Report
Department for International Development

NORTHERN GHANA MILLENNIUM VILLAGES IMPACT EVALUATION: PRELIMINARY REPORT ON THE SECOND ROUND OF DATA

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Acronyms and Abbreviations

CEW	Community Education Workers
CHN	Community Health Nurses
CHW	Community Health Worker
CPI	Consumer Price Index
CV	Control Village
DFID	UK Department for International Development
DHS	Demographic and Health Surveys
DD	Difference-in-Difference
EI	Earth Institute
FBO	Farmer-Based Organisation
GEHIP	Ghana Essential Health Intervention Programme
GLSS	Ghana Living Standards Survey
GSS	Ghana Statistical Service
HMIS	Health Management Information System
ICT	Information and Communications Technology
IDD	Initial Design Document
ISSER	Institute of Statistical, Social and Economic Research
M&E	Monitoring & Evaluation
MDGs	Millennium Development Goals
MV	Millennium Village
MVP	Millennium Villages Project
NGO	Non-Governmental Organisation
NHIS	National Health Insurance Scheme
NORPREP	Northern Region Poverty Reduction Programme
PRG	Peer Review Group
PTA	Parent-Teacher Association
PVA	Poverty and Vulnerability Assessment
RCA	Reality Check Approach
SADA	Savannah Accelerated Development Authority
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation and Hygiene
WFP	World Food Programme

Report

Northern Ghana Millennium Villages Impact Evaluation: Preliminary Report on the Second Round of Data

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Executive Summary

In 2011, the UK Department for International Development (DFID) commissioned an impact evaluation of the Millennium Village Project (MVP) in Northern Ghana. The original design foresaw three rounds of data collection: baseline (2012), mid-line (2014) and end-line (2016). In response to discussions with the Peer Review Group (PRG), two smaller household survey rounds were later added to the design for the 'in-between' years (2013, 2015). These additional rounds focus on a subset of modules such as demographics, consumption and expenditure – and allow the evaluation team to achieve greater statistical power for these variables in order to detect relatively small effects of the intervention (Brown et al 2013). The baseline data was collected in 2012, and includes an analysis of the full dataset alongside qualitative assessments (Masset et al 2014).

This report summarises the second year of data collection (undertaken in 2013). The scope of this report is more limited than the Baseline Report given the data collected in the second year. The second survey round collects a reduced set of information at all levels (households, individuals and villages) and there is no qualitative follow-up. The findings presented here focus only on those variables for which an observable change can be reasonably expected given the time frame between the baseline and the second round of data collection used in this report.

The baseline survey targeted a sample of 755 households in the Millennium Villages (MV) and 1,496 households in the Control Villages (CV), with the eventual sample comprising of 711 MV households and 1,461 CV households. The follow-up survey shows low attrition rates from year one to year two, with the overall attrition rate between the two rounds being 0.51%. Additionally, across a number of different assessments, the data quality appears to have improved slightly in the follow-up survey.

In terms of findings, household participation in the MVP programme is generally high. Almost all households report having been given a bed net during the previous year, with about 50% of households reporting being visited by a community health worker (CHW), and 70% report having visited a health centre of any type during the 12 months prior to the interviews. Participation rates are generally higher in MV areas than in CV areas, particularly in relation to the distribution of mosquito nets, CHW visits, and the activities performed by CHWs during household visits, such as nutrition counselling and use of mosquito nets. CV areas appear to attend health clinics and be receiving vitamin A, food supplements and medications with more frequency than MV areas (in the case of vitamin A and food supplements the difference is statistically significant). A large proportion of households report being members of a community group, such as a women's group or a Parent-Teacher Association (PTA), with the differences to the CV areas being particularly large for farmers' organisations (cooperatives and other Farmers' Based Organisations [FBOs]). And lastly, a larger number of school-age children received free school meals and other school supplies in MV areas, though the ratios of children offered school meals and other supplies are rather low in both areas.

In terms of targeting, participation in activities that are supported by the programme by different sections of the population in both MV and CV areas is fairly evenly distributed. One exception is the lowest quintile of the poverty expenditure distribution, which appears to be under targeted in MV areas and over targeted in CV areas (with the exception of CHW visits). This may suggest that the MVP is facing some difficulties in reaching out to the poorest sectors of the population.

In terms of the impact of the project, no difference in poverty rates emerged between MV and CV areas over the first two survey rounds. The estimates do, however, point to a larger increase in poverty in the MV areas, but the effect size is very small and is not statistically significant. Over the two survey rounds, per capita income has increased considerably and the variance of income also increased.

Nevertheless, the impacts of the project on per capita income between the MV and CV areas are negligible at this stage and not statistically significant.

The data show a positive impact of the intervention on attendance rates in primary school. Indeed, there is a sizable and statistically significant difference in attendance rates at the baseline between the MV and CV areas and no difference at the follow-up. The changes show that attendance increased over the period by some 4% points in MV areas, while it decreased by the same percentage in the CV areas – the latter being harder to explain. These are only tentative findings and it seems that part of this effect could be driven by seasonal factors related to the different timing of data collection in MV and CV areas.

Overall, household migration outside the study area is limited, although there is a sizable migration of *individuals* in and out of the study area. The baseline data showed many more out-migrants than in-migrants by a factor of at least four, with about 5% of households with one in-migrant member and about 25% of households with an out-migrant member. The main reason for in-migration is marriage, while the main reasons for out-migration are schooling and work. This is a reflection of the level of deprivation of the area. There are no differences in the proportions of in-migrants between MV and CV areas and there is a larger proportion of out-migrants from MV areas compared to CV areas. It therefore seems that the MV project has so far not exerted any significant attraction from neighbouring communities and that the changes in the demographic composition of the population across treatment groups are minimal, and not the result of the project intervention.

