
Emprunté gratuitement. *Indramina maimaimpoana.*	9
Aménagé sans autorisation. *Ampiasaina fa tsy nahazoana alalana.*	10
Autres (**A SPECIFIER**). *Hafa.*	…
NSP.	98
Refus.	99

Q8. En quelle année votre ménage a-t-il acquis ce terrain … **(CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS)** ? *T@ taona firy no nahazoanareo ity tany … (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS) ity ?*

REPONSE NUMERIQUE : ANNEE D'ACQUISITION DU TERRAIN (4 CHIFFRES)

NOTER « 9998 » SI NSP / NOTER « 9999 » SI REFUSE.

Q9. Combien de saisons de plantation effectuez-vous sur ce terrain… **(CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS) ?** *Ao anatin'ny erin-taona, impiry mamboly ianareo eo @ ity tany … (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS) ity ?*

REPONSE NUMERIQUE : NOMBRE DE SAISONS

SE REFERER AU SHOWCARD #2

POSER Q10 A Q12 POUR CHAQUE SAISON

Q10. En quelle période de l'année se situe … **(CITER 1 A 1 LES SAISONS)** *? aiza ho aiza ao anatin'ny taona ny vanim-potoana fambolena … (CITER 1 A 1 LES SAISONS) ?*

DUREE EN MOIS (0 – 12)

NOTER « 98 » SI NSP / NOTER « 99 » SI REFUSE.

Q11. Pendant la saison … **(CITER 1 A 1 LES SAISONS)**, quel type de culture se trouve sur ce terrain … **(CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS)** ? *Ny vanim-potoana fambolena … (CITER 1 A 1 LES SAISONS), inona no karazam-boly hita eo @ ity tany … (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS) ?*

Cultures vivrières. *Voly sakafo.*	1	**CONTINUER**
Cultures fourragères. *Voly sakafom-biby fiompy (vilona sns).*	2	
Cultures permanentes/bois. *Voly maharitra/hazo.*	3	
Jachère. *Tany voavadika (mbola tsy misy voly).*	4	**SAISON SUIVANTE OU Q13**
Forest/Beaucoup de bois. *Ala/Hazo be dia be*.	5	
Pâturage. *Ahitra.*	6	
En location (metayage). *Nahofa.*	7	

Offert gratuitement. *Nomena maimaimpoana*.	8
Autres (**A SPECIFIER**). *Hafa.*	...
NSP	98
Refuse	99

Q12. Quelles récoltes ont-été plantées sur ce terrain **… (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS)** pendant la **… (CITER 1 A 1 LES SAISONS)** ? *Inona avy ireo vokatra novolena teto @ ity tany … (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS) ity tnandritry ny vanimpotoana fambolena … (CITER 1 A 1 LES SAISONS) ?*

SE REFERER AU SHOWCARD #3 – REPRENDRE LES CODES DES RECOLTES

LISTER JUSQU'A 3 RECOLTES PAR ORDRE D'IMPORTANCE

Q13. Quel type de sol prédomine sur ce terrain **… (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS)** ? *Inona no tena mandrafitra ity tany … (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS) ity ?*

CITER 1 A 1 LES REPONSES

Sablonneux*. Mamasipasika.*	1
Entre sablonneux & argileux. *Sady mamasipasika no misy tany manga.*	2
Argileux. *Tany manga.*	3
Autres (**A SPECIFIER**). *Hafa.*	...
NSP	8
Refuse	9

Q14. Comment est la pente de ce terrain **… (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS)**? *Toa ny ahoana ny fitongilan'ity tany … (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS) ity ?*

CITER 1 A 1 LES REPONSES

Plat. *Mahitsy.*	1		Autres (à spécifier)	...
Légère. *Somary mitongilana.*	2		NSP	8
Modérée. *Mitongilana.*	3		Refuse	9
Accidenté. *Tena mitongilana be.*	4			

Q15. Ce terrain**… (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS)** est-il marécageux ? *Manangon-drano ve io tany… (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS) io ?*

Oui. *Eny.*	1		NSP.	2
Non. *Tsia.*	0		Refus.	3

Q16. Quel type de contrôle/précautions prenez-vous afin de protéger le terrain **… (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS)** contre l'érosion ? *Inona no ataonareo /ampiasainareo ho fisorohana ny fahapotehan'ity tany … (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS) ity ?*

LISTER JUSQU'A 2 STRUCTURES.

Aucun. *Tsy misy.*	1	**TERRAIN/MODULE SUIVANT**
Terrasses. *Terasy.*	2	
Digue pour contrôler l'érosion. *Tatatra ahafahana mamehy ilay fahapotehana.*	3	**CONTINUER**
Gabions / Sacs de sable. *Harona misy vatokely / gonim-pasika.*	4	
Forest/Beaucoup de bois. *Ala/Hazo be dia be*.	5	
Pâturage. *Fiarovana vita @ ahitra.*	6	

Ecorce d'arbres. *Fiarovana vita @ hazo.*	7
Digue alimentant une conserve d'eau. *Tatatra mamatsy dobo fanangonana rano.*	8
Fossés de drainage. *Dobo fanariana rano.*	9
Autres (**A SPECIFIER**). *Hafa.*	...
NSP	98
Refuse	99

Q17. Depuis combien de temps utilisez-vous ce/cette **… (CITER 1 A 1 LES STRUCTURES)** ? *Oviana ianao no nanomboka nampiasa … (CITER 1 A 1 LES STRUCTURES) ?*

Ces 12 derniers mois. *Tao anatin'izay 12 volana lasa izay.*	1	Il y a 5 années. *5 taona lasa izay.*	5
		Il y a plus de 5 années. *5 taona mahery.*	6
Il y a 2 années. *2 taona lasa izay.*	2	NSP	7
Il y a 3 années. *3 taona lasa izay.*	3	Refuse	8
Il y a 4 années. *4 taona lasa izay.*	4		

Q18. Quels systèmes d'irrigation, s'il y en a, utilisez-vous sur ce terrain **… (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS)** ? *Ahoana no fomba fanondrahana ampiasainareo eto amin'ity tany … (CITER 1 A 1 LES TERRAINS DE 1000 m² OU PLUS) ity ?*

LISTER JUSQU'A 2 SYSTEMES

Eau de pluie / sans irrigation. *Ranon'orana / tsy tondrahana.*	1
Irrigation suivant la gravitation. *Atao manaraka ny fitongilanan'ny tany.*	2
Détournement de ruisseau. *Manodina lakan-drano.*	3
Seau. *Siny.*	4
Pompe manuelle. *Paompy tanana.*	5
Pompe à pédale. *Paompy vohizina.*	6
Pompe à moteur. *Paompy misy motera.*	7
Autres (**A SPECIFIER**). *Hafa.*	...
NSP	98
Refuse	99

MODULE R : MOISSONS PAR TERRAIN PAR SAISON DE PLANTATION

EN VOUS REFERANT AU SHOWCARD #2, LISTER LES NOMS ET CODES DE TOUTES LES RECOLTES CULTIVEES PENDANT CHAQUE SAISON DE PLANTATION SUR CHAQUE TERRAIN DE 1000 m2 OU PLUS

R1. Rappeler le nombre de terrain de 1000 m2 ou plus. *Isan'ny tany 1000 m2 na mihoatra.*
REPONSE NUMERIQUE : NOMBRE DE TERRAINS
SE REFERER AU SHOWCARD #2

R2. Code ID des terrains. *Code ID-n'ilay tany.*
SE REFERER AU SHOWCARD #2

R3. Nombre de saisons du terrain. *Isan'ny vanim-potoana fambolena eo @ tany.*
REPONSE NUMERIQUE : NOMBRE DE SAISONS
SE REFERER AU SHOWCARD #2

R4. Nombre de récoltes de la saison. *Isan'ny vanim-potoana fambolena eo @ tany.*
REPONSE NUMERIQUE : NOMBRE DE RECOLTES
SE REFERER AU SHOWCARD #2

R5. Noms de/des récoltes. *Anaran'ireo voly.*
REPONSE LITERALE
SE REFERER AU SHOWCARD #3

R6. Code ID de/des récoltes. *Code ID-n'ireo voly ?*
SE REFERER AU SHOWCARD #3

UNE FOIS LA LISTE COMPLETE, POSER LE MODULE ENTIER POUR CHAQUE RECOLTE DE CHAQUE SAISON DE PLANTATION POUR CHAQUE TERRAIN.

R7. Le terrain contenant la récolte **… (NOM DE LA RECOLTE)** est-il situé dans une zone disposant d'un système d'irrigation ? *Tafiditra anatina faritra misy fitarihan-drano ve ny tany misy ny voly … (NOM DE LA RECOLTE) ?*

Oui. *Eny.*	1	**CONTINUER**	NSP.	2	
Non. *Tsia.*	0	**ALLER A R15**	Refus.	3	**ALLER A R15**

R8. Par rapport au circuit de l'eau, où est localisé le terrain contenant la récolte **… (NOM DE LA RECOLTE)** ? *Raha mihoatra @ lalan'ny rano, aiza ho aiza ny tany misy ny voly … (NOM DE LA RECOLTE) ?*
CITER 1 A 1 LES REPONSES

Début de la source. *Eo amin'ny fiandohany.*	1	NSP	4
Milieu de la source. *Eo afovoany.*	2	Refus	5
Queue de la source. *Eny @ faranny.*	3		

R9. Combien de canaux irrigent le terrain contenant la récolte **… (NOM DE LA RECOLTE)** dispose-t-il ? *Firy ny isan'ny tatatra manondraka ny tanymisy ny voly … (NOM DE LA RECOLTE) ?*
REPONSE NUMERIQUE : NOMBRE D'IRRIGATIONS
NOTER « 0 » SI AUCUNE / NOTER « 98 » SI NSP / NOTER « 99 » SI REFUSE.

R10. En moyenne, en combien de temps l'eau arrive-t-elle jusqu'au terrain contentant la récolte **… (NOM DE LA RECOLTE)** ? *@ ankapobeny, firy minitra eo no fotoana ahatongavan'ny rano eo @ tany misy io voly … (NOM DE LA RECOLTE) io ?*
DUREE DU TRAJET DE L'EAU EN MINUTES
NOTER « 998 » SI NSP / NOTER « 999 » SI REFUSE.

R11. Ce timing correspond-il à vos besoins ? *Mifanaraka amin'ny filànao ve io fotoana io ?*

Oui. *Eny.*	1	NSP.	2
Non. *Tsia.*	0	Refus.	3

R12. Comment est la qualité de l'eau du/des canal/canaux ? *Manao ahoana ny kalitaon'ny rano entin'ireo tatatra ?*

Bonne. *Tsara.*	1	NSP	4
Quelque peu saumâtre. *Somary maloto.*	2	Refus	5
Saumâtre. *Maloto.*	3		

R13. Avez-vous reçu la totalité de l'eau qui vous a été allouée ? *Ianao ve nahazo ny abetsaky ny rano izay tokony ho azonao ?*

Oui. *Eny.*	1	**ALLER A R15**	NSP.	2	**ALLER A R15**
Non. *Tsia.*	0	**CONTINUER**	Refus.	3	

R14. Si non, pourquoi ? *Raha tsia, inona no mety ho antony ?*

L'infrastructure de l'irrigation n'est pas encore achevée. *Mbola tsy vita hatr@ farany ny foto-drafitr'asa fanondrahana.*	1
L'infrastructure de l'irrigation est en mauvais état. *Efa ratsy ny foto-drafitr'asa fanondrahana.*	2
Irrigation impossible car manque de pluies. *Tsy ampy orana, ka tsy afaka ny hanondraka mihitsy.*	3
L'eau a été détournée vers d'autres utilisations. *Nampiasaina tamin'ny zavatra hafa ny rano.*	4
Autres. *Hafa.* (A SPECIFIER)	...
NSP	98
Refuse	99

R15. Avez-vous utilisé des engrais organiques sur ce terrain contentant la récolte **… (NOM DE LA RECOLTE)** pendant cette saison ? *Ianao ve nampiasa zezika natoraly t@ io tany misy ny voly …* (NOM DE LA RECOLTE) *io nandritran'io vanim-potoana fambolena io ?*

R16. Avez-vous utilisé des engrais chimiques sur ce terrain contentant la récolte **… (NOM DE LA RECOLTE)** pendant cette saison ? *Ianao ve nampiasa zezika simika t@ io tany misy ny voly …* (NOM DE LA RECOLTE) *io nandritran'io vanim-potoana fambolena io ?*

R17. Avez-vous utilisé des herbicides sur ce terrain contentant la récolte **… (NOM DE LA RECOLTE)** pendant cette saison ? *Ianao ve nampiasa akora/fanafody fanalana ahitra-dratsy t@ io tany misy ny voly …* (NOM DE LA RECOLTE) *io nandritran'io vanim-potoana fambolena io ?*

R18. Avez-vous utilisé des pesticides sur ce terrain contentant la récolte **… (NOM DE LA RECOLTE)** pendant cette saison ? *Ianao ve nampiasa akora/fanafody famonoana biby kely t@ io tany misy ny voly …* (NOM DE LA RECOLTE) *io nandritran'io vanim-potoana fambolena io ?*

	R15.	**R16.**	**R17.**	**R18.**
Oui. *Eny.*	1	1	1	1
Non. *Tsia.*	0	0	0	0
NSP.	2	2	2	2
Refuse.	3	3	3	3

R19. Quand est-ce que la plantation de la récolte **… (NOM DE LA RECOLTE)** a été achevée ? *Oviana no tapitra ny fambolena ny voly …* (NOM DE LA RECOLTE) *t@ io tany io ?*
REPONSE NUMERIQUE : SEMAINE (0 – 4) – MOIS (0 – 12)

R20. Comment avez-vous cultivé la récolte **… (NOM DE LA RECOLTE)** sur ce terrain ? *Ahoana no fomba nambolena ireo voly ireo …* (NOM DE LA RECOLTE) *t@ io tany io ?*

Semé. *Nafafy.*	1	NSP.	2
Planté. *Natsatoka.*	0	Refus.	3

R21. Cette récolte … (NOM DE LA RECOLTE) a-t-elle été plantée sur la totalité du terrain ? *Novolena t@ velaran-tany rehetra ve io voly … (NOM DE LA RECOLTE) io ?*

Oui. *Eny.*	1	**ALLER A R23**	NSP.	2	**ALLER A R23**
Non. *Tsia.*	0	**CONTINUER**	Refus.	3	

R22. Approximativement, quelle proportion du terrain est cultivée de cette recolte … (NOM DE LA RECOLTE) ? *Raha kajiana, mety ho ampahafirin'ny velaran'ny tany no misy io voly … (NOM DE LA RECOLTE) io ?*

Moins d'1/4. *Latsaky ny 1/4.*	1	Plus de 3/4. *Mihoatry ny 3/4.*	4
1/4 – 1/2.	2	NSP	5
1/2 – 3/4.	3	Refuse.	6

R23. Quelle quantité de … (NOM DE LA RECOLTE) a été moissonné(e) au total sur ce terrain ? *Toa ny ahoana ny abetsaky ny vokatra … (NOM DE LA RECOLTE) rehetra azo t@ io tany io ?*

REPONSE NUMERIQUE : QUANTITÉ DE RECOLTES MOISSONNEES

UNITÉ : *1 – Kilo ; 2 – sac de 50 kg ; 3 – sac de 100 kg ; 4 – Seau (grand) ; 5 – grappe ; 6 – pièce ; 7 – botte (ex : de foin) ; 8 – charrette ; … autres* (A PRECISER)

S'ASSURER SI LES VALEURS RAPPORTEES SONT DES RECOLTES BRUTES OU NON : *1 – Brutes ; 2 – Déjà traitées ; 3 – NA.*

POSER R24 UNIQUEMENT POUR LA RECOLTE « MANIOC (MANGAHAZO) » OU « PATATE DOUCE (VOMANGA) »