1. Introduction

The UK Department for International Development (DFID) commissioned a five-year impact evaluation of the Millennium Village Project (MVP) in Northern Ghana in 2011. The project itself will run from 2012 until 2016, with interventions targeting a cluster of 34 communities. The MVP has been designed to demonstrate how an integrated approach to community-led development can translate the international Millennium Development Goals (MDGs) into results. It is an approach that has been previously piloted in Kenya and Ethiopia and in 2006 launched at scale to reach nearly half a million people across 10 countries throughout Sub-Sahara Africa. The new Millennium Village (MV) in Northern Ghana is the first to be accompanied by an independent impact evaluation.

This report is based on the second year of data collection (undertaken in 2013), with a more limited scope than the Baseline Report as it is based on data from a reduced household instrument. Originally, the evaluation design conceived only three data collection rounds, at baseline (2012), mid-line (2014) and end-line (2016). In response to discussions with the Peer Review Group (PRG) however, two smaller household survey rounds were later added to the design for the 'in-between' years (2013, 2015). These additional rounds focus on a subset of modules such as demographics, consumption and expenditure – which allow the evaluation team to achieve greater statistical power for these variables in order to detect relatively small effects of the intervention (Brown et al 2013).

The Baseline Report (Masset et al 2014) is publically available,[1] and it is planned that this and subsequent datasets will be made available for re-analysis.

Summary of the evaluation design

The evaluation uses a mixed methods approach to impact evaluation (Masset et al 2013a; 2013b). At the core of the methodology is a difference-in-difference (DD) design that compares changes in outcomes in the MVP areas before implementation to post-implementation, with changes in the same outcomes for an explicit control group. DD allows the evaluation to isolate the MVP impact on outcomes (including poverty, child development, under-nutrition, and child mortality) from effects of other variables changing over time. Alongside the quantitative survey data, there are a number of supporting qualitative approaches that aim to better understand how and why change has occurred.

While the implementation of a randomised trial is in principle possible by, for example, randomly allocating the interventions to matched village pairs, it would have been highly impractical in this particular case and the cost would have been prohibitive. The matching of control villages to project villages (on aggregate characteristics) and further matching of project and control households at the analysis stage (on household characteristics) within a DD approach appears to be the next best feasible approach after a randomised design. For a more detailed discussion, see Masset et al (2013b).

There are four key qualitative modules. First, a Poverty and Vulnerability Assessment (PVA) describes local and multi-dimensional perspectives of wealth and well-being. Second, an Institutional Assessment captures empowerment and institutional change, particularly between the community and district levels. Third, a Reality Check Approach (RCA) uses a mini-anthropological study to better understand how the MVP affects the realities of people as well as capture any unintended consequences. And, lastly, an Interpretational Lens approach takes the preliminary quantitative survey findings and obtains local feedback and interpretation around emerging themes of analysis.

As outlined in the Initial Design Document (IDD) (Masset et al 2013a), the goal of the evaluation is to assess whether the intervention is meeting the MDGs target and whether it is doing so in a sustainable way by breaking poverty trap constraints. In order to achieve these goals the IDD outlined a data

[1] http://www.ids.ac.uk/publication/millennium-villages-impact-evaluation-baseline-summary-report

collection plan that would gather detailed information on most MDGs targets every two years and on incomes and poverty every year. Yearly data on income and expenditure are used to analyse poverty dynamics over the five years of project operations in order to test the project ability to break poverty traps at community and household levels.

Unlike the baseline (2012), mid-term (2014), and end-line (2016), the second year of data collection (conducted in 2013) makes use of a reduced set of *only quantitative* instruments: a shortened household survey alongside a community-level survey. The reduced household questionnaire covered the following sections:

- Household demographic composition (including migration)
- Participation in activities supported by the project
- Education, employment, and household enterprises
- Shocks
- Expenditure, savings, and credit
- Agricultural production, agricultural inputs, and livestock

These sections are designed to construct household expenditure and income figures and rates of migration, school attendance, and shocks. In addition, we introduced a module to collect information on household participation in project activities. Baseline, mid-term and endline surveys collect a much larger amount of information that was not collected in the second survey round including: household-level data on time use; malaria prevention; food, water and energy security; water use; energy use; housing conditions; household assets; land; and social networks; Demographic and Health Survey (DHS) type data from male and female adults (child mortality; contraception; pregnancy, postnatal care and breastfeeding; child vaccinations, diarrhoea and fever; infant and child feeding; malaria transmission knowledge; HIV/AIDS knowledge; literacy; mobile phone use; local organisations; extension training; general health and treatment seeking behaviour; coping mechanisms; trust; collective action; empowerment; domestic violence); children's' tests scores and cognitive skills; anthropometric outcomes; rates of malaria infection; and, anaemia. Community data containing information on prices, funding and projects, and shocks were collected but not made available to the evaluation team. Hence, this report does not cover the analysis of data on shocks, project activities, and prices at the community level, and instead the report focuses on the analysis of the household-level data only.

Aims of the report

The overall goal of the report is the identification of emerging issues and trends in the project outcomes and in the process of data collection. The report does not provide an impact analysis of the project after one year of operations, rather it is exploratory in nature and aims at identifying topics to investigate as further data become available. More specifically the goals of the report are as follows: First, to analyse the available data by reporting on changes in income and expenditure, poverty and rates of migration, school attendance, and shocks. Second, we report on levels of participation in project activities and characteristics of targeting of the interventions. Third, we assess the quality of the data collected with the aim of testing the applicability of the difference-in-differences design and of improving the data collection process. It should also be noted that after just one year of project activities a large impact on poverty is not expected and that the Earth Institute (EI) considers two years a minimum period to assess progress towards the MDG targets. The results of this preliminary analysis do not represent an evaluation of the impact of the intervention on poverty or other indicators.