R24. Quelle proportion du terrain de … (NOM DE LA RECOLTE) douce a déjà été moissonnée ? *Raha kajiana tsotsotra, mety ho ampahafirin'y velaran'ny tany misy … (NOM DE LA RECOLTE) no efa voajinja ?*

Moins d'1/4. *Latsaky ny 1/4.*	1	Plus de 3/4. *Mihoatry ny 3/4.*	4
1/4 – 1/2.	2	NSP	5
1/2 – 3/4.	3	Refuse.	6

R25. Quelle quantité de récolte … (NOM DE LA RECOLTE) moissonnée pendant la première saison a été vendue ? *Firy t@ ireo vokatra … (NOM DE LA RECOLTE) nojinjaina nandritry ny vanim-potoana fambolena voalohany no lafo ?*

REPONSE NUMERIQUE : QUANTITÉ DE RECOLTES MOISSONNEES VENDUES

UNITÉ : *1 – Kilo ; 2 – sac de 50 kg ; 3 – sac de 100 kg ; 4 – Seau (grand) ; 5 – grappe ; 6 – pièce ; 7 – botte (ex : de foin) ; 8 – charrette ; … - autres* (A PRECISER)

S'ASSURER SI LES VALEURS RAPPORTEES SONT DES RECOLTES BRUTES OU NON : *1 – Brutes ; 2 – Déjà traitées ; 3 – NA.*

R26. A quel montant s'élève la valeur totale des récoltes … (NOM DE LA RECOLTE) vendues ? *Ohatrinona no totalimbidin'ny vokatra … (NOM DE LA RECOLTE) lafo ?*

REPONSE NUMERIQUE : MONTANT EN ARIARY (7 CHIFFRES)

ESTIMER LE MONTANT DES PAIEMENTS EN NATURE

R27. Quelle proportion des récoltes moissonnées … (NOM DE LA RECOLTE) pendant la saison a été pourrie, détruite par les insectes/rongeurs, volée, etc. après la moisson ? *Taorian'ny fanjinjana, ampahany firy t@ vokatra … (NOM DE LA RECOLTE) izay nojinjaina t@ io vanimporoana io no loa, very, lanin'ny biby kely, ny voalavo, sns.?*

Moins d'1/4. *Latsaky ny 1/4.*	1	Plus de 3/4. *Mihoatry ny 3/4.*	4
1/4 – 1/2.	2	NSP	5
1/2 – 3/4.	3	Refuse.	6

R28. Quelle était la raison de cette perte ? *Inona no anton'ny fahaverezana ?*
LISTER JUSQU'À 2 RAISONS.

Pourri. *Loa.*	1
Insectes. *Biby kely.*	2
Rongeurs/animaux domestiques. *Voalavo, biby fiompy ao an-trano.*	3
Inondation. *Tondra-drano.*	4
Vol. *Halatra.*	5
Autre **(A SPECIFIER).** *Hafa.*	…
NSP	98
Refuse.	99

MODULE S : HONORAIRES ET MAINTENANCE

S1. Avez-vous payé des honoraires chez une Association des Usagers de l'Eau ? *Nandoa sarany tany @ Fikambanan'ny Mpampiasa Rano ve ianareo ?*

Oui. *Eny.*	1	**CONTINUER**	NSP.	2	**ALLER A S4**
Non. *Tsia.*	0	**ALLER A S4**	Refus.	3	

S2. Si oui, combien avez-vous payé ? *Raha eny, ohatrinona ny sarany nalohanareo ?*
REPONSE NUMERIQUE : MONTANT EN ARIARY (6 CHIFFRES)
UNITE DE MESURE : *1 – m² ; 2 – are ; 3 – hectare ; 4 – acre ; 5 - Foyer*

S3. En tout, combien avez-vous payé ces 12 derniers mois ? *Raha totaliana, ohatrinona ny sarany nalohanareo tao anatin'izay 12 volana farany izay ?*
REPONSE NUMERIQUE : MONTANT EN ARIARY (6 CHIFFRES)

	MONTANT (ARIARY)	UNITE
S2.	!__!__!__!__!__!__!	
S3.	!__!__!__!__!__!__!	

S4. Ces 12 derniers mois, avez-vous personnellement entrepris **… (CITER 1 A 1 LES ACTIVITES)** ? *Tao anatin'izay 12 volana farany izay, raha ianareo manokana, nanantanteraka … (CITER 1 A 1 LES ACTIVITES) ve ianareo ?*

Oui. *Eny.*	1	NSP.	2
Non. *Tsia.*	0	Refus.	3

POSER S5 POUR TOUTES LES ACTIVITES ENTREPRISES PERSONNELLEMENT

S5. Combien de fois, ces 12 derniers mois, combien de fois avez-vous entrepris … **(CITER 1 A 1 LES ACTIVITES ENTREPRISES)** ? *Tao anatin'izay 12 volana lasa izay, impiry ianao no nanatanteraka … (CITER 1 A 1 LES ACTIVITES ENTREPRISES) ?*

REPONSE NUMERIQUE

S6. Ces 12 derniers mois, l'Association des Usagers de l'Eau a-t-elle entrepris … **(CITER 1 A 1 LES ACTIVITES)** ? *Tao anatin'izay 12 volana farany izay, nanantanteraka … (CITER 1 A 1 LES ACTIVITES) ve ny Fikambanan'ny Mpampiasa Rano ?*

Oui. *Eny.*	1	NSP.	2
Non. *Tsia.*	0	Refus.	3

POSER S7 POUR TOUTES LES ACTIVITES ENTREPRISES PAR L'ASSOCIATION

S7. Aviez-vous participé à une activité de … **(CITER 1 A 1 LES ACTIVITES ENTREPRISES)** entreprise par l'Association des Usagers de l'Eau ? *Nandray anjara tamin'ny … (CITER 1 A 1 LES ACTIVITES ENTREPRISES) notarihin'ny Fikambanan'ny Mpampiasa Rano ve ianareo ?*

CITER 1 A 1 LES REPONSES

Oui, main d'œuvre. *Eny, nanampy t@ asa.*	1
Oui, donation d'argent. *Eny, nanome vola.*	2
Oui, main d'œuvre et donation d'argent. *Eny, sady nanampy t@ asa no nanome vola.*	3
Non, pas de main d'oeuvre. *Tsia, tsy afaka ny nanampy t@ asa.*	4
Non, pas d'argent. *Tsia, tsy nisy vola afaka nomena.*	5
Non, ni argent ni main d'œuvre. *Tsia, sady tsy nanampy t@ asa no tsy nanome vola.*	6
Non, aucune contribution ne nous a été réclamée. *Tsia, tsy nisy fandraisana anjara notakiana taminay.*	7

CODE	ACTIVITE	S4.	S5.	S6.	S7.
1	Maintenance des canaux d'évacuation de son propre terrain. *Fikarakarana ny tatatra fivoahan'ny rano ho an'ny taninareo.*				
2	Maintenance des canaux secondaires (pour nourrir la terre). *Fikarakarana ny tatatra entina manamando ny tany rehetra manodidina.*				
3	Maintenance générale des infrastructures d'irrigation. *Fikarakarana @ankapobeny ny foto-drafitr'asa fanondrahana.*				
4	Protection des réservoires (plantation de graminées) *Fiharovana ny fitehirizan-drano (fambolena bozaka).*				
…	Autres (**A SPECIFIER**). *Hafa.*				

SI AUCUNE PARTICIPATION, ALLER AU MODULE SUIVANT
POSER S8 SI LE MANAGE A PARTICIPE A LA MAIN D'ŒUVRE (S7 = 1)
POSER S9 SI LE MANAGE A DONNE DE L'ARGENT (S7 = 2)
POSER S8 ET S9 SI LE MENAGE A FAIT LES DEUX (S7 = 3)

S8. Ces 12 derniers mois, combien de jours les membres du ménage ou/et vous-même, avez-vous travaillé pour **… (CITER 1 A 1 LES ACTIVITES AUXQUELLES LE MENAGE A PARTICIPE)** ? *Tao anatin'izay 12 volana farany izay, firy andro no niasanao na ny olona ao an-tokantranonao t@ … (CITER 1 A 1 LES ACTIVITES AUXQUELLES LE MENAGE A PARTICIPE) ?*

REPONSE NUMERIQUE : NOMBRE DE JOUR(S)

NOTER 1 SI MOINS D'UN JOUR

S9. Ces 12 derniers mois, quelle somme d'argent avez-vous ou/et votre foyer dépensé pour **… (CITER 1 A 1 LES ACTIVITES AUXQUELLES LE MENAGE A PARTICIPE)** ? *Tao anatin'izay 12 volana farany izay, ohatrinona no vola laninao sy ny fianakavianao t@ (CITER 1 A 1 LES ACTIVITES AUXQUELLES LE MENAGE A PARTICIPE) ?*

REPONSE NUMERIQUE : MONTANT EN ARIARY

CODE	ACTIVITE	S8.	S9.
1	Maintenance des canaux d'évacuation de son propre terrain. *Fikarakarana ny tatatra fivoahan'ny rano ho an'ny taninareo.*		!__!__!__!__!__!__!
2	Maintenance des canaux secondaires (pour nourrir la terre). *Fikarakarana ny tatatra entina manamando ny tany rehetra manodidina.*		!__!__!__!__!__!__!
3	Maintenance générale des infrastructures d'irrigation. *Fikarakarana @ankapobeny ny foto-drafitr'asa fanondrahana.*		!__!__!__!__!__!__!
4	Protection des réservoires (plantation de graminées) *Fiharovana ny fitehirizan-drano (fambolena bozaka).*		!__!__!__!__!__!__!
…	Autres (**A SPECIFIER**). *Hafa.*		!__!__!__!__!__!__!

MODULE T : EXTENSION DES ACTIVITES AGRICOLES

T1. Pendant la saison de pluie de 2015/2016, vous-même ou un membre de votre famille, avez-vous reçu un conseil sur **… (CITER 1 A 1 LES SUJETS)** ? *Nandritry ny vanim-potoana latsak'orana 2015/2016, ianao ve na olona ao @ tokatranonareo, nahazo toro-hevitra momba ny ... (CITER 1 A 1 LES SUJETS) ?*

Oui. *Eny.*	1	NSP.	2
Non. *Tsia.*	0	Refus.	3

T2. Quelle était la source principale du conseil sur **… (RAPPELER LES SUJETS) ?** *Avy aiza ireo toro-hevitra momba ny … (RAPPELER LES SUJETS) ?*

401	Personnel du projet AD2M. *Mpiasan'ny tetik'asa AD2M.*
402	Gouvernement. Service d'Extension de l'agriculture. *Fanjakana, sampana misahana ny fanitarana ny fambolena.*
403	Privé, Service d'Extension agricole. *Tsy miankina, sampana misahana ny fanitarana ny fambolena.*

404	Gouvernement. Service d'Extension de la pêche. *Fanjakana, sampana misahana ny fanitarana ny fanjonoana.*
405	ONG. *ONG.*
406	Coopération agricole / association de fermiers. *Fiaraha-miasa @ fambolena / fikambana mpamboly.*
407	Coopération pêche. *Fiaraha-miasa fanjonoana.*
408	Journée sur terrain/école pour les fermiers. *Fidinana eny an-tanimboly na any @tsekoly ho an'ny mpamboly.*
409	Meeting du village sur l'extension agricole. *Fivoriana nokarakaraina teo an-tanàna momba ny fanitarana ny fambolena.*
410	Cours sur l'extension agricole. *Fiofanana momba ny fanitarana ny fambolena.*
411	Fermier meneur. *Ny mpamboly mpitarika.*
412	Autre Fermier (voisin, parent). *Mpamboly hafa (mpiara-monina, havana)*
413	Média électroniques (télé, radio, Etc…). *Serasera electronika (télé, radio sns…)*
414	Média en papier (prospectus …). *Serasera an-taratasy isan-karazany.*
…	Autres (**A SPECIFIER**). *Hafa.*

CODE	SUJETS	S1.	S2.
301	Nouvelles Variétés du Riz. *Karazana vary vaovao.*		
302	Nouvelles Variétés d'Autres Récoltes. *Karazana voly hafa vaovao.*		
303	Protection des récoltes. *Fiarovana ny voly.*		
304	Lutte contre les animaux nuisibles. *Ady @ biby mpanimba voly.*		
305	Usage de l'engrais. *Fampiasana zezika.*		
306	Labourage minimum. *Fetra famadiham-bainga kely indrindra.*		
307	Irrigation. *Fanondrahana.*		
308	Compostage. *Fanatsarana ny tany fambolena @ alalan'ny fako.*		
309	Marketing / ventes de récoltes. *Marketing / fivarotana ny voly.*		
310	Certificats de terre. *Taratasin-tany.*		
311	Accessibilité aux crédits*. Fahafana mihindram-bola.*		
312	Sylviculture. *Fomba fitrandrahana ny ala.*		
313	Soin des animaux en général. *Fikarakarana ny biby @ ankapobeny.*		
314	Maladies animales / vaccination. *Aretin'ny biby / tsindrona.*		
315	Production halieutique. *Jono.*		
…	Autres (**A SPECIFIER**). *Hafa.*		

POSER T3 ET T4 POUR TOUTES LES SOURCES IDENTIFIEES EN T2

T3. Ces 12 derniers mois, dans votre ménage, qui a reçu le conseil/information venant de **… (CITER 1 A 1 LES SOURCES)** ? *Tao anatin'izay 12 volana farany izay, iza @ ireo olona ao antokatranonareo no nahazo ireo toro-hevitra avy any @ … (CITER 1 A 1 LES SOURCES) ?*
REPRENDRE LES CODES SOURCES EN T2 - SE REFERER AU SHOWCARD #1
LISTER JUSQU'A 3 MEMBRES PAR SOURCE

T4. Vous-même ou un membre de votre ménage, avez-vous payé ou donné quelque chose pour recevoir tout type de conseil/information venant de **… (CITER 1 A 1 LES SOURCES)** ? *Nandoa tambiny na sarany ve ianao na ny fianakavianao mba ahazoana ireo toro-hevitra avy any @ … (CITER 1 A 1 LES SOURCES) ?*

Oui. *Eny.*	1	NSP.	2
Non. *Tsia.*	0	Refus.	3

CODE SOURCE	S3.			S4.
	1	2	3	
401				!__!__!__!__!__!__!
402				!__!__!__!__!__!__!
403				!__!__!__!__!__!__!
404				!__!__!__!__!__!__!
405				!__!__!__!__!__!__!
406				!__!__!__!__!__!__!
407				!__!__!__!__!__!__!
408				!__!__!__!__!__!__!
409				!__!__!__!__!__!__!
410				!__!__!__!__!__!__!
411				!__!__!__!__!__!__!
412				!__!__!__!__!__!__!
413				!__!__!__!__!__!__!
414				!__!__!__!__!__!__!
…				!__!__!__!__!__!__!

MODULE U : BETAIL

U1. Ces 12 derniers mois, vous ou un membre de votre ménage, avez-vous élevé/possédé **… (CITER 1 A 1 LES BETAILS)** ? *Tao anatin'izay 12 volana farany izay, ianao ve na olona ao an-tokatranonareo, niompy/nanana … (CITER 1 A 1 LES BETAILS) ?*

Oui. *Eny.*	1
Non. *Tsia.*	0

U2. Actuellement, combien de **… (CITER 1 A 1 LES BÉTAILS POSSEDES)** posséde votre ménage ? *@ izao ankehitriny izao, firy ny isan'ny … (CITER 1 A 1 LES BÉTAILS POSSEDES) anananareo ?*

REPONSE NUMERIQUE : NOMBRE DE BETAILS

COMPTER EGALEMENT CEUX QUI NE SONT PAS DANS LA FERME MAIS AILLEURS

CODE	BETAIL	U1.	U2.
301	Veau. *Zanak'omby.*		!__!__!__!
302	Génisse. *Omby vavy mbola tsy niteraka.*		!__!__!__!
303	Vache. *Omby vavy.*		!__!__!__!
304	Taureau. *Omby dia.*		!__!__!__!
305	Bœuf. *Omby lahy.*		!__!__!__!
306	Ane/mul, cheval. *Ampondra, soavaly.*		!__!__!__!
307	Chèvre. *Osy.*		!__!__!__!
308	Mouton. *Ondry.*		!__!__!__!