We also observe that the analysis conducted in this report is exploratory, as it is not grounded in an agreed analysis plan. The econometric methods used in this report as well as the metrics (for example, the MDGs) employed in the analysis are still to be finalised. Because only some, out of several, potential outcome indicators available in the second round data were employed in this report, there is also a risk of selective reporting. A complete analysis plan detailing the methods of analysis, the outcome indicators, and the sub-group of analysis will be published shortly.

Finally, we observe that some issues that emerged at the time of conducting the baseline and analysing the data are not further investigated in this report. We refer in particular to the likelihood of a seasonal bias in project effects estimates resulting from the baseline being administered at different times in the project and control areas, and on the remarkable difference observed in child mortality rates in the project area compared to the control area and to the rest of Ghana. With the exception of education indicators, the outcome variables analysed in this report (migration, poverty and income) are not affected by seasonal bias either by construction or because of the way the survey was designed (for example, respondents report expenditure and school attendance over the previous 12 months). There appears to be a seasonal effect on reporting school attendance that we discuss in Section 6. Child mortality data are built from birth histories collected in adult questionnaires. The latter questionnaires are only collected every two years and were not collected during this survey round. Similarly, no health-related proxy determinants of mortality were collected in the second round of interviews.

The report is structured as follows. Firstly, the report considers the 2013 dataset by providing a brief overview of attrition rates compared to the baseline sample, as well as household demographic characteristics (Section 2). Next, the report goes on to consider the participation of respondents in the MVP intervention activities (Section 3). The report then goes on to summarise the findings on per capita expenditure and poverty (Section 4), income and income changes (Section 5), and education (Section 6). Finally, the report ends with a discussion on the migration of households and individuals (Section 7), and covariate shocks (Section 8).

2. Sample characteristics and attrition rates

This section reviews the characteristics of the sample collected during the second round of data collection and, particularly, given that this is a panel survey, the extent to which the households / individuals targeted in the baseline are the same (or otherwise). The section focuses on the panel structure and overall attrition rates, as well as panels of individuals. Further details are provided in Appendix 1.

Panel structure

The baseline survey targeted a sample of 755 households in the MV villages and 1,496 households in the CV villages. However, not all of these households were found at the baseline (the baseline sample comprises 711 MV households and 1,461 CV households). During the planning phase of the first follow-up survey it was decided that rather than replace the households missed at the baseline, the survey would make efforts to re-interview the households not found at the baseline. The final panel of households will be therefore composed out of the pool of households originally targeted at the baseline. For some of these households data will be missing for some of the survey years.

The number of panel households at follow-up is large (see Table 1). This is the result of a relatively low attrition rate from Year 1 to Year 2. The overall attrition rate between the two rounds is 0.51%, and it is very similar in the MV group (0.56%) and in the CV group (0.48%).

Table 1. Completed household interviews

Sample	Target	2012	2013
MV interviews	755	711	743
MV panel	*755*	*711*	*707*
CV interviews	1,496	1,461	1,487
CV panel	*1,496*	*1,461*	*1,454*
ALL interviews	2,251	2,172	2,230
ALL panel	*2,251*	*2,172*	*2,161*

Panels of individuals

While the previous section shows a low attrition rate for households in the survey, this section explores panels of individuals. A larger number of individuals were listed at follow-up compared to the baseline (Table 2). This is the result of both a larger number of households interviewed at the follow-up as well as changes in the household composition. There are also some ambiguities regarding people listed as household members that are not easy to resolve. For example, Table 2 excludes in the computation of people listed in 2013 all deceased people between the two surveys but not people who moved away between the two surveys.

Table 2. Individuals listed in the surveys

Sample	2012	2013
MV individuals	5,231	5,576
MV panel		*4,930*
CV individuals	10,337	10,649
CV panel		*9,869*
ALL individuals	15,568	16,225
ALL panel		*14,799*

The number of panel people is smaller than the number of listed people in 2013. This is partly the result of changes in household composition resulting from patterns of births and deaths, partly the

result of individuals moving in and out of the household, and partly the result of errors in listing household members either at baseline or follow-up.

Households underwent a change in composition between the two survey rounds, albeit the change is too small to draw definitive conclusions from the data. The fraction of non-household members[2] identified in this way is very small in both surveys and similar in size. The demographic characteristics of non-members, however, have slightly changed from one survey to the other. Non-members are more likely to be female, younger, and less likely to be part of the "nuclear" family[3]. About 80% of individuals belong to the "nuclear" family (see Table 3). The demographic composition of the average household is nonetheless relatively stable.

Table 3. Characteristics of non-household members

	2012		2013	
	Members	Non-members	Members	Non-members
Share	98.54	1.46	98.84	1.16
Female	50.2	57.4**	50.5	57.9**
Age	23.4	24.6	23.6	19.8**
Nuclear	81.0	78.1	81.0	64.0***

One other major reason for changes in household composition consists of errors in reporting. The characteristics of household members wrongly listed and missed out show that errors are more likely to occur when members do not belong to the "nuclear" family definition (head, spouses, and children). This suggests that respondents may have an inherent difficulty in classifying individuals belonging to an extended household into the household definition adopted by the survey.

This has some implications for the analysis of the data. While the sample average household size might be the same across surveys as errors of both types can balance out, there might be considerable changes in household composition for some households. Since household size is the denominator of several relevant indicators, this can result in changes in outcome variables that are difficult to explain. We have decided to address this problem by careful data collection. Data on composition of household members is collected with great care at each survey round not just by reporting changes in composition but also by checking the validity of reporting in the previous round and appropriately coding and solving inconsistencies across rounds. The idea is that by further probing over five years, the inconsistencies found will be largely improved, if not solved, and that a "true" household size will be obtained.

[2] For our purposes, individuals who resided for longer than five months outside the home over the previous 12 months are considered non-household members unless they are household heads or infants.

[3] We defined the nuclear family as composed of individuals that are household heads, spouses, or children. Parents, brothers, sons/daughters-in-law, and other relatives are considered member of the extended family.

3. Participation in activities supported by MV programme

In this section we look at household participation in activities supported by the MVP, both in their levels and across the income distribution. A section of the follow-up questionnaire was devoted to assess household participation in the activities promoted by the MVP – something that was not possible in the pre-MVP baseline. It is important to note, however, that similar interventions are promoted by the government and non-governmental organisations (NGOs) in the same area and therefore participation in the same activities is high in the control areas as well.

We first provide some information on the status of project implementation at mid-2013 when the second round of data was collected. This account is based on three main sources: an Annual Report of MVP Savannah Accelerated Development Authority (SADA) by EI dated March 2013; a visit to the field by the author of this report together with members of the qualitative team; and a preliminary analysis of project cost data.

The MVP is structured along four integrated components: (i) agriculture and agri-business; (ii) education; (iii) health; and (iv) infrastructure, with supporting inputs from community mobilisation, cooperative development, information technology (IT) and monitoring and evaluation (M&E) staff.

Agriculture

As of August 2013 (the time of the second round of data collection), most activities in the agricultural sector consisted of forming groups and cooperatives of up to 25 members; distributing inputs such as fertiliser and seeds; and agricultural extension work. The interventions in agriculture consist of forming farmers groups of up to 25 members. The groups are then federated into cooperatives of up to 250 members, which are again federated at a higher level into district unions. Cooperatives borrow from local banks below the market rate to purchase fertiliser and seeds from the project. Three crops (soya, rice and maize) have been prioritised based on farmers' preferences, who were informed of their potential to enhance food security and incomes. There were 4,000 farmers enrolled in the scheme, however the project could only support approximately 2,000 participants.

Health

The project aims to increase both the demand and supply of health services. To date, project activities have mostly consisted of rehabilitating or constructing new health infrastructure and establishing a CHW network. CHWs are the cornerstone of MVP's health interventions. They perform a wide and intensive range of diagnostic and curative tasks at the community level, guided by a mobile phone-based application (*Commcare*) and supervised by Ghana Health Service's (GHS) community health nurses (CHNs). It is expected that every household is visited by a CHW once per quarter in their homes. During visits, CHWs observe whether family members, particularly children, are sick. They measure body temperatures, arm circumferences and can provide medications or referrals to clinics. Suspected cases of diarrhoea and malaria incidence are prioritised. CHWs also provide advice that is aided by recorded short audio phone messages in the local language through their phones. Counselling by CHWs covers a wide range of topics including: breastfeeding, diet, and using mosquito bednets. The project also recruited other key clinical staff such as: physicians' assistants, midwives, laboratory technicians, and CHNs. More than 12,000 long-lasting insecticide treated bed nets have been distributed. The project also promotes registering for the National Health Insurance Scheme (NHIS) by paying the first year's registration fee. Finally, the MVP introduced two types of ambulances: two standard ambulances and seven tricycles with trailers for short journeys (e.g. to Community-based Health Planning and Services compounds) and where roads and tracks are less motorable. Owing to a

number of legal and logistic difficulties, the project is unable (as of mid-2013) to provide food supplements or drugs on a large scale. Vitamin A and de-worming campaigns were conducted by the GHS without involving the MVP directly.

Education

Up until mid-2013, the project focused on supply side activities such as rehabilitating or constructing new classrooms, teachers' quarters and other facilities. Some social mobilisation work and an assessment of facilities needs were conducted. 70 community education workers (CEW) were recruited to serve as community advocates for primary school enrollment, and to provide remedial education services to students. At the time, school feeding was provided in eight of the 20 primary schools in the project area with the support of the World Food Programme (WFP). A limited number (28 in total) of school supplies and scholarship for girls secondary education were delivered.

Infrastructure

Many small infrastructure projects have been implemented, such as building warehouses and roads. Up to 14 types of feeder roads were under repair or construction in August 2013. The work is undertaken by private contractors following a public tender. A scoping study about improving irrigation infrastructure was underway, whilst extending the power grid to some MVs was being negotiated. Similarly, the expansion of telecommunications and internet coverage was under negotiation with the government and private firms. Community plans for constructing boreholes for domestic use were formulated.

Tables 4 through 8 provide some indications about the costs incurred by the MVP from inception to mid-2013 when the second round data were collected. There are some uncertainties regarding these figures. It is not clear whether reported expenditures refer to the time of the order, the delivery of the item, or the transfer to the account. It is also unclear whether a given service or item is provided immediately when the expenditure is reported. In other words, there is no close match between reporting expenditures and the timing of activities. Some observation can nevertheless been made. Costs are divided into eight categories presented in Table 4. In the first six months of operations, the project incurred substantial administrative and management costs related to setting up physical and human infrastructure. By far, health, education and agriculture infrastructure (in this order) are the sectors that the project has invested in the most.

Table 4. Total project costs mid-2012 to mid-2013

	2012	2013	2012	2013
	USD	USD	%	%
Mgmt & Admin Operating	1,173,686	177,719	40.1	6.1
Health	922,123	577,031	31.5	19.7
Education	299,154	351,074	10.2	12.0
Agri/Coop/Business Dev	256,027	132,716	8.8	4.5
Environment	14,030	790	0.5	0.0
Monitoring and Evaluation	89,102	9,257	3.0	0.3
Infrastructure, Water & Sanitation	171,225	648,471	5.9	22.2
Community Development	0	11,582	0.0	0.4
Total Expense	2,925,350	1,908,643	100.0	65.2

Expenditure data was disaggregated by sector by the main items relating costs to activities, though a one-to-one matching of this type is rarely possible (Tables 5 through 8). A quick inspection of these

tables shows that the first year of the project tried to set up conditions to establish a stable supply and demand for the services offered. A large share of investments were devoted to building the physical and human infrastructure to both provide the services and to mobilise the community to access them. In the health sector, the largest expenditure shares are "access to care," which includes construction, refurbishing and rehabilitation of clinics, and CHWs who visit every household to monitor health status and promote the health services provided. Similarly, expenditure in education has consisted of classroom construction and rehabilitation, and hiring CEWs dedicated to motivating parents and providing remedial classes to students. The largest agricultural expenditures consisted of small irrigation projects, farm inputs (seeds and fertiliser), and extension agents who were primarily involved in forming of cooperatives and farmer groups. Other considerable infrastructure expenditure, not implemented alongside community mobilisation, consisted of road construction and rehabilitation and the establishment of modern communications systems.