309	Cochon. *Kisoa.*		!__!__!__!
310	Poule pondeuse, poulet de chair. *Akoho mpanatody, akoho fangalana nofony.*		!__!__!__!
311	Poule locale. *Akoho vavy gasy.*		!__!__!__!
312	Coq local. *Akoho lahy gasy.*		!__!__!__!
313	Dinde. *Vorontsiloza.*		!__!__!__!
314	Canard. *Gana.*		!__!__!__!
315	Canard de barbarie. *Dokotra.*		!__!__!__!
316	Oie. *Gisa.*		!__!__!__!
317	Pigeon. *Voro-manidina.*		!__!__!__!
…	Autres (**A SPECIFIER**). *Hafa.*		!__!__!__!

Qualitative

Key Informant Interview Protocol

Instructions: Use this protocol for interviews with AD2M Social Facilitators and Technicians; AD2M Rural Infrastructure Heads; Ministry of Agriculture Staff at the regional or district level; and country program coordination teams.

Begin all interviews by:
- Introducing yourself and explaining the purpose of the interview and the evaluation of AD2M
- Reminding respondents that we'll be asking questions about AD2M, but that we are primarily interested in the ***irrigation*** component (as opposed to land titling or other AD2M interventions).
- Obtaining consent [*see consent language*]; explain how long you expect the interview to take (30 minutes) and remind the respondent they can elect to stop the interview at any time for any reason.

Background

1. What do you know about the AD2M program in this area? *[probe: targeting, purpose of program, specific interventions]*
2. What was your role in the AD2M program *[describe]*?
3. How long did you serve in this role and what were your key responsibilities?
4. Were there any other programs similar to AD2M that operated here around the same time period? What were these other programs?

Program Processes

Targeting
1. How were famers selected to benefit from AD2M irrigation assistance (i.e., canals and/or dams)? *[probe: ask them to describe targeting process in as much detail as possible]*
2. What differences did you perceive, if any, between the farmers selected to receive AD2M irrigation assistance and those who were not selected?
3. Do you think households understood why some were selected to benefit from AD2M irrigation and others were not? Were any households upset that they were not selected to benefit from AD2M irrigation schemes?

Irrigation Delivery
4. What types of irrigation schemes were offered under AD2M (dams, canals, etc.)? Please tell me about all irrigation schemes AD2M supported in this area and how each of these functioned (if/how they were shared by multiple households, etc.).
5. Were there any challenges getting households to uptake AD2M irrigation schemes? Describe.
6. Did one type of irrigation scheme work better than another (for example, did canals work better than dams?). If there were only canals, did the canals function properly?

7. How were irrigation schemes affected by seasonality? *[probe: rainy season, dry season]*. Did canals or dams function better in one season or the other? Were irrigation-related challenges different depending on the season?
8. Were AD2M beneficiaries responsible for maintaining their own canals? How did this work and do you think it was effective?
9. Were there any disputes between beneficiary households about AD2M canals or dams?

Water User Associations (WUAs)

10. Prior to AD2M, were there Water User Associations (WUAs) or other associations governing water use (such as farmer's associations) in this area? If yes, how did these organizations function? If not, how were WUAs formed under AD2M? How did AD2M affect any existing WUAs, if at all?
11. In your words, what was the main purpose of WUAs? *[probe: ask respondent to describe a typical WUA in this area]*
12. Was there any difficulty recruiting people to join WUAs?
13. In your opinion, did WUAs function properly (as intended) during AD2M? Were you aware of WUA guidelines? Do you believe the guidelines were followed? *[probe: ask for specific evidence regarding WUA guidelines]*
14. Did WUAs succeed in maintaining irrigation infrastructure? In regulating water use? How did they do this?
15. Were fees required to join WUAs? If so, how much was the entry fee? Do you think the fees prevented some people from joining the WUA who otherwise would have joined?
16. Were there any other costs (for example transport costs or time) to being part of a WUA? Describe.
17. If there were disputes related to AD2M canals and dams, were WUAs involved in dispute resolution? How did they do this?
18. Are WUAs in this area still active today? Why do you think this is?

Training

19. What types of training were provided to AD2M beneficiary households? *[probe: trainings related to irrigation infrastructure maintenance; trainings related to sustainable land practices; trainings related to crop production and crop diversification]*
20. AD2M Social Facilitators and Technicians ONLY: What was your role in training beneficiary households and/or WUAs? Did you face any challenges in delivering trainings to farmers and/or WUAs? What types of challenges? What recommendations would you have for future trainings of beneficiary households and/or WUAs?
21. Who provided these trainings? In your opinion, were the trainings effective? Why or why not? How do you think the trainings could have been improved?
22. Was any training provided to WUAs? Who provided it and what did the training include? Do you think it was effective? Why or why not? How do you think the trainings could have been improved?

Strengths & Challenges

23. In your opinion, what were the main strengths of AD2M's irrigation component? What were the key successes of the program? *[probe: ask the respondent to be as specific as possible]*

24. What were the main weaknesses of AD2M's irrigation component?
25. **<u>Infrastructure Heads ONLY</u>**: What lessons did you learn from the design and construction/rehabilitation of irrigation systems under AD2M? What might you do differently in the future?
26. **<u>Infrastructure Heads ONLY</u>**: What were the costs of construction/rehabilitation in this area? How did the actual costs compare to the predicted costs? Can you think of any ways to reduce construction/rehabilitation costs in the future?
27. Were there any contextual factors (for example, community relationships) or moderating factors (for example, drought) that either facilitated or hindered the success of AD2M's irrigation schemes in this area? *[probe: ask the respondent to be as specific as possible]*

Perceived Effects

1. Do you think AD2M irrigation support had any effect on crop production? What about on rice yields, specifically? *[probe: ask respondent to give specific evidence for any effects described]*
2. Did farming practices change at all as a result of AD2M irrigation schemes? *[describe]* Why or why not?
3. What were the main crops grown in this area <u>prior</u> to AD2M? And during/after AD2M?
4. Did you notice any changes at the <u>community</u>-level as a result of AD2M irrigation schemes? (*probe: canals, dams, etc.*)
5. If WUAs existed prior to AD2M, did you notice any changes in how they functioned as a result of AD2M? Were these changes positive or negative? *[describe]*

Conclusion

1. Is there anything else you would like to tell me about your experience with the AD2M program?
2. Do you have any other comments or recommendations for future irrigation programs in Madagascar?

[END. Thank the respondent for his/her time.]

Semi-Structured Interview Protocol – Local Leaders

Instructions: Use this protocol for interviews with local leaders only.

Begin all interviews by:
- Introducing yourself and explaining the purpose of the interview and the evaluation of AD2M
- Reminding respondents that we'll be asking questions about AD2M, but that we are primarily interested in the ***irrigation*** component (as opposed to land titling or other AD2M interventions).

- Obtaining consent [*see consent language*]; explain how long you expect the interview to take (15-20 minutes) and remind the respondent they can elect to stop the interview at any time for any reason.

Background (general)

5. What is your role in this community? How long have you served in this role?
6. How long have you lived in this community?
7. How would you describe your community in terms of social dynamics--do people get along, for the most part?
8. What are the main sources of income here? *[probe: if farming/agriculture, what crops specifically?]*

Background (AD2M)

9. Were you familiar with the AD2M irrigation program in this area? *[probe if needed: do you recall any programs designed to help farmers irrigate their plots? With dams, canals, etc.?]*
10. What do you remember about the AD2M program in this area? *[probe: targeting, purpose of program, specific interventions]*
11. Did you serve any role in the AD2M program *[describe]*? If yes, how long did you serve in this role and what were your key responsibilities?
12. Did you benefit (either directly or indirectly) from AD2M's irrigation support? How?
13. Do you know what a Water User Association (WUA) is? Does one exist in this area now? If yes, how long has the WUA been operational and what is its primary function?
14. Were there any other programs similar to AD2M (i.e., supporting farmers and/or providing irrigation) that operated here around the same time period as AD2M? What were these other programs? Describe.

Perceived Effects

6. Do you think AD2M irrigation support (dams, canals) had any effect (positive or negative) on individuals in your community (i.e., farmers)? What about on your community at large? Describe.
7. Do you recall any tension or disagreements related to AD2M dams or canals (for example, over water access or irrigation infrastructure maintenance)? Describe.
8. Do you think AD2M irrigation support (canals, dams) had any effect on crop production? What about on rice yields, specifically? *[probe: ask respondent to give specific evidence for any effects described]*
9. Did farming practices change at all as a result of AD2M irrigation schemes? *[describe]* Why or why not?
10. What were the main crops grown in this area <u>prior</u> to AD2M? And during/after AD2M? Now?
11. If WUAs existed prior to AD2M, did you notice any changes in how they functioned as a result of AD2M? Were these changes positive or negative? *[describe]*

Conclusion

3. Is there anything else you would like to tell me about your community's experience with the AD2M program?
4. Do you have any other comments or recommendations for future irrigation programs in Madagascar?

[END. Thank the respondent for his/her time.]

Focus Group Discussion Protocol – Water User Associations (WUAs)

Instructions: Use this protocol for focus groups with Water User Associations (WUAs).

Begin all focus groups by:
- Introducing yourself and explaining the purpose of the focus group and the evaluation of AD2M
- Reminding participants that we'll be asking questions about AD2M, but that we are primarily interested in the ***irrigation*** component (as opposed to land titling or other AD2M interventions).
- Obtaining consent [*see consent language*]; explain how long you expect the focus group to take (60-90 minutes) and remind the participants they can elect to stop participating in the focus group at any time for any reason.

Background

15. *Ask all participants to <u>briefly</u> introduce themselves (names, how long they've lived in the area, etc.)*
16. What do you all remember about the AD2M program in this area? *[probe: purpose of program, specific interventions]*
17. How did each of you come to be involved in the Water User Association (WUA)?
18. What were your roles in the WUA during AD2M? *[probe: regular member? leadership responsibilities?]*
19. Why did you decide to get involved with the WUA? If you served in a leadership role, why did you decide to take on a leadership position in the WUA?
20. What are/were the main benefits of the WUA to you personally?
21. Are you still involved with the WUA here? In what capacity?

Water User Associations

28. Prior to AD2M, were there Water User Associations (WUAs) or other associations governing water use (such as farmer's associations) in this area? If yes, how did these organizations function? If not, how were WUAs formed under AD2M?
29. How did AD2M affect any existing WUAs, if at all?

30. If WUAs existed prior to AD2M, did you notice any changes in how they functioned as a result of AD2M? Were these changes positive or negative? *[describe]*
31. In your own words, what is or was the main purpose of WUAs? *[probe: ask respondent to describe a typical WUA in this area]*
    a. What did/does your WUA do to maintain irrigation infrastructure (dams, canals, etc.)? How do/did you determine what needed to be done and who would do it? Who was ultimately responsible for infrastructure maintenance?
    b. How does/did your WUA regulate water use?
    c. Did WUAs succeed in maintaining irrigation infrastructure? In regulating water use? How did they do this?
    d. Were there any differences in how AD2M WUAs functioned versus non-AD2M WUAs?
32. Was there any difficulty recruiting people to join WUAs? If so, why?
33. Was any training in water management provided to WUAs under AD2M? Who provided it and what did the training include? Do you think it was effective? Why or why not? How do you think the trainings could have been improved?
34. In your opinion, did WUAs function as intended during AD2M? Were you aware of WUA guidelines? Do you believe the guidelines were followed? *[probe: ask for specific evidence regarding WUA guidelines]*
35. Were fees required to join WUAs? If so, how much was the entry fee? Do you think the fees prevented some people from joining the WUA who otherwise would have joined?
36. Were there any other costs (for example transport costs or time) to being part of a WUA? Describe.
37. If there were disputes related to AD2M canals and dams, were WUAs involved in dispute resolution? How did they do this?
38. Are WUAs in this area still active today? Why do you think this is? What has changed in the WUA since the end of AD2M?

Strengths & Challenges

1. In your opinion, what were the main strengths of WUAs during AD2M? What services did the WUA provide that would have otherwise been absent?
2. What were the key successes of the AD2M program? *[probe: ask the respondent to be as specific as possible]*
3. What were the main weaknesses of WUAs? What about AD2M's irrigation infrastructure more generally?
4. Were there any contextual factors (for example, community relationships) or moderating factors (for example, drought) that either facilitated or hindered the success of WUAs? What about the success of AD2M's irrigation schemes in this area? *[probe: ask participants to be as specific as possible]*
5. How do you think WUAs could be improved or made more effective?

Perceived Changes

12. Do you think AD2M irrigation support had any effect on crop production? What about on rice yields, specifically? *[probe: ask participants to give specific evidence for any effects described]*
13. Did farming practices change at all as a result of AD2M irrigation schemes? How? *[probe: sowing practices, tilling practices, harvesting practices, etc.]*
14. What were the main crops grown in this area <u>prior</u> to AD2M? And during/after AD2M?
15. Did you notice any changes at the <u>community</u>-level as a result of AD2M irrigation schemes? (*probe: canals, dams, etc.*)
16. Did the AD2M WUAs bring about any other changes (positive or negative) at the community-level?

Conclusion

5. Is there anything else you would like to tell me about your experience with the WUAs or the AD2M program?
6. Do you have any other comments or recommendations for future irrigation programs in Madagascar?

[END. Thank the participants for their time.]

Focus Group Discussion Protocol – Beneficiary Farmers

Instructions: Use this protocol for focus groups with beneficiary farmers.

Begin all focus groups by:
- Introducing yourself and explaining the purpose of the focus group and the evaluation of AD2M.
- Reminding participants that we'll be asking questions about AD2M, but that we are primarily interested in the ***irrigation*** component (as opposed to land titling or other AD2M interventions).
- Obtaining consent [*see consent language*]; explain how long you expect the focus group to take (60-90 minutes) and remind the participants they can elect to stop participating in the focus group at any time for any reason.

Background

22. *Ask all participants to <u>briefly</u> introduce themselves (names, how long they've lived in the area, etc.)*
    a. Did you benefit from one of AD2M's irrigation schemes? Which type of irrigation system (canal, dam, etc.) did you gain access to through AD2M? *[allow all participants to describe]*

b. How were you selected to benefit from the canal or dam? Are you still relying on the same canal or dam to irrigate your plot(s)?
23. What do you all remember about the AD2M program in this area? *[probe: purpose of program, specific interventions]*

Farming Practices

1. Did you participate in any trainings related to farming? If yes, what were the main things you learned from the training?
2. Did your farming practices change at all as a result of AD2M irrigation schemes? *[describe]* Why or why not? How exactly did your farming practices change? *[probe: changes in sowing practices, changes in tilling practices, changes in harvesting practices, etc.]*
3. What were the main crops you grew on your plots <u>prior</u> to AD2M? And what were the main crops you grew after you gained access to AD2M canals or dams? Are you still growing these same crops? Why or why not?

Water User Associations (WUAs)

1. Were you part of a WUA during AD2M? If yes, how and why did you get involved? If no, were you aware of WUAs?
2. In your own words, what is/was the purpose of WUAs?
3. Did WUAs help maintain the irrigation infrastructure (canals, dams, etc.)? How did they do this, and were they successful?
4. Did WUAs regulate water access and use? How did they do this, and were they successful?
5. What other services did WUAs provide, if any? Did you benefit from these services?
6. Are WUAs still actively functioning? Are there any differences in how they function now versus how they functioned during AD2M? Describe.