Table 5. Health expenditure mid-2012 to mid-2013

	2012	2013	2012	2013
	USD	USD	%	%
Access to care	715,790	544,538	77.6	94.4
Infectious and Tropical Disease	10,133	5,659	1.1	1.0
Real-time HMIS	22,537	10,074	2.4	1.7
CHWs	130,836	9,843	14.2	1.7
Child health (WASH)	16,179	2,274	1.8	0.4
Nutrition	17,638	326	1.9	0.1
Rep Maternal Health	9,011	4,313	1.0	0.7
Total Health	922,123	577,031	100.0	100.0

Table 6. Infrastructure expenditure mid-2012 to mid-2013

	2012	2013	2012	2013
	USD	USD	%	%
Transport	70,472	508,654	41.2	78.4
Energy		57,600	0.0	8.9
ICT	93,393	81,789	54.5	12.6
Water and Sanitation	7,360	427	4.3	0.1
Total	171,225	648,471	100.0	100.0

Table 7. Education expenditure mid-2012 to mid-2013

	2012	2013	2012	2013
	USD	USD	%	%
Quality	251,536	329,380	84.1	93.8
School Meals	52	824	0.0	0.2
Gender	9,149	12,933	3.1	3.7
CEW Outreach	33,339	329	11.1	0.1
Secondary	5,079	7,607	1.7	2.2
Total	299,155	351,074	100.0	100.0

Table 8. Agricultural expenditure mid-2012 to mid-2013

	2012	2013	2012	2013
	USD	USD	%	%
Irrigation	77,449	67,676	30.3	51.0
Inputs	89,837	11,355	35.1	8.6
Extension Agents	34,977	39734	13.7	29.9
Access to Market	24,174	0	9.4	0.0
Pre & Post Harvest Losses	0	0	0.0	0.0
Business Development	28,839	12,923	11.3	9.7
Micro Financing	751	1,026	0.3	0.8
Total	256,027	132,716	100.0	100.0

Participation rates in activities supported by the programme

The participation rates of selected project activities are reported in Table 9. Participation rates are also reported for CVs as similar services to those implemented by the MVP are also provided by other agencies and the government. The last column in the table reports the number of observations as the target population varies with the service provided. For example, counselling on breastfeeding is only given to mothers, measurement of circumference arms is only performed on children under five, etc.

Almost all the MV and CV households report having been given a bed net during the previous year. About 50% of households report being visited by a CHW and 70% report having visited a health centre of any type during the 12 months before the interview. Participation rates are generally higher in MV areas, particularly in relation to distribution of mosquito nets, CHW visits, and the activities performed by CHWs during household visits, such as nutrition counselling and use of mosquito nets. CV areas appear to attend health clinics and be receiving vitamin A, food supplements and medications with more frequency than MV areas (in the case of vitamin A and food supplements the difference is statistically significant). More sanitary pads are delivered in MV areas but the difference is not statistically significant and the ratio is however very low. NHIS membership appears much higher in the MV areas, this is probably a result of the promotional campaign conducted by the project.

The high participation rate in activities that are similar if not identical to those provided by the MVP is a reflection of the high level of investments by the Government of Ghana, NGOs and international organisations in the area. With the implementation of MV the interventions in CV might also increase as agencies are reallocating resources away from MV areas. This potential problem for the comparability of MV and CV areas is monitored by qualitative interviews and data collection on project implementation at the district level. The data collected by the qualitative team and reported in Appendices G and F of the baseline report identified the following projects operating in the two districts in the health sector alone: iodised salt and food fortification (WFP); expanded programme for immunisation (UNICEF, Global Fund and GEHIP); community-led total sanitation (UNICEF); child protection project (World Vision); water and sanitation development (NORPREP); community case management, malaria control for child survival, tuberculosis control programme (GHS). Projects in this area are normally designed and implemented by or in coordination with regional health offices and the district health departments. There is likely to be substantial overlap between the activities conducted by MVP and other projects and certainly they are perceived as very similar by beneficiaries.

Unfortunately, obtaining detailed data on the myriad of projects running in the area has proved difficult and we do not have information on the characteristics or size of their operations.

It is clear that the project also has conducted considerable effort in community mobilisation, particularly in the formation of farmer groups. A large proportion of MV households report belonging to a community group, such as a women's group or a Parent-Teacher Association (PTA), with the differences to the CV areas being particularly large for farmers' organisations (cooperatives and other FBOs).

While a larger number of school-age children received free school inputs in the MV areas, it appears that the participation in education interventions has been rather limited so far. A similar fraction of children have access to school feeding in the two areas, and the distribution of bursaries and sanitary pads has been very limited.

Table 9. Household participation in selected project activities

	MV	CV	P-value	Obs.
Someone distributed bed nets	98.9***	88.6	0.000	2,230
Visit by a CHW	53.3***	40.9	0.000	2,230
CHW provided condoms	5.9**	1.8	0.006	1,004
CHW measured children's arms	30.6***	19.9	0.000	1,004
CHW advised on breastfeeding	44.4***	28.1	0.000	996
CHW advised on child feeding	45.8***	29.5	0.000	985
CHW advised on use of bed nets	51.1***	33.5	0.000	986
Visited a health facility	73.9	71.5	0.481	2,230
Children given deworming	38.2	34.7	0.509	1,600
Children given vitamin A	25.0**	37.9	0.001	1,595
Children given food supplements	0.8***	6.5	0.000	1,598
Children given sanitary pads	2.0*	0.8	0.073	1,592
Member of NHIS	81.2**	67.2	0.004	2,230
Member of cooperative	30.3***	8.3	0.000	2,230
Member of farmer-based organisation	26.9***	3.8	0.000	2,230
Member of farmer field school	2.8**	0.1	0.010	2,230
Member of women's group	28.0**	17.2	0.001	2,230
Member of PTA	56.8***	36.3	0.000	2,230
Children had a school meal in last day in school	35.4	23.4	0.114	2,230
Children received a bursary	0.5	0.1	0.142	2,230
Children received stationery, uniform, etc.	32.4*	24.2	0.053	2,230

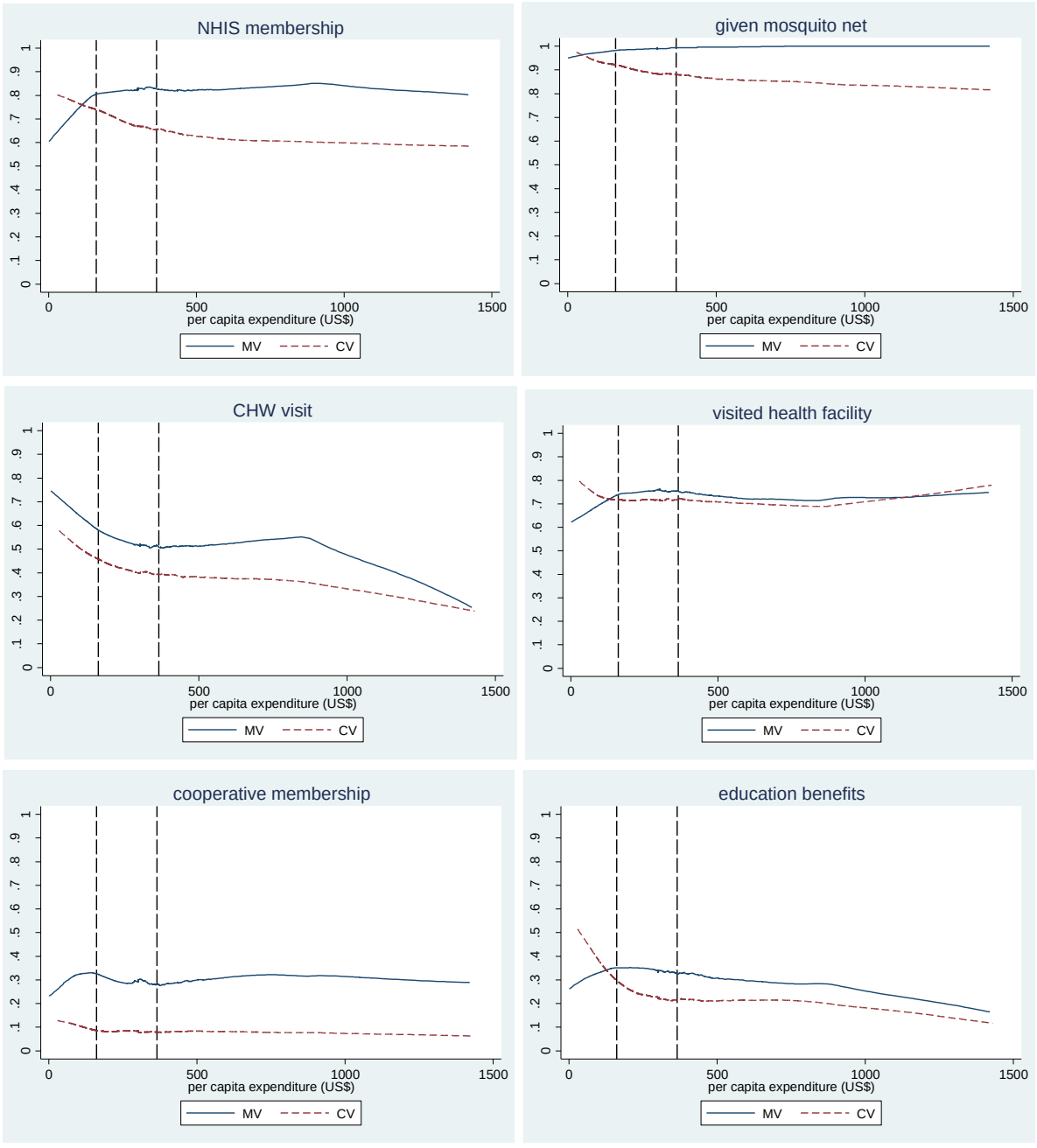
*Difference statistically significant at 10%, ** significant at 5%, *** significant at 1%

From a sectoral perspective it appears that higher participation rates are recorded in health-related activities while participation in education activities and productive activities is moderate at this stage. Most activities implemented in the first year were concentrated in the health sector. It should be noted, however, that participation in health-related activities is high in control areas as well and that the percentage differences in participation rates between MV and CV areas are rather similar across sectors and that in some cases participation is statistically significantly higher in the CV areas. Hence, while the level of project resource investment might have been higher in the health sector, the success of each sector in reaching beneficiaries is similar. In any case, it is difficult to conduct a sectoral assessment of the intervention only relying on household-level data and without access to project budget figures. An analysis of the project costs is underway and the results will be presented at the midterm.