Perceived Effects

17. How did AD2M irrigation schemes help to irrigate your plot(s)? *[probe: for example, was a canal dug to irrigate your plot(s)?]*
   a. Did the canal or dam function properly? Describe.
   b. Did you have any trouble accessing the canal or dam? Describe.
   c. Was the canal or dam properly maintained? Describe.
   d. Was water use regulated effectively? Describe.
18. Did AD2M's irrigation support (canals, dams, etc.) have any effect on your crop production? What about on rice yields, specifically? *[probe: ask participants to give specific evidence for any effects described]*
19. What about today? Has your crop production (including rice yields) continued at the same level since you gained access to AD2M canals or dams? *[describe]*
20. Did you notice any changes at the <u>community</u>-level as a result of AD2M irrigation schemes? (*probe: canals, dams, etc.*)

21. If WUAs existed prior to AD2M, did you notice any changes in how they functioned as a result of AD2M? Were these changes positive or negative? *[describe]*
22. Did WUAs bring about any other changes (positive or negative) at the community-level?

Strengths & Challenges

6. What were the key successes of AD2M's irrigation schemes? And WUAs? *[probe: ask participants to be as specific as possible]*
7. What were the main weaknesses of AD2M's irrigation infrastructure (canals and dams)?
8. Were there any contextual factors (for example, community relationships) or moderating factors (for example, drought) that either facilitated or hindered the success of the canals and dams? *[probe: ask participants to be as specific as possible]*
9. How do you think canals, dams or WUAs could be improved or made more effective in the future?

Conclusion

7. Is there anything else you would like to tell me about your experience with the AD2M program? With WUAs?
8. Do you have any other comments or recommendations for future irrigation programs in Madagascar?

[END. Thank the participants for their time.]

Appendix D: Pre-analysis Plan

There was no pre-analysis plan for this project.

Appendix E: Sample Size and Power Calculations

This goal of this study was to estimate impacts of the AD2M programme on all recipients. Thus, it was vital to have a sample size sufficiently large to detect meaningful effects. To do this, we provide power analyses based on our actual survey data from AD2M beneficiaries and the comparison group. We focussed on the outcome of production value per hectare. The power analysis calculations were based on the following assumptions:

- Minimum detectable effect size: Our study was powered to detect a 0.348 standardised mean difference effect on the quantity of rice produced per capita.

- Number of villages (clusters): 62, with 28 households surveyed per village, for a total of 1,986 households. Villages are the next smallest administrative unit after communes. These villages were distributed evenly across AD2M beneficiary communes.

- Estimated intra-cluster correlation coefficient: 0.11. This value is based on the actual data.

- The proportion of the outcome variance explained by the exogenous covariates:

  – Level 1: 0.30. Covariates included standard household-level physical, natural, human and social capital, as well as demographic characteristics.

  – Level 2: 0.25. Covariates included village-level infrastructure and public services, population and village-level demographics, land use and management, and proxies for collective action.

- Power was set to 0.80.

- α level was set to .05.

- This was a one-sided test. From a fairly extensive review of the literature (aided by review articles), yield and income gains were found in nearly every empirical analysis, with a few showing low or no gains, generally because of poor construction or maintenance. Thus, no evidence suggests a need to be powered for negative impacts.

- We did not restrict our sample on the basis of our matching algorithm, so we used the entire sample in these power calculations.

Table E.1: Power calculation summary

Assumption		Comments
Alpha level (α)	.05	Probability of a type I error
Two-tailed or one-tailed test?	1	
Power (1 − β)	0.80	Statistical power (1 − probability of a type II error)
ρ (intra-cluster correlation coefficient)	0.11	Proportion of variance among level 2 units [V2/(V1 + V2)]

Assumption		Comments
P	0.33	Proportion of the level 2 units randomised to treatment
R_1^2	0.30	Proportion of variance in the level 1 outcome explained by level 1 covariates
R_2^2	0.25	Proportion of variance in the level 2 mean outcome explained by level 2 covariates
g^*	1	Number of level 2 covariates used
n (average cluster size)	28	Mean number of level 1 units per level 2 cluster (harmonic mean recommended)
J (sample size [n of clusters])	68	Number of level 2 units in the sample
Design effect	2.75	Estimated from empirical data
MDES	**0.348**	**Minimum detectable effect size**

Appendix F: Monitoring Plan

This is an ex-post evaluation, so there is no monitoring plan.

Appendix G: Structural or Theoretical Model Specification

We did not use structural estimation in this project, so we have no specification to report.

Appendix H: Descriptive Statistics

This section compares household background characteristics as well as plot features between the treatment and control groups. We show summary statistics for selected plot- and household-level features including plot biophysical characteristics, spatial characteristics of production management, production inputs and household demographics for both the treatment and control groups.

As expected, a higher percentage of plots (73 percent for treatment areas versus 60 percent in control areas) in treatment areas had access to irrigation. However, not all households within villages where an irrigation perimeter was built or rehabilitated were allocated irrigated parcels. For rehabilitated areas, those with pre-existing claims to the land within the perimeter maintained those claims. For newly built irrigation perimeters, and unclaimed land in the rehabilitated perimeters, project documents indicate that project staff worked with community members to identify vulnerable households (e.g., those with little or no land and/or those with few or no cattle). We have limited ability to account for potential selection bias, though the data we have seems to suggest that somewhat better-off households may have been more likely to benefit instead.

In terms of demographic characteristics, we find that the percentage of treatment household heads who considered themselves literate in French was 18% versus 9% for control household heads. Somewhat less compelling was the fact that 42% of treatment households considered themselves literate in Malagasy, whereas only 26% considered themselves literate in Malagasy in control households. The latter is less compelling because AD2M also undertook literacy campaigns to increase functional literacy in Malagasy; we can therefore anticipate higher Malagasy literacy rates amongst beneficiaries or that the difference actually does capture pre-project differences. We also find treatment households to be better off than the control group in terms of employment; on average, 55 percent of treatment households had a member with full-time wage employment versus 44 percent in the control group. Similarly, 57 percent of treatment households had a member with part-time employment, compared with 46 percent in the control group.

Regarding features of plot management and production input, we find that more plots in treatment areas (51 percent) have an educated manager compared to plots in control areas (33 percent). Control areas have more hectares of cultivated land, although this difference is not statistically significant. Interestingly, treatment plots have fewer hectares of cultivated rice than the control group. This is however somewhat expected, given treatment farmers received training in agricultural intensification and diversification.

Table H.1: Climate and biophysical characteristics

	Control			Treated			t-test	t-test	ksmirnov
Variable	N	Mean	SE	N	Mean	SE	t-stat	p-value	p-value
Plot has any irrigation	840	0.60	0.02	614	0.73	0.02	-5.25	0.00	0.00
NDVI index (Aug 2011)	840	0.37	0.00	614	0.37	0.00	-1.67	0.10	0.00
Proportion - plot primary soil type is sand	840	0.19	0.01	614	0.19	0.01	-0.35	0.73	1.00
Proportion - plot primary soil type is loam	840	0.37	0.02	614	0.31	0.02	2.30	0.02	0.06
Proportion - plot slope is flat	840	0.78	0.01	614	0.72	0.02	2.78	0.01	0.05
Proportion - plot slope is slight	840	0.18	0.01	614	0.23	0.02	-2.40	0.02	0.08
Proportion - plot slope is moderate	840	0.03	0.01	614	0.03	0.01	-0.30	0.77	1.00
Proportion - plot is marsh/wetland	840	0.44	0.02	614	0.49	0.02	-1.92	0.06	0.18

Note: Sample 2 – August 2011 NDVI < 0.46

Table H.2: Production Management

	Control			Treated			t-test	t-test	ksmirnov
Variable	N	Mean	SE	N	Mean	SE	t-stat	p-value	p-value
Plot manager is female	840	0.16	0.01	614	0.17	0.02	-0.30	0.77	1.00
Plot manager has any education	840	0.33	0.02	614	0.51	0.02	-7.11	0.00	0.00
Proportion - plot is held on a permanent or semi-permanent basis	840	0.89	0.01	614	0.86	0.01	1.61	0.11	0.61

Table H.3: Production Inputs

	Control			Treated			t-test	t-test	ksmirnov
Variable	N	Mean	SE	N	Mean	SE	t-stat	p-value	p-value
Hectares cultivated	840	13.35	7.28	614	1.96	0.30	1.34	0.18	0.13
Hectares cultivated with rice	804	13.66	7.61	597	1.75	0.31	1.35	0.18	0.04
Organic fertiliser was used on any plot	840	0.08	0.01	614	0.10	0.01	-1.57	0.12	0.99

Table H.4: Household demographics

	Control			Treated			t-test	t-test	ksmirnov
Variable	**N**	**Mean**	**SE**	**N**	**Mean**	**SE**	**t-stat**	**p-value**	**p-value**
Household adult equivalents	840	4.02	0.06	614	4.62	0.08	-6.26	0.00	0.00
Dependency ratio (age<15 | >60) : (15<=age<=60)	840	1.08	0.03	614	1.08	0.04	0.00	1.00	0.75
Household head age	840	41.95	0.53	614	46.44	0.58	-5.67	0.00	0.00
Household had a member with wage employment	840	0.44	0.02	614	0.55	0.02	-4.09	0.00	0.00
Household had a member with part-time employment	840	0.46	0.02	614	0.57	0.02	-3.91	0.00	0.00
Household head can read & write french	840	0.09	0.01	614	0.18	0.02	-5.37	0.00	0.00
Household head can read & write malagasy	840	0.26	0.02	614	0.42	0.02	-6.53	0.00	0.00
Separate rooms of dwelling	840	1.31	0.03	614	1.47	0.03	-3.54	0.00	0.00
Household dwelling has improved toilet	840	0.07	0.01	614	0.12	0.01	-3.76	0.00	0.20
N of children of head or spouse > 15 living elsewhere	840	0.32	0.03	614	0.46	0.04	-3.15	0.00	0.08

Table H.5: Spatial characteristics

	Control			Treated			t-test	t-test	ksmirnov
Variable	**N**	**Mean**	**SE**	**N**	**Mean**	**SE**	**t-stat**	**p-value**	**p-value**
Fokontnay access to credit from any source	840	0.05	0.00	614	0.10	0.00	-11.54	0.00	0.00
Fokontnay average minutes to drinking water	840	15.03	0.28	614	11.36	0.17	10.14	0.00	0.00
District Belo Sur Triribihina	840	0.14	0.01	614	0.40	0.02	-11.42	0.00	0.00

Figure H.1: Programme and control area NDVI
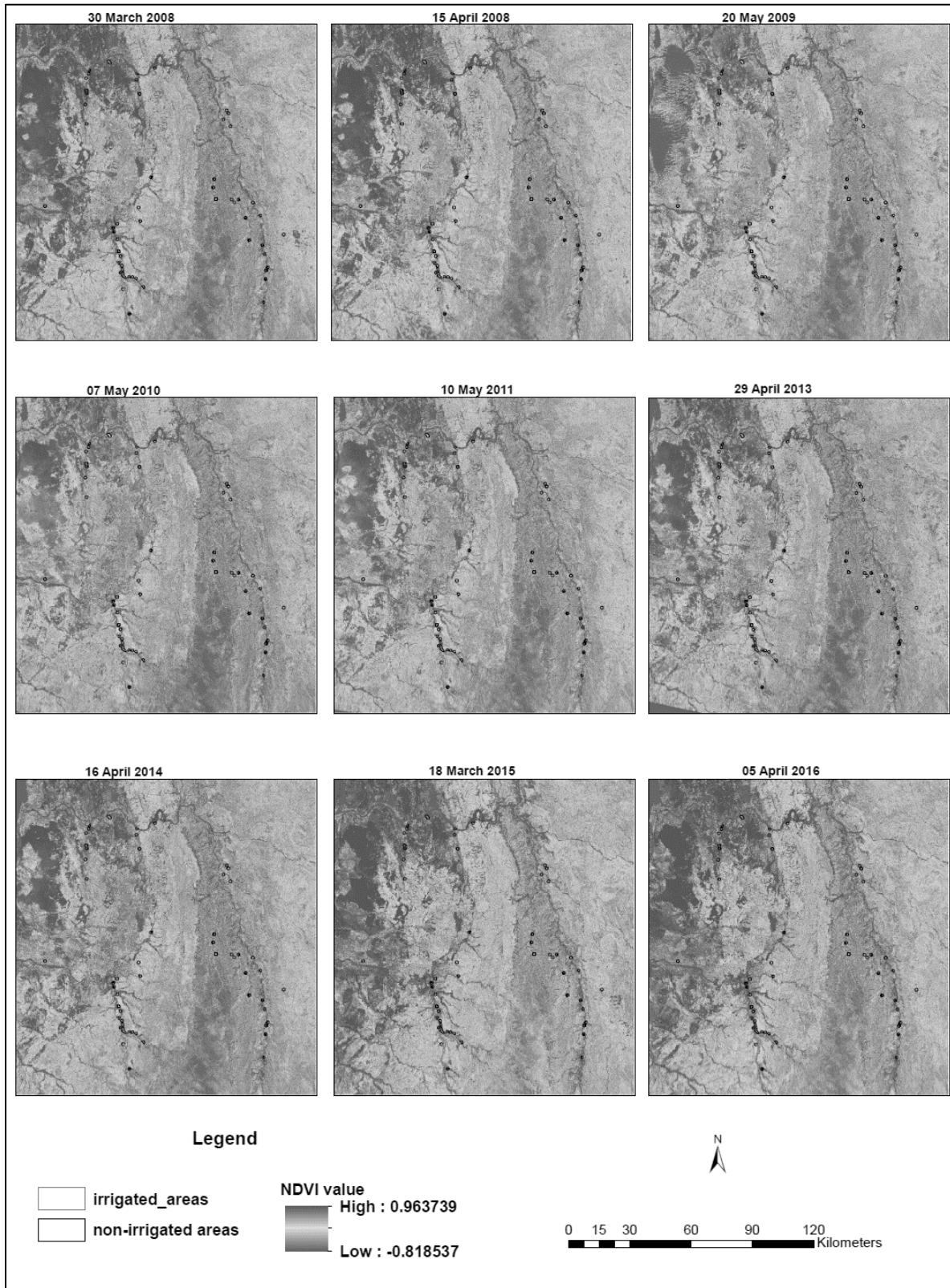
Appendix I: Results