Targeting

The follow-up survey also considers the participation of respondents in programme activity across the household income distribution by plotting participation rates over per capita expenditure for MV and CV areas separately (Figure 1). We use per capita expenditure as a proxy for poverty (this is explained in section 4), calculated at the baseline.[4] The charts include the official poverty line and the lowest quintile of the expenditure distribution. The charts show again that participation is higher for all interventions in MV areas. Participation curves are also flat for the majority of the expenditure distribution for both the MV and CV areas pointing to an untargeted provision of benefits. One exception is the lowest quintile of the expenditure distribution, which appears to be under-targeted in MV areas and over-targeted in CV areas (with the exception of CHW visits), which suggests that the MVP is facing some difficulties in reaching out to the poorest sectors of the population.

Figure 1. Household participation in project activity by per capita expenditure levels



[4] The baseline figures used as per capita expenditure at follow-up may be affected by participation, thus producing a spurious correlation in the series.

We further investigated the participation patterns shown in Figure 1 by testing differences in participation levels between MV and CV areas by expenditure quintile. The analysis shows that differences in participation rates between MV and CV areas are similar for all quintiles of the expenditure distribution for visits to health facilities and cooperative membership, meaning that the observed patterns observed in Figure 1 for these variables could be driven by a few differences at the very bottom of the expenditure distribution. Non-parametric smoothers are often sensitive to small differences and outliers at the end tails of the distribution which can produce misleading results (Deaton, 1997). Table 10, however, also shows that there are no differences between MV and CV areas in NHIS membership and access to education benefits for the bottom quintile, while large and statistically significant differences exist for all other quintiles of the expenditure distribution. Also, Table 10 shows that differences between MV and CV areas in access to bed nets increases with household per capita expenditure and no difference is observed for the bottom quintile of the expenditure distribution. This appears to confirm that for some activities the project is reaching the poorest households with some difficulty. This observation is entirely driven from the analysis of the data and not supported by qualitative research.

Table 10. Difference in participation between MV and CV area by per capita expenditure quintile

	Bottom	2nd	3rd	4th	Top
NHIS membership	-0.02	0.14***	0.14***	0.21***	0.22***
Given mosquito net	0.05**	0.06**	0.12***	0.13***	0.15***
CHW visit	0.14***	0.12**	0.11**	0.12**	0.12**
Visited health facility	0.00	0.05	0.03	0.04	0.01
Cooperative membership	0.22***	0.24***	0.18***	0.21***	0.25***
Education benefits	-0.02	0.14***	0.14***	0.10**	0.05

4. Per capita expenditure and poverty

One of the reasons for conducting the second round data collection was to produce annualised data on consumption and expenditure – whereas previously this was not going to be undertaken in the original evaluation design. This section considers the per capita expenditure data and calculates poverty rates.

Changes in the expenditure questionnaire

The first follow-up survey introduced two main changes to the baseline expenditure questionnaire. The first is the inclusion of a short module on the consumption of common property resource items, while the second is a question asking a subjective valuation of the market price of home-produced food. The changes introduced are additional to the existing survey and do not represent a change to the way the original questionnaire is administered. This means that expenditure figures calculated using the baseline survey questions that are common to both surveys are comparable. Figures calculated using the revised sections of the expenditure questionnaire are not strictly comparable.

In addition, the adjustments produced by the household subjective valuation of own consumption seem to overestimate household own consumption. Hence, we decided to employ those sections of the questionnaire that are comparable across the two surveys for the calculation of expenditure data. Our analysis also suggests that subjective evaluations of own consumption should not be collected in future survey rounds as they appear to provide imprecise estimates (large variances and many extreme values) and are not strictly comparable to expenditure figures originally collected at the baseline.

The question on the subjective valuation of home-produced goods does not seem to have produced the expected results. The question asks what would be the market price of one unit of the own-produced quantity of a given food item. Calculation of expenditure by applying these subjective prices to own consumption, however, resulted in a much larger valuation of own consumption than the one obtained by applying prices derived from the monetary expenditure section of the consumption module. This is probably the result of difficulties in asking/answering the question. The impression is that either the enumerator or the respondent or both interpreted the question in relation to the whole quantity consumed rather than to one unit of the reported quantity consumed.

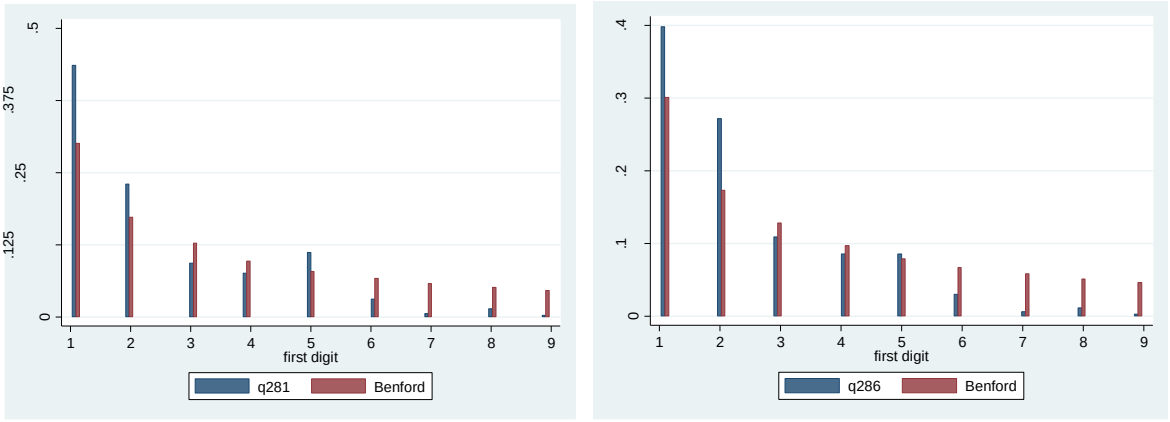
The section on common property resources contains subjective valuations of the market price of consumption of game meat, firewood, animal fodder, fish, and building material. Animal fodder is not a consumption item while the other items are already covered in other lines of the expenditure questionnaire and represent to some extent duplications. The section is useful, however, to follow more closely the impact of the intervention on the use of common property resources over time. We did not include this section in the calculation of final expenditure figures.