Appendix I.A: Summary of sample

Table I.A.1: Covariate balance tests by stratum, N=1,454

	Block 1 Control N=46, Treated N=3				Block 2 Control N=317, Treated N=96				Block 3 Control N=303, Treated N=261				Block 4 Control N=137, Treated N=179				Block 5 Control N=37, Treated N=75			
	Control Mean	Treated Mean	Diff.	p-value	Control Mean	Treated Mean	Diff.	p-value	Control Mean	Treated Mean	Diff.	p-value	Control Mean	Treated Mean	Diff.	p-value	Control Mean	Treated Mean	Diff.	p-value
NDVI index (aug 2011)	0.35	0.37	0.02	(.354)	0.36	0.36	0.00	(.429)	0.37	0.37	0.00	(.962)	0.37	0.38	0.01	(.249)	0.39	0.38	-0.01	(.461)
Ln(hectares cultivated)	-0.15	0.64	0.78	(.094)	0.07	-0.14	-0.21	(.079)	-0.09	0.02	0.10	(.199)	0.04	0.09	0.04	(.749)	0.38	0.40	0.02	(.907)
Plot manager is female	0.15	0	-0.15	(.476)	0.13	0.16	0.03	(.501)	0.17	0.20	0.03	(.400)	0.18	0.15	-0.04	(.374)	0.30	0.13	-0.16	(.037)
Plot manager has any educ.	0	0	0		0.09	0.14	0.04	(.253)	0.39	0.36	-0.03	(.535)	0.72	0.75	0.04	(.438)	0.89	0.97	0.08	(.073)
Prop. – plots owned	1	1	0		0.94	0.92	-0.01	(.697)	0.87	0.85	-0.02	(.415)	0.81	0.85	0.03	(.406)	0.82	0.88	0.06	(.369)
Prop.– plots, sand	0.16	0	-0.16	(.449)	0.15	0.21	0.07	(.096)	0.20	0.21	0.01	(.782)	0.26	0.16	-0.10	(.016)	0.13	0.19	0.05	(.401)
Prop. – plots, loam	0.68	1	0.32	(.213)	0.42	0.39	-0.02	(.655)	0.31	0.38	0.07	(.055)	0.27	0.22	-0.04	(.329)	0.46	0.18	-0.28	(.001)
Prop. – plots, flat	0.97	1	0.03	(.749)	0.89	0.81	-0.08	(.023)	0.72	0.74	0.02	(.655)	0.69	0.68	-0.01	(.873)	0.48	0.66	0.19	(.036)
Prop. – plots,slight slope	0.03	0	-0.03	(.749)	0.09	0.17	0.08	(.019)	0.23	0.22	-0.01	(.767)	0.23	0.24	0.00	(.932)	0.49	0.30	-0.19	(.027)
Prop.– plots, moderate slope	0	0	0		0.02	0.02	0.00	(.836)	0.03	0.02	-0.01	(.373)	0.03	0.05	0.02	(.454)	0.03	0.01	-0.02	(.317)
Prop. - plot is wetland	0.22	0.11	-0.11	(.647)	0.38	0.38	0.00	(.942)	0.49	0.47	-0.02	(.635)	0.55	0.52	-0.03	(.513)	0.48	0.66	0.18	(.034)
Organic fertiliser on any plot	0	0	0		0.04	0.05	0.01	(.642)	0.11	0.08	-0.02	(.392)	0.10	0.15	0.05	(.203)	0.16	0.11	-0.06	(.408)
Household adult equivalents	2.37	2.89	0.52	(.297)	3.44	3.35	-0.09	(.544)	4.21	4.24	0.03	(.841)	5.00	5.07	0.07	(.740)	5.93	6.62	0.69	(.087)
Dependency ratio	0.67	0.67	0.00	(.993)	1.10	1.13	0.03	(.769)	1.14	1.08	-0.06	(.482)	1.11	1.11	0.00	(.974)	0.87	0.96	0.10	(.582)
Ln(hh head age)	3.10	3.10	-0.01	(.935)	3.52	3.55	0.03	(.449)	3.78	3.76	-0.02	(.481)	3.88	3.87	-0.01	(.857)	3.97	4.02	0.05	(.182)
Household had wage employment	0.09	0.33	0.25	(.179)	0.31	0.30	0.00	(.942)	0.46	0.56	0.10	(.018)	0.74	0.60	-0.14	(.009)	0.78	0.72	-0.06	(.473)
Household had part-time employ.	0.20	0	-0.20	(.407)	0.30	0.36	0.07	(.208)	0.50	0.54	0.04	(.355)	0.74	0.68	-0.06	(.239)	0.84	0.65	-0.18	(.042)
Head, read & write french	0	0	0		0.00	0.02	0.02	(.074)	0.07	0.08	0.01	(.511)	0.24	0.25	0.00	(.920)	0.54	0.6	0.06	(.553)
Head read & write malagasy	0	0	0		0.08	0.05	-0.03	(.331)	0.26	0.28	0.01	(.753)	0.58	0.66	0.09	(.109)	0.86	0.81	-0.05	(.499)
Separate rooms of dwelling	1.02	1	-0.02	(.801)	1.16	1.24	0.08	(.108)	1.26	1.36	0.10	(.030)	1.65	1.51	-0.14	(.254)	2.08	2.08	0.00	(.998)
Household has improved toilet	0	0	0		0.02	0	-0.02	(.143)	0.06	0.07	0.01	(.529)	0.15	0.15	0.00	(.905)	0.32	0.41	0.09	(.367)
N of children of head or spouse > 15 living elsewhere	0	0	0		0.14	0.14	-0.01	(.909)	0.36	0.36	0.00	(.989)	0.64	0.61	-0.03	(.817)	0.68	0.87	0.19	(.439)

Figure I.A.2.a: Balance summary
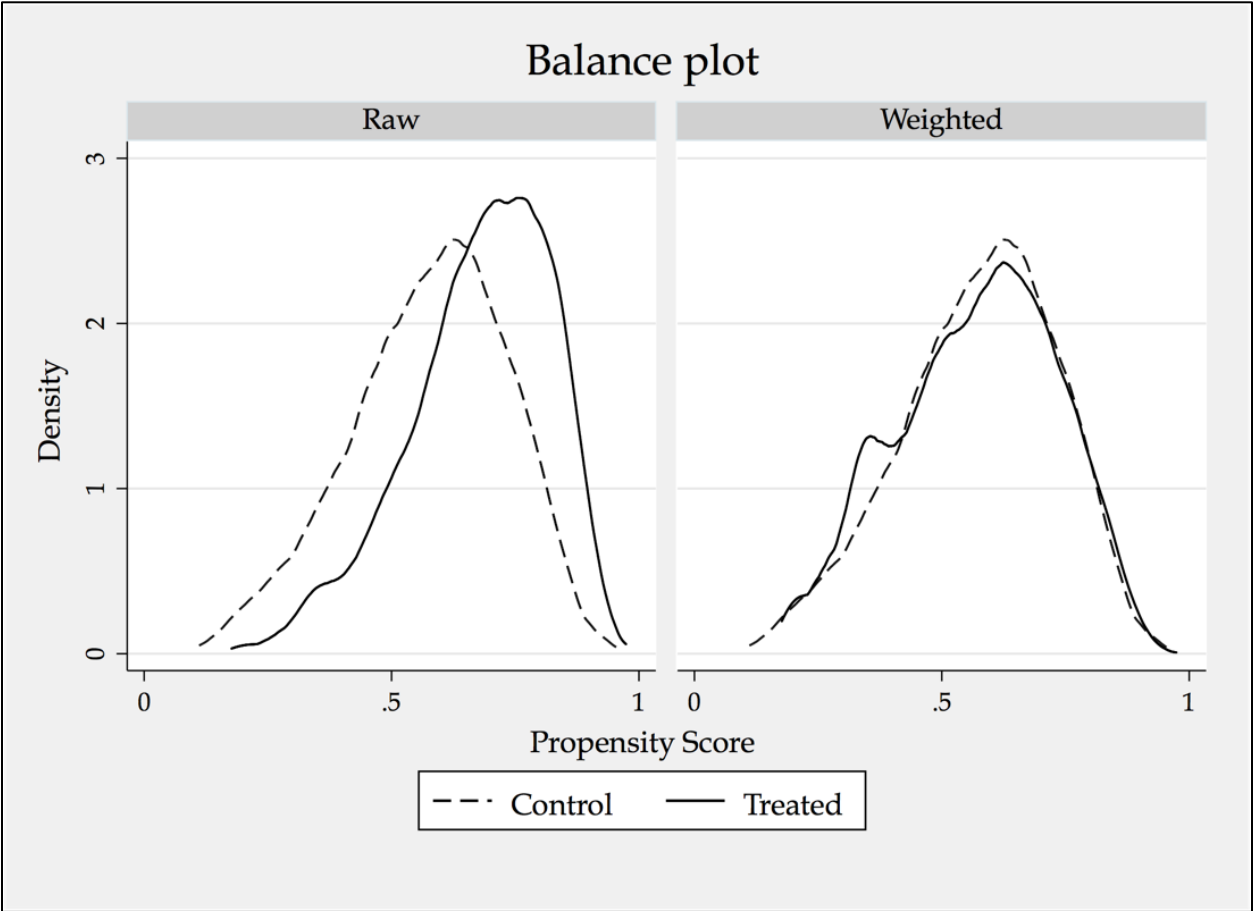
Table I.A.2.a: Test of balance

Chi-square	42.26
p value	.008

Table I.A.2.b: Balance summary – full sample

		Observations	Raw	Weighted
		N	1,713	1,713.0
		Treated	614	853.0
		Control	1,099	860.0

Variable	Standardised differences		Variance ratios	
	Raw	Weighted	Raw	Weighted
NDVI (August 2011)	-0.426	0.036	0.71	0.78
ln(hectares cultivated)	-0.031	-0.009	1.14	1.14
Plot manager is female	0.003	-0.019	1.01	0.97
Plot manager has any education	0.190	0.037	1.03	1.00
Plot is held on a permanent or semi-permanent basis	0.073	-0.013	0.88	1.03
Plot primary soil type is sand	-0.044	0.051	0.99	1.15
Plot primary soil type is loam	-0.065	0.016	0.97	1.02
Plot slope is flat	-0.073	-0.037	1.11	1.05
Plot slope is slight	0.059	0.035	1.10	1.05
Plot slope is moderate	-0.021	0.020	0.88	1.09
Plot is marsh/wetland	0.127	0.018	1.02	1.02
Organic fertiliser was used on any plot	0.136	0.031	1.52	1.09
Household adult equivalents	0.303	-0.002	1.28	1.02
Dependency ratio (age < 15 | > 60):(15 ≤ age ≤ 60)	0.009	-0.004	1.08	1.03
ln(household head age)	0.335	-0.019	0.75	0.90
Household has a member with wage employment	0.106	-0.025	0.99	1.01
Household has a member with part-time employment	0.134	-0.035	0.98	1.01
Household head can read and write French	0.158	0.062	1.36	1.11
Household head can read and write Malagasy	0.173	0.060	1.09	1.02
Separate rooms of dwelling	0.185	-0.026	0.56	0.17
Household dwelling has improved toilet	0.189	0.085	1.71	1.24
N of children of head or spouse > 15 living elsewhere	0.131	0.001	1.21	0.96

Appendix I.B: Results for full sample

Table I.B.a: Crop production outcomes

Variable	Irrigation dummy	ATET	*t* stat	*p* value	Control mean	Treated mean	*N*
Value of crop production per hectare	Yes	-0.006	-0.10	(.918)	13.82	13.81	1,713
	No	0.094	1.67	(.095)	13.72	13.81	1,713
Value of crop production per capita	Yes	0.001	0.02	(.987)	12.32	12.32	1,713
	No	0.103	1.80	(.073)	12.22	12.32	1,713
Rice yields	Yes	0.110	2.12	(.034)	7.56	7.67	1,582
	No	0.170	3.22	(.001)	7.50	7.67	1,582
Quantity of rice per capita	Yes	0.126	2.38	(.017)	5.92	6.05	1,582
	No	0.188	3.49	(.000)	5.86	6.05	1,582

Table I.B.b: Crop input and management outcomes

Variable	Irrigation dummy	ATET	*t* stat	*p* value	Control mean	Treated mean	*N*
Extension from any source	Yes	0.103	2.92	(.004)	0.262	0.365	1,713
	No	0.107	3.15	(.002)	0.258	0.365	1,713
Whether attended any trainings	Yes	0.103	2.92	(.004)	0.262	0.365	1,713
	No	0.107	3.15	(.002)	0.258	0.365	1,713
Mechanical soil and water conservation	Yes	0.057	2.18	(.029)	0.220	0.277	1,713
	No	0.063	2.49	(.013)	0.214	0.277	1,713
Biological soil and water conservation	Yes	-0.018	-1.01	(.314)	0.098	0.080	1,713
	No	-0.013	-0.78	(.434)	0.093	0.080	1,713
Number of cattle held	Yes	0.717	1.17	(.241)	4.23	4.95	1,713
	No	0.151	0.24	(.808)	4.80	4.95	1,713
Number of oxen held	Yes	0.459	2.07	(.038)	1.74	2.20	1,713
	No	0.421	1.94	(.053)	1.78	2.20	1,713
Proportion of plots with inorganic fertiliser	Yes	0.009	1.48	(.139)	0.010	0.019	1,713
	No	0.010	1.68	(.093)	0.009	0.019	1,713
Used pesticide on any plot	Yes	0.079	3.38	(.001)	0.169	0.248	1,713
	No	0.086	3.88	(.000)	0.162	0.248	1,713
Cropped more than one season	Yes	0.124	4.16	(.000)	0.484	0.608	1,713
	No	0.185	6.59	(.000)	0.423	0.607	1,713

Table I.B.c: Household welfare outcomes

Variable	Irrigation dummy	ATET	*t* stat	*p* value	Control mean	Treated mean	*N*
Food worries, past 7 days	Yes	-0.103	-3.26	(.001)	0.551	0.447	1,713
	No	-0.101	-3.24	(.001)	0.549	0.448	1,713
Lacked food, past year	Yes	-0.089	-3.64	(.000)	0.837	0.748	1,713
	No	-0.072	-3.01	(.003)	0.819	0.748	1,713
N of consumer durables	Yes	1.209	5.29	(.000)	4.82	6.03	1,713
	No	1.014	4.50	(.000)	5.01	6.03	1,713
Any household member ill	Yes	0.003	0.12	(.902)	0.287	0.293	1,713
	No	0.003	0.10	(.918)	0.290	0.293	1,713
Educational expenditures	Yes	0.287	1.04	(.296)	2.81	3.10	1,713
	No	0.205	0.76	(.448)	2.89	3.10	1,713

Table I.B.d: Irrigation performance outcomes

Variable	ATET	*t* stat	*p* value	Control mean	Treated mean	*N*
Received water on time	0.181	3.32	(.001)	0.553	0.733	983
Received full allocation	0.163	3.35	(.001)	0.496	0.659	983
Water quality good	0.168	3.82	(.000)	0.229	0.397	983

Appendix I.C: Results for treated and irrigated households versus results for control households

Table I.C.a: Crop production outcomes

Variable	Irrigation dummy	ATET	*t* stat	*p* value	Control mean	Treated mean	*N*
ln(production value per hectare, Winsorised)	Yes	0.068	1.07	(.285)	13.82	13.88	1,356
	No	0.181	2.79	(.005)	13.70	13.88	1,356
ln(production value per capita, Winsorised)	Yes	0.078	1.21	(.228)	12.30	12.38	1,356
	No	0.194	2.96	(.003)	12.18	12.38	1,356
ln(production quantity per hectare of rice, Winsorised)	Yes	0.192	3.07	(.002)	7.54	7.74	1,318
	No	0.250	4.01	(.000)	7.48	7.74	1,318
ln(production quantity per capita of rice, Winsorised)	Yes	0.216	3.36	(.001)	5.86	6.08	1,318
	No	0.276	4.31	(.000)	5.80	6.08	1,318

Table I.C.b: Crop input and management outcomes

Variable	Irrigation dummy	ATET	*t* stat	*p* value	Control mean	Treated mean	*N*
Extension from any source	Yes	0.068	1.60	(.109)	0.313	0.381	1,356
	No	0.094	2.36	(.018)	0.288	0.382	1,356
Whether attended any trainings	Yes	0.068	1.60	(.109)	0.313	0.381	1,356
	No	0.094	2.36	(.018)	0.288	0.382	1,356
Mechanical soil and water conservation	Yes	0.038	1.20	(.232)	0.257	0.294	1,356
	No	0.063	2.12	(.034)	0.232	0.294	1,356
Biological soil and water conservation	Yes	-0.014	-0.70	(.482)	0.101	0.087	1,356
	No	-0.005	-0.29	(.776)	0.092	0.087	1,356
Number of cattle held	Yes	0.813	1.15	(.249)	4.11	4.92	1,356
	No	0.076	0.11	(.914)	4.84	4.92	1,356
Number of oxen held	Yes	0.544	2.21	(.027)	1.73	2.27	1,356
	No	0.496	1.94	(.052)	1.77	2.27	1,356
Proportion of plots with inorganic fertiliser	Yes	-0.005	-0.52	(.602)	0.026	0.021	1,356
	No	-0.002	-0.21	(.836)	0.023	0.021	1,356
Used pesticide on any plot	Yes	0.128	5.68	(.000)	0.151	0.278	1,356
	No	0.132	5.95	(.000)	0.146	0.278	1,356
Cropped more than one season	Yes	0.154	4.04	(.000)	0.477	0.631	1,356
	No	0.218	6.35	(.000)	0.412	0.630	1,356

Table I.C.c: Household welfare outcomes

Variable	Irrigation dummy	ATET	t stat	p value	Control mean	Treated mean	N
Food worries, past 7 days	Yes	-0.107	-2.90	(.004)	0.570	0.463	1,356
	No	-0.090	-2.45	(.014)	0.553	0.463	1,356
Lacked food, past year	Yes	-0.023	-1.00	(.319)	0.796	0.773	1,356
	No	-0.018	-0.79	(.427)	0.791	0.773	1,356
N of consumer durables	Yes	0.981	3.13	(.002)	5.18	6.16	1,356
	No	0.764	2.54	(.011)	5.40	6.16	1,356
Any household member ill	Yes	-0.014	-0.38	(.706)	0.308	0.295	1,356
	No	-0.006	-0.17	(.863)	0.300	0.294	1,356
Educational expenditures	Yes	0.555	1.60	(.110)	2.59	3.14	1,356
	No	0.485	1.43	(.152)	2.66	3.14	1,356

Table I.C.d: Irrigation performance outcomes

Variable	ATET	t stat	p value	Control Mean	Treated Mean	N
Received water on time	0.150	2.49	(.013)	0.583	0.733	893
Received full allocation	-0.054	-1.87	(.062)	0.712	0.659	893
Water quality good	0.268	6.14	(.000)	0.129	0.398	893

Appendix I.D: Balance tests for treated and irrigated households versus those for control households

Figure I.D.a: Balance summary
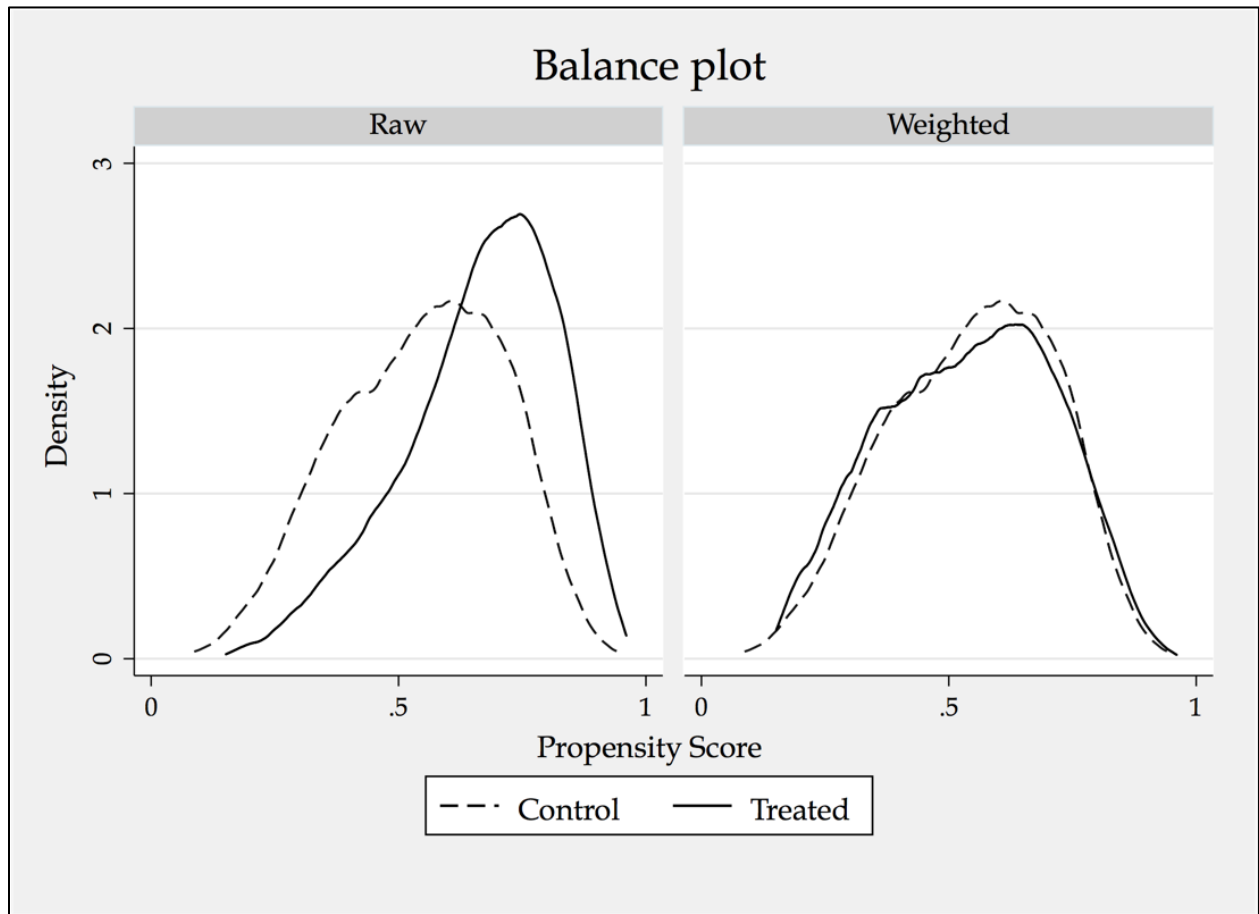
Table I.D.a: Test of balance

Chi-square	22.21
p value	.507

Table I.D.b: Balance summary

		Observations	Raw	Weighted
		N	1,356	1,356
		Treated	516	673.3
		Control	840	682.7

Variable	Standardised differences		Variance ratios	
	Raw	Weighted	Raw	Weighted
NDVI (August 2011)	0.105	0.004	1.71	1.42
ln(hectares cultivated)	0.054	0.008	0.88	0.84
Plot manager is female	0.023	-0.051	1.04	0.92
Plot manager has any education	0.418	-0.011	1.12	1.00
Plot is held on a permanent or semi-permanent basis	-0.055	0.023	1.08	0.92
Plot primary soil type is sand	-0.031	-0.012	0.94	1.01
Plot primary soil type is loam	-0.164	-0.033	0.87	0.97
Plot slope is flat	-0.099	0.016	1.10	0.97
Plot slope is slight	0.094	-0.020	1.11	0.95
Plot slope is moderate	0.033	-0.003	1.11	0.97
Plot is marsh/wetland	0.217	-0.010	0.99	1.02
Organic Fertiliser was used on any plot	0.089	-0.047	1.29	0.89
Household adult equivalents	0.374	0.000	1.32	1.02
Dependency ratio (age < 15 | > 60):(15 ≤ age ≤ 60)	-0.015	0.007	1.03	1.10
ln(household head age)	0.324	0.000	0.74	0.92
Household had a member with wage employment	0.235	-0.049	1.00	1.01
Household had a member with part-time employment	0.269	-0.055	0.97	1.02
Household head can read and write French	0.312	-0.019	1.96	0.97
Household head can read and write Malagasy	0.400	-0.015	1.29	1.00
Separate rooms of dwelling	0.203	-0.043	0.46	0.16
Household dwelling has improved toilet	0.225	0.012	1.86	1.03
N of children of head or spouse > 15 living elsewhere	0.152	0.014	1.29	1.01

Note: excluding households where August 2011 NDVI ≥ 0.46 and treated non-irrigating households

Appendix I.E: Production results in primary rainy season

Table I.E.a: Production results in primary rainy season

Variable	Irrigation dummy	ATET	*t* stat	*p* value	Control mean	Treated mean	*N*
Value of crop production per hectare	Yes	-0.126	-2.15	.032	13.55	13.43	1,402
	No	-0.089	-1.49	.136	13.51	13.43	1,402
Value of crop production per capita	Yes	-0.114	-1.92	.055	12.06	11.94	1,402
	No	-0.075	-1.24	.216	12.02	11.94	1,402
Rice yields	Yes	-0.016	-0.31	.755	7.22	7.21	1,397
	No	0.003	0.05	.959	7.20	7.21	1,397
Quantity of rice per capita	Yes	-0.003	-0.07	.947	5.63	5.63	1,397
	No	0.018	0.36	.721	5.61	5.63	1,397

Appendix J: Cost Data for Programme Implementation

The total cost of AD2M-2 over a 7-year period, including physical and financial contingencies, for the period from 2016 to 2022 is estimated at $56.7 million, or approximately 136 billion Malagasy Ariary. The share of foreign currency is 7%, amounting to $3.7 million. Taxes will cover about 13% of the project's total costs, which corresponds to about $7.7 million. Local currency costs are estimated to be about $45.3 million, or about 109 billion Malagasy Ariary (80% of the total).

The cost of component 1 (support for local governance and land tenure security) is approximately $40.8 million, or 72% of the project's total cost. Component 2 (support for the sustainable development of the productive base) has a cost of $7 million, or 12%, and the cost of component 3 (project management and monitoring and evaluation) is $8.9 million, or 16% of the project's costs.

IFAD will contribute $34.4 million (60.7% of total funding) to the project in the form of a loan for the period from 2016 to 2022. The project is also co-financed through a $6 million grant from the support fund for smallholder farmers for climate change (Adaptation for Smallholder Agriculture Programme), which makes up about 10.6% of the project's total funding. Additionally, a loan from the OPEC Fund for International Development of $7.5 million (13.2% of the total funding) is intended to finance the development and economic development of the Beboka Irrigated Perimeter in the district of Antsalova.

The government of Madagascar's contribution to the project is estimated at $7.7 million (13.5% of the cost of the project). In addition to the financing of value-added tax and customs duties on imported products for the purposes of the project, the government of Madagascar will contribute to the financing of certain operating costs of the project monitoring unit. The contribution of the beneficiaries takes the form of in-kind and financial contributions to investments in vulnerable micro-projects, hydro-agricultural development works and agricultural intensification and diversification work. This contribution is estimated at $1.2 million, or 2% of the cost of the AD2M-2 project.

Given that the increased crop revenue per household is $45 and that the total number of programme beneficiaries is 342,000 we can estimate the irrigation programme's total benefit to be $97,050,625.92, assuming that households incur costs of $10 and that irrigation lasts for 10 years. The table below illustrates two benefits scenarios assuming different levels of crop revenue, household costs and duration of irrigation system.

Table J.1: Cost–benefit analysis

Number of beneficiaries: 342,000		Scenario 1	Scenario 2
		342,000 × ($45 − $5)	**342,000 × ($45 − $10)**
Assumed real discount rate	**Years irrigation system lasts**	$13,680,000	$11,970,000
5%	10	$110,915,001.50	$97,050,625.92
	20	$179,007,187.90	$156,631,288.30

Under the first scenario, we assume household costs are $5. In this setting, total programme benefits are of $110,915,001.50 if the irrigation system lasts 10 years and $179,007,187.90 if it lasts 20 years. In the second scenario, we make the more realistic assumption that household costs are $10. In this case, programme benefits are $156,631,288.30 if the irrigation system lasts 20 years.

Appendix K: .do Files

The folder export_draft contains the file structure, raw data and STATA .do files required to execute the impact evaluation analysis for the AD2M Madagascar project. To recreate the analysis, follow these steps:

1. Put the folder export_draft on your computer, making note of the file path.

2. Open the file export_draft/do/ad2m_master.do in STATA and update the change directory line to reflect the file path for the export_draft folder.

3. Ensure that the list of user-written commands in ad2m_master.do is installed in STATA.

4. Execute the do-file ad2m_master.do to run all of the other .do files in the appropriate sequence to generate the analysis data sets.

5. Open the file export_draft/do/output_v11.0.do in STATA and update the change directory line to reflect the file path for the export_draft folder.

6. The file output_v11.0.do is the primary file used to generate the outputs for the current analysis. The .do file will run through data set preparation, but the analyses and table making are set up to be run manually by using putexcel. This choice was made simply because putexcel causes errors when run as part of a larger set of code.

7. Open the file export_draft/do/season_v11.0.do in STATA and update the change directory line to reflect the file path for the export_draft folder.

8. The file season_v11.do is structured much the same as output_v11.0.do, with the file running through data set creation and analysis being conducted after an exit line. Table-making lines again are commented out because of the need to run those separately to avoid errors.

The analysis .do files export files in Excel and Portable Network Graphics format for tables and graphs, respectively. Formatting is done in Excel to finalise the output.

The .do files are available here:
https://www.dropbox.com/s/442i60mgekgqpwj/export_draft.zip?dl=0

NDVI ANALYSIS RESULT FOR IRRIGATION PROJECT IMPACT ASSESIMENT OF MENABE REGION, MADAGASCAR

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Introduction

This work is aimed at supporting the impact of irrigation infrastructure evaluation study in the Menabe region of Madagascar by analyzing time series NDVI data using Landsat images. IFAD has developed irrigation infrastructure in Menabe region of Madagascar in 2008. The impact of the irrigation infrastructure is under study by a study team. Time series NDVI to see the greenness over time by comparing controls (non-irrigated areas) and irrigated area is recommended by IFAD. Hence the objective of this work is to provide time sires Landsat NDVI data for the period of 2008 -2016.

Methods and materials

Background of the study area

The study area is located in Menabe region of Madagascar (figure 1).
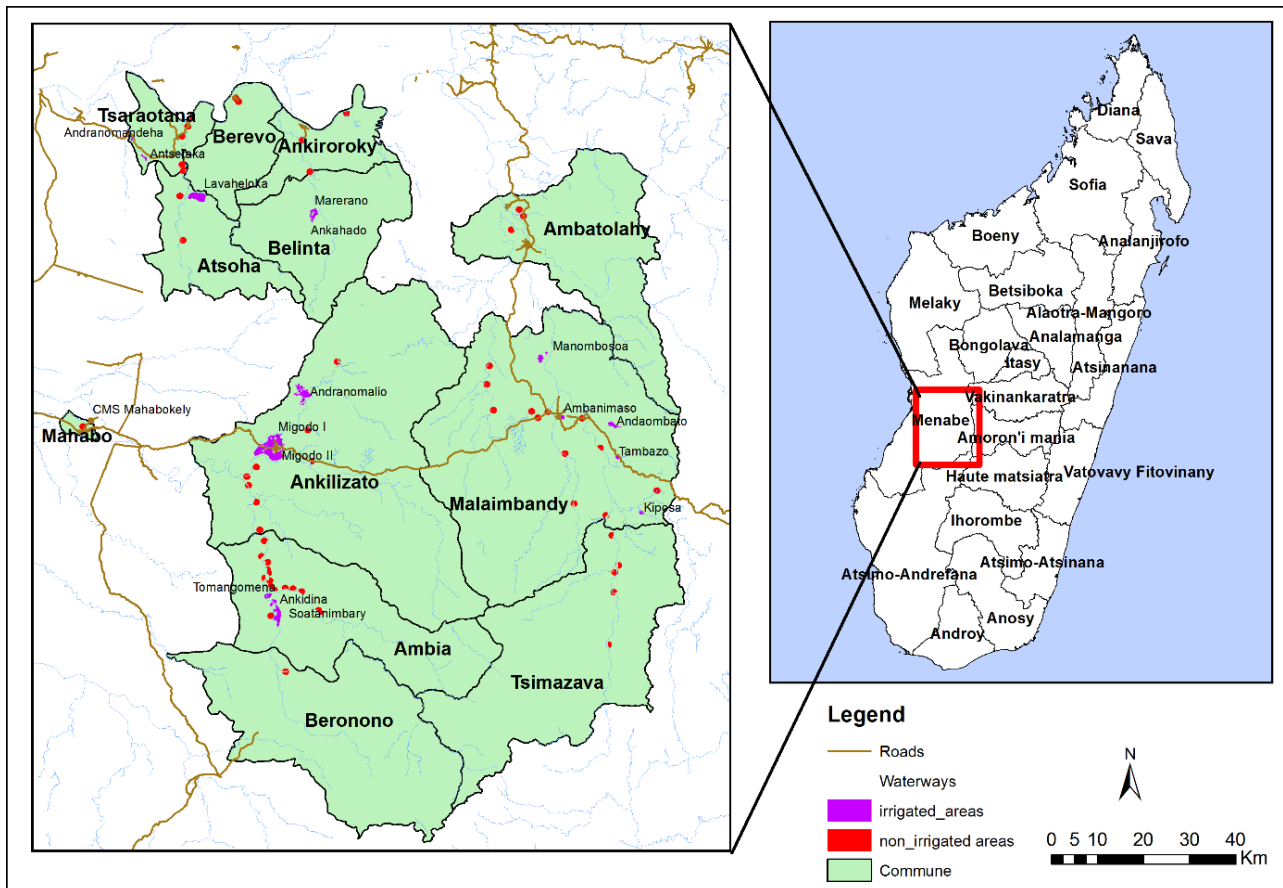
Figure 1: Location of the study area

Approach

Data

Surface reflectance images of Landsat 5, Landsat 7 and Landsat 8 were obtained from United States Geological Survey (USGS) for free by ordering through Global Visualization web page (http://glovis.usgs.gov/). All of the images were pre-processed by USGS. The pre-processing of the images includes georeferencing of the images to WGS1984 UTM zone 38 south, radiometric correction, atmospheric correction and conversion of all the images to surface reflectance. Other detail description of the satellite images is given in Table 1.

Initially the plan was to generate NDVI for two seasons using April images for the first season and September images for the second season for the period of 2008-2016. But images were not available for the month of September in the specified period and if available it is highly covered by cloud. Similarly, April images were also available only for four years. Because of this reason, for the first season we used May, March and April images based on their availability. And for the second season we used August images which is available only for the year 2011 and for period of 2013-2016.

Table 1 Description of Satellite images used for the study

No	Path/Row	Spacecraft id	Sensor id	Pixel size	Image ID	Date acquired
1	160/74	Landsat 5	Tm	30 meter	LT51600742008106JSA00	15-APR-08
2	160/74	Landsat 5	Tm	30 meter	LT51600742008090JSA01	30-MAR-08
3	160/74	Landsat 5	Tm	30 meter	LT51600742009140JSA01	20-MAY-09
4	160/74	Landsat 5	Tm	30 meter	LT51600742010127JSA00	07-MAY-10
5	160/74	Landsat 5	Tm	30 meter	LT51600742011130JSA00	10-MAY-11
6	160/74	Landsat 8	OLI_TIRS	30 meter	LC81600742013119LGN01	29-APR-13
7	160/74	Landsat 8	OLI_TIRS	30 meter	LC81600742014106LGN00	16-APR-14
8	160/74	Landsat 8	OLI_TIRS	30 meter	LC81600742015077LGN00	18-MAR-15
9	160/74	Landsat 8	OLI_TIRS	30 meter	LC81600742016096LGN00	05-APR-16
10	160/74	Landsat 7	ETM+	30 meter	LE71600742011234PFS00	22-AUG-11
11	160/74	Landsat 8	OLI_TIRS	30 meter	LC81600742013231LGN00	19-AUG-13
12	160/74	Landsat 8	OLI_TIRS	30 meter	LC81600742014234LGN00	22-AUG-14
13	160/74	Landsat 8	OLI_TIRS	30 meter	LC81600742015237LGN00	25-AUG-15
14	160/74	Landsat 8	OLI_TIRS	30 meter	LC81600742016240LGN00	27-AUG-16

Image processing

In this study 14 Landsat satellite images were utilized of which 5 were from Landsat 5, 8 were from Landsat 8 and one image from Landsat 7. All the pre-processing of the images including

georefrencing, atmospheric correction, geometric correction and conversion image to surface reflectance has been done by the data supplier (USGS). But Landsat 7 image gap-filling was not done by USGS.

The scan- line corrector(SLC) of Landsat 7 which was designed to correct the under sampling of the primary scan mirror, failed on May 31, 2003. Because of this the data from Landsat 7 after May 31,2013 has scan gap. An estimate of 22% of the data is lost on every image due to scan gap. Images from Landsat 7 are still available and utilized by filling the gaps using developed algorithms. Developed algorithms to fill Landsat 7 image gaps can be grouped in to three: multi source, single source and hybrid. The multi-source approach involves filling the gapped image using other image and the single source algorithm uses non-gapped area to fill gapped area within the image itself. The hybrid algorithm uses the combination of both the multi-source and single source algorithms (Manali and Amit 2012).

In this study, we used the hybrid method (the local histogram matching and single file gap fill). Frist the local histogram method was applied. Hence, Landsat 7 image of 22 August 2011 was filled by Landsat 7 image captured on 07 September 2011. Then the single file gap fill method is applied on the image gap filled through the histogram matching method. After applying the two methods the image become fully gap filled (See fig 2).

Part of Landsat image with gap (22 August 2011)   Part of Landsat 7 image after gap-filling (22 August 2011)
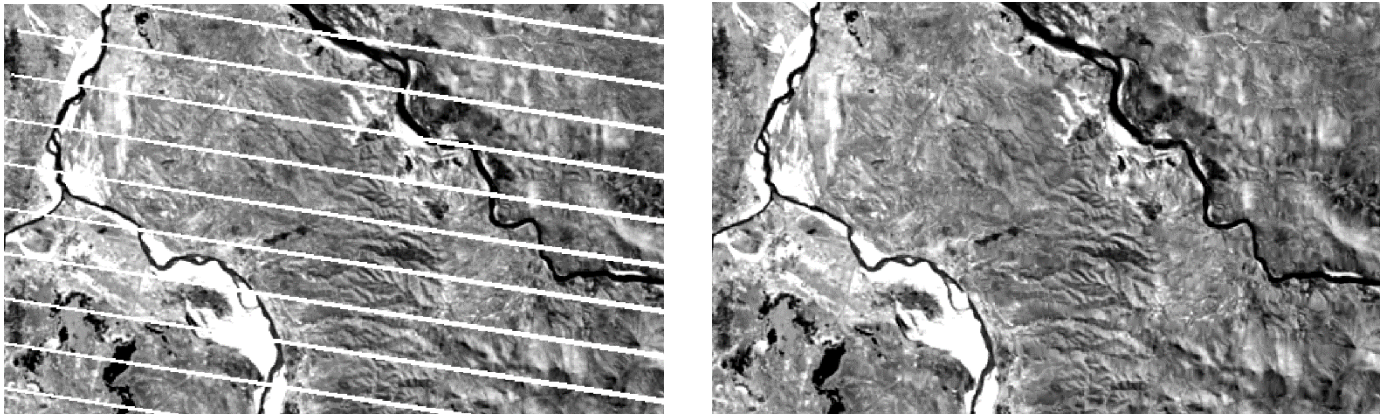
Figure 2: Gap filled image of Landsat 7 ETM+ of year 2011

Selection of non-irrigated areas(controls)

Before generating the NDVI statistics 60 non-irrigated (controls) areas were selected based on their similarity with the irrigated area, proximity to river, suitability for irrigation and presence of settlement. To select these areas based on the specified criteria, 144 village locations were downloaded from open street map website (https://www.openstreetmap.org). Then, the village locations, rivers and irrigated areas were displayed on NDVI map of year2008 in ArcMap for visual analysis. Through visual analysis, based on the specified criteria, 60 areas out of 144 areas are found to be suitable for control. Following the selection of location of controls, a 508-meter buffer around each point were generated based on the average area of the irrigated area which is about 160 hectares (see Figure 3). That means the area of each of the non-irrigated places is 160 hectares unless part of it is removed where overlapped with waterbody.
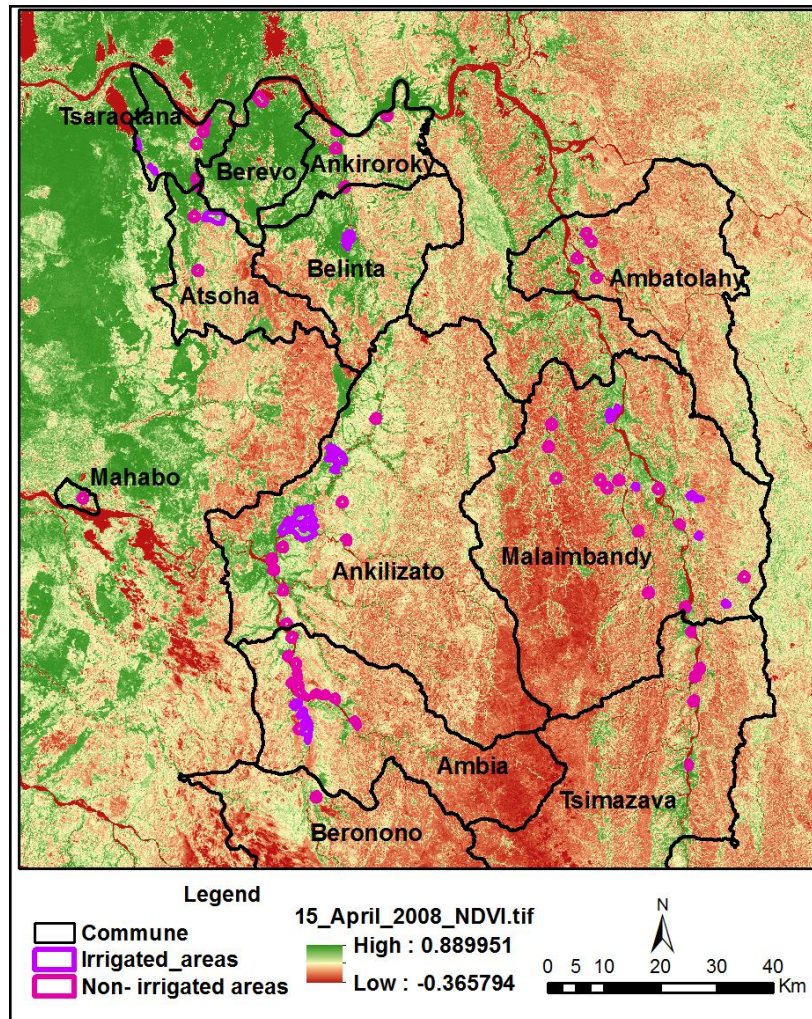
Fig 3 Location of Irrigated and non-irrigated areas in the project area

There are 17 irrigated areas in the study region which has been implemented since 2008 by IFAD. The statistical summary of time series NDVI was generated for each of the 60 non-irrigated and

17 irrigated areas. Mean NDVI was used to compare irrigated area with that of non-irrigated area over time (2008-2016).

NDVI calculation and analysis

The Normalized Difference Vegetation Index (NDVI is generated using the following equation in ENVI software version 5.1. NDVI is the ratio of the difference between the near-infrared band (NIR) and the red band (RED) and the sum of these two bands (Rouse Jr et al. 1974).

$$NDVI = \frac{NIR - RED}{NIR + RED}$$

Where:

NDVI: Normalized Difference Vegetation Index

NIR: Near infrared band

RED: Red band

Then the NDVI images were clipped to the study area boundary and exported to ArcGIS 10.4 for further analysis and mapping.

Statistical summary (min, maximum, range, mean, standard deviation) of the NDVI value has been generated for each of the irrigated and non-irrigated areas in ArcGIS 10.4 software. For the first season (March, April and May) the statistical summary was generated for nine years (2008-2016). And for the second season(August) the summary was generated for the period of 2011-2016. The statistical summary then exported to excel sheet for documentation and to create NDVI charts.

The mean NDVI charts were created to compare the irrigated area with the non-irrigated areas over time. Also mean NDVI chart was plotted for each of the irrigated area to see what has been happing to each area over time.

Result and discussion

The result of the time series NDVI in the study area is presented using graphs (Figure 4, 5,6 and 7) and maps (Figure 8 and 9). Generally, the average NDVI for each of the irrigated areas has been increased for both seasons indicating that the irrigation project has positive impact in terms of land productivity.

When we compare irrigated areas with no-irrigated areas using the average NDVI, in the first season the average NDVI has been increased for both irrigated and non-irrigated areas but higher for the irrigated areas starting from 2010 to 2013 (figure 6). From 2013 to 2015 it was constant for the irrigated area and become increased in 2016. For the non-irrigated area, the average NDVI slightly decreased in 2014 compared to 2013 but become higher than the irrigated areas in 2015 and become less than the irrigated area in 2016 but increased than before. The minimum NDVI has been recorded in 2009 for both irrigated and non- irrigated areas. This could be related to drought. And the average NDVI for non-irrigated area was higher than that of the irrigated area in 2015.

When we compare the average time series NDVI of the irrigated and non-irrigated areas in the second season (2011 and 2013-2016), in 2011 the average NDVI was low for both irrigated and non-irrigated areas but slightly higher for non-irrigated areas. From 2013-2016 the average NDVI value has been increased for the irrigated area but for the no-irrigated areas the average NDVI was increasing from 2013 to 2015 but by far less than that of the irrigated areas and decreased in 2016 compared to the 2015 (Figure 7)

The time series NDVI maps (Figure 8 and 9) indicates vegetated areas(+value) and non-vegetated areas(-value).

Generally, the mean NDVI has increased over the considered period (2008-2016) for both the irrigated and non-irrigated areas but higher for the irrigated areas. The reason why the mean NDVI is higher for the irrigated areas over time could be related to the treatment applied by the project.
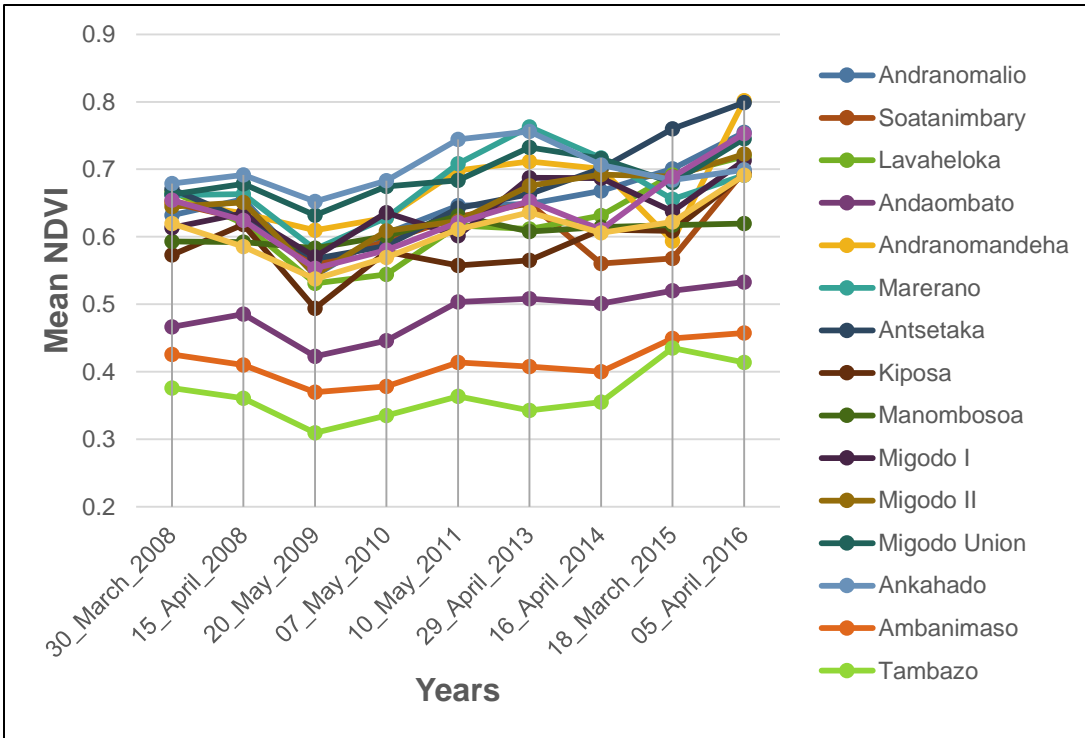
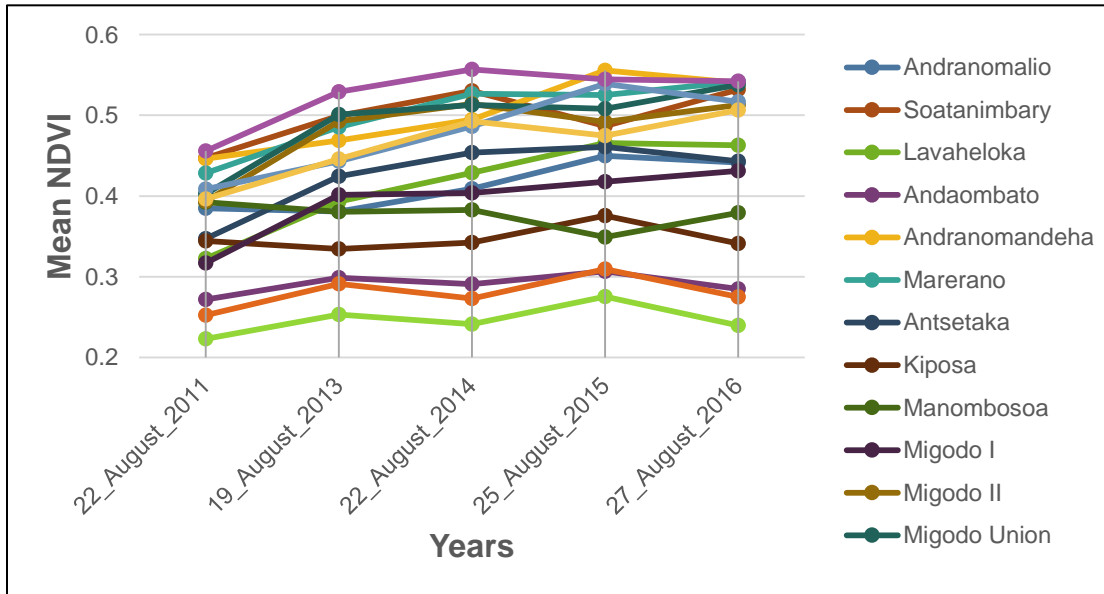Figure 4: Time series mean NDVI for Irrigated areas for the first season (2008-2016)

Figure 5: Time series mean

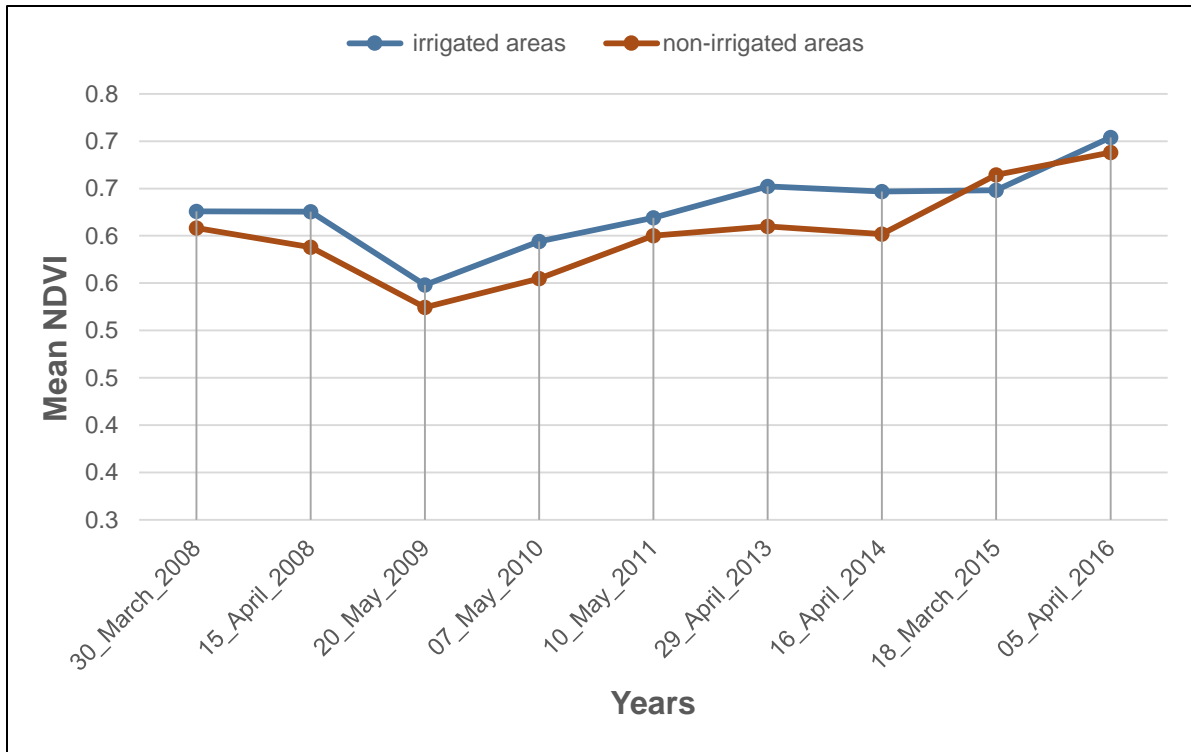NDVI for Irrigated areas for the second season (2011-2016)

Figure 6: Time series mean NDVI for Irrigated and Non-irrigated areas for the first season (2008-2016)
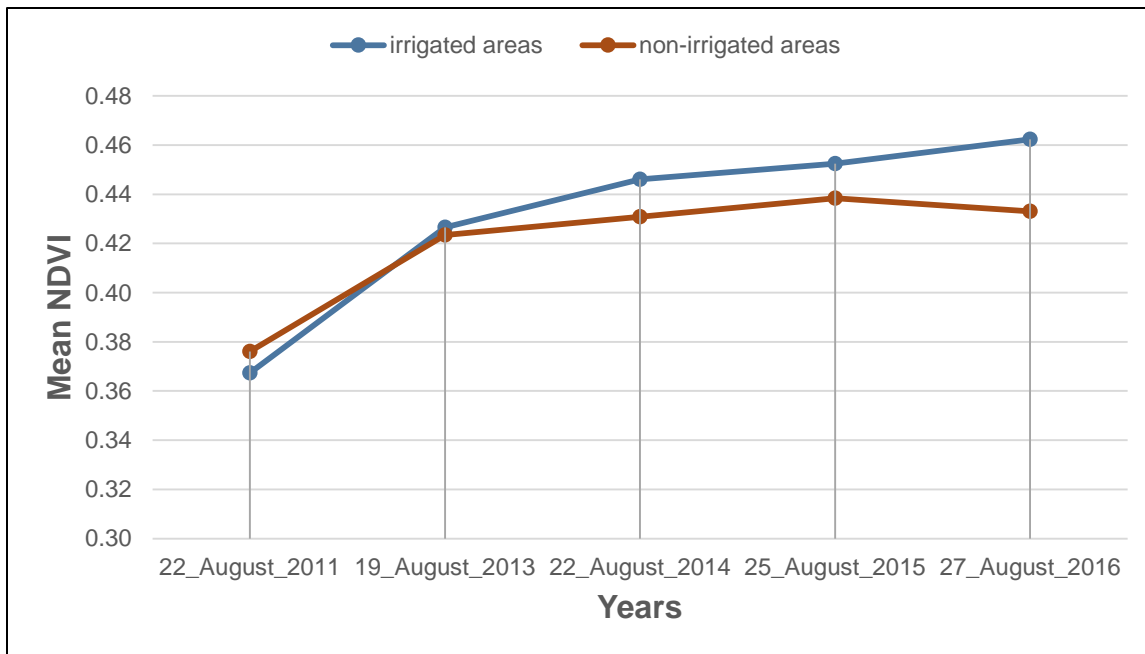

Figure 7: Time series mean NDVI for irrigated and non-irrigated areas for the second season (2011-2016)
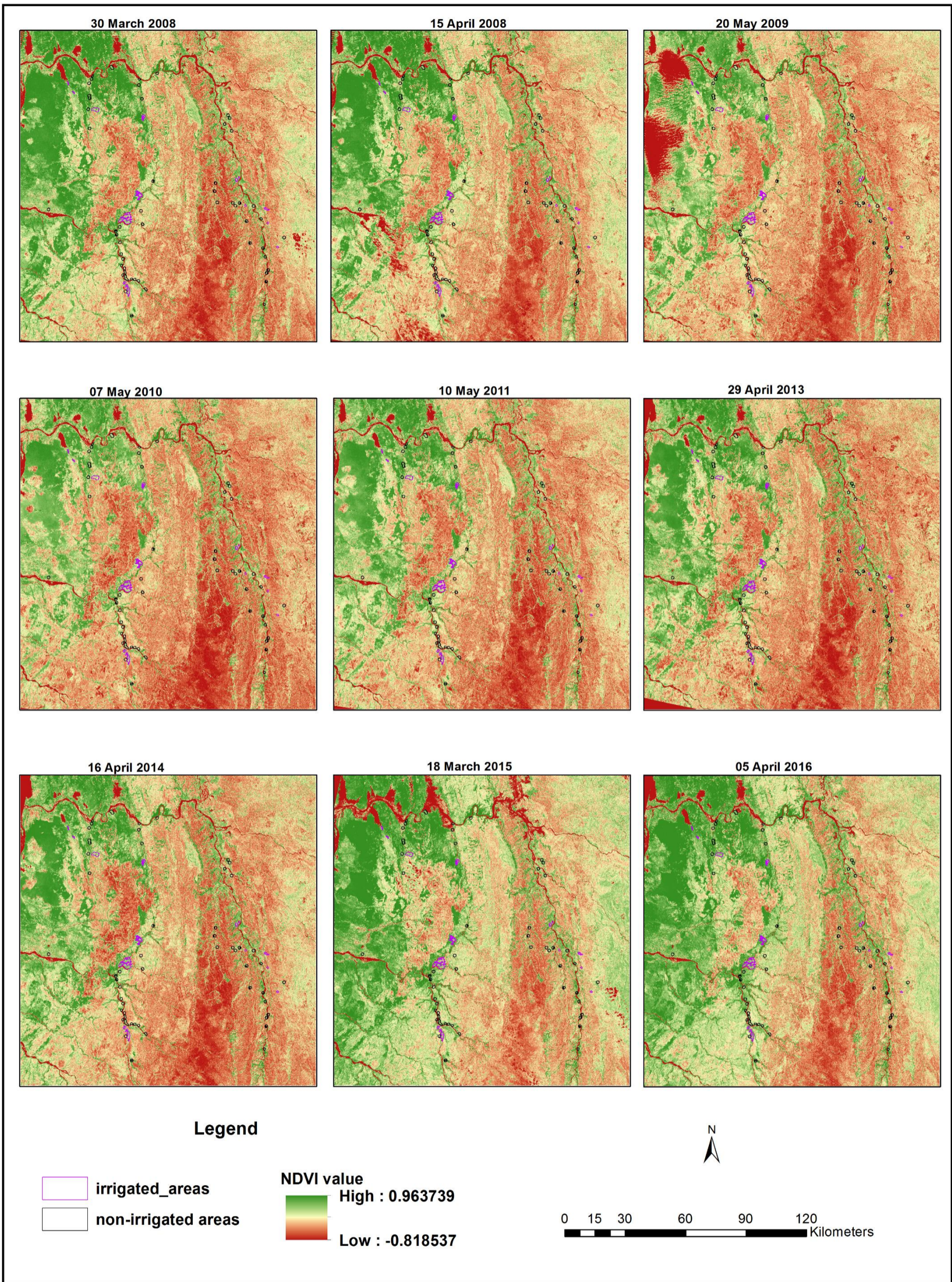
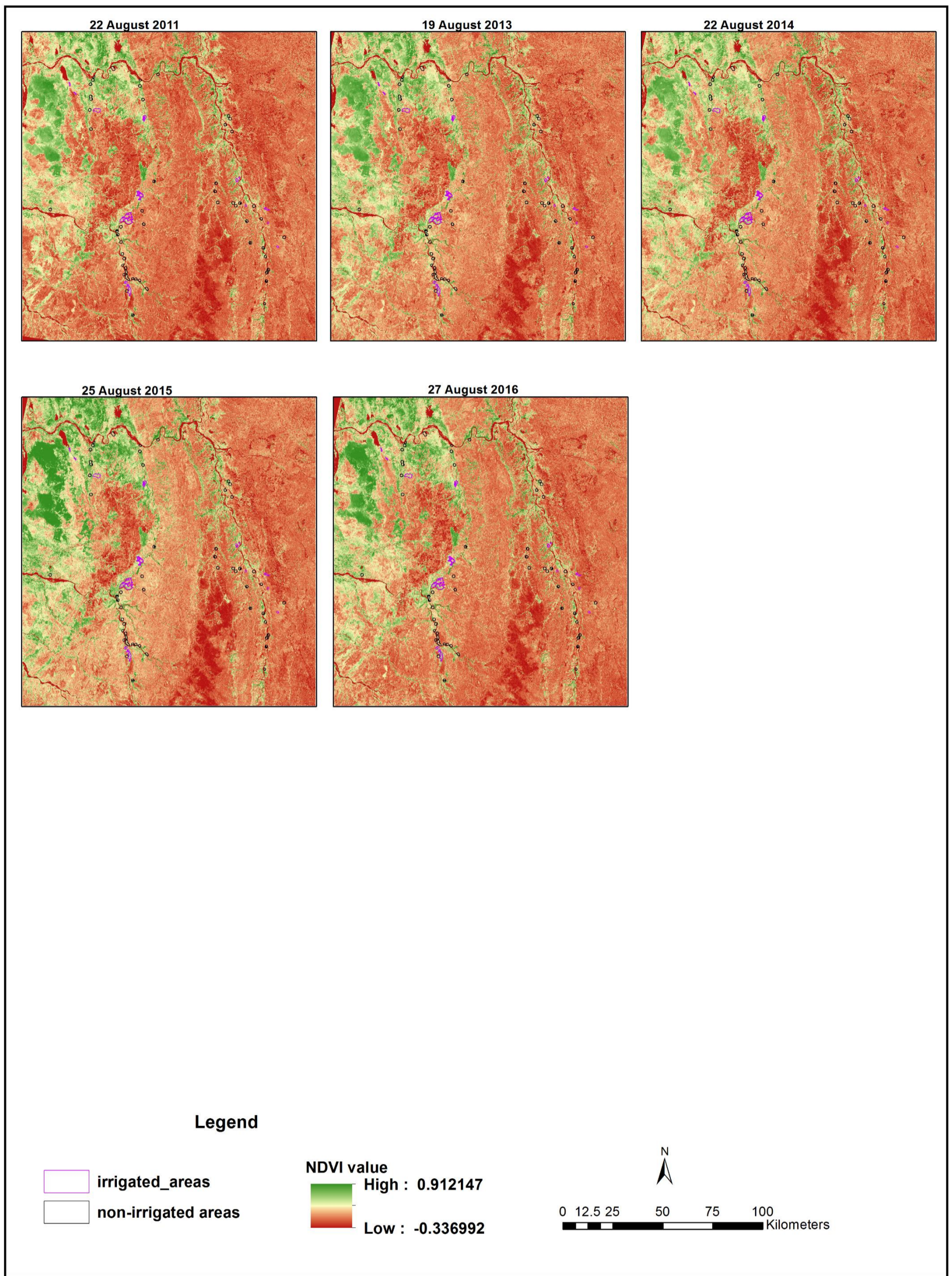Figure 8: Time series NDVI map for the first season (2008-2016)

Legend

irrigated_areas

non-irrigated areas

NDVI value
High : 0.912147
Low : -0.336992

Figure 9:Time series NDVI map for the second season (2011-2016)

References

Manali Desai and Amit Ganatra, 2012 "Survey on Gap Filling in Satellite Images and Inpainting Algorithm", International Journal of Computer Theory and Engineering, Vol. 4, No. 3, June.

Rouse Jr, J., et al. 1974. Monitoring vegetation systems in the Great Plains with ERTS. NASA special publication, 351, 309

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