Quality of the expenditure data

We assess the quality of the expenditure data by comparing the distribution of first digits in reported food purchases and own consumption of food to a theoretical Benford's distribution. A large distance from the Benford's distribution is a sign of large measurement error or data fabrication. By this standard, the baseline data were found to be of poor quality. Further, using the same approach, we compare the quality of the expenditure data to expenditure data collected by the Ghana Statistical Service (GSS) and the Institute of Statistical, Social and Economic Research (ISSER). The quality of the data appears to be inferior to data collected by the latter research institutions, but only by a small

margin. The second round of data seems to suggest an improvement, albeit small, in the quality of the expenditure data collected both in absolute and in comparison to other available expenditure datasets. The statistical tests are larger than those calculated at the baseline, but tests are not very informative as they are a function of sample size. Tests point strongly to a rejection of the hypothesis of conformity to the Benford's distribution, but the number of reported observations (purchases) has increased, suggesting that data are collected with more accuracy and the distance values (M and D* distances in Table 11) are smaller in 2013 compared to 2012, though by a small amount.

Figure 2. Observed and Benford's distribution for purchases and own-consumption of food



Note: the y axis reports the values of the theoretical Benford distribution of the first digit: $P(digit)=\log_{10}(1+1/digit)$

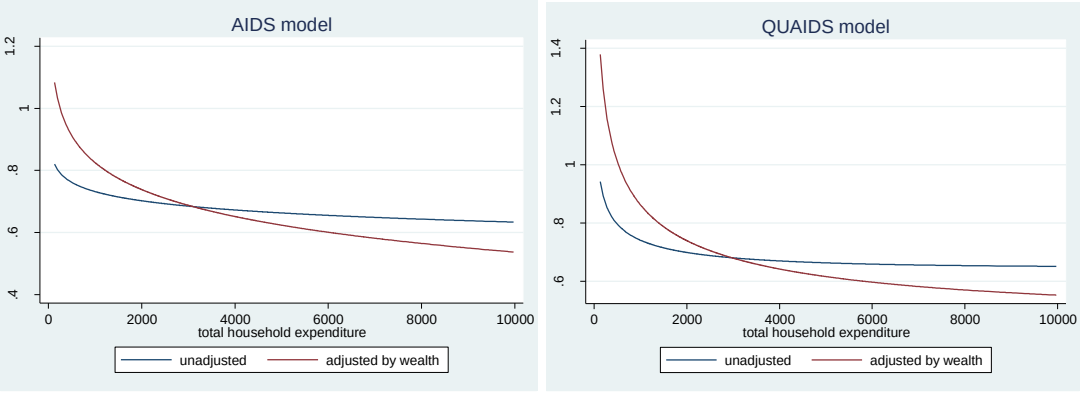
Table 11. Quality analysis based on Benford's law

	Observations	M distance	D* distance	Chi-square	Kuiper's test
Purchases					
2012	29,298	0.201	0.171	7,414***	36.1
2013	33,580	0.188	0.164	8,002***	35.3
Own-consumption					
2012	19,107	0.101	0.151	4,222***	26.9
2013	20,766	0.097	0.152	4,697***	28.3

Engel curves

The estimation of Engel curves offers another opportunity to assess the quality of the data and a first approach to understanding consumption behaviour in the area. We estimated food Engel curves using AIDS and QUAIDS model specifications with and without adjustment for measurement error as we did for the baseline data. Food Engel curves have the usual shape, whereby the food share declines as total expenditure increases (Figure 3). This is in sharp contrast with the baseline data that produced standard food Engel curves only after adjusting for measurement error. One interpretation is that the follow-up data are of better quality and that measurement error resulting from large reported consumption of food items has diminished during the follow-up round.

Figure 3. Food Engel curves



Food Engel curves are still affected by measurement error. After adjusting expenditure figures using an instrumental variable approach, the curves become steeper both in the AIDS and QUAIDS models (Table 12). This results in lower expenditure elasticities and in elasticities that decrease as total household expenditure increases. The latter is a result that is in line with standard demand theory and observation of consumer behaviour.

Table 12. Estimated food Engel curves and expenditure elasticities

	AIDS model		QUAIDS model	
	Unadjusted	**Adjusted by wealth**	**Unadjusted**	**Adjusted by wealth**
Log of household expenditure	-0.043***	-0.125***	-0.254**	-0.560***
	(0.008)	(0.023)	(0.089)	(0.120)
Log of household expenditure squared			0.013**	0.026***
			(0.006)	(0.007)
Elasticities				
1st quintile	0.94	0.84	0.62	0.25
2nd quintile	0.94	0.83	0.62	0.20
3rd quintile	0.94	0.82	0.63	0.17
4th quintile	0.94	0.81	0.63	0.15
5th quintile	0.93	0.79	0.64	0.12

Note: 1) All regressions include the following covariates: age of head of household, household size, and dummy variables for 103 localities. 2) Instruments of models 'adjusted by wealth' are the value of the stock of wealth and its square. 3) The estimation of the adjusted standard share forms was performed using the ivregress command in stata. The estimation of the adjusted quadratic forms was performed running regressions of total household expenditure on the instruments, calculating the residuals and including the residuals, their squares, and cubes in the second stage. 4) The calculation of elasticities was performed at the mean values of the *estimated* expenditure share for each quintile of the expenditure distribution.

Price adjustments

In order to compare expenditures in the baseline and first follow-up we need to adjust expenditure figures for inflation. To do so, we apply prices obtained from the GSS Consumer Price Index (CPI) bulletin series.[5] The GSS reports price indices by region, disaggregated between food and non-food in addition to the overall CPI. The price series calculated by the GSS changed in June 2013 in a number of ways: Upper East and Upper West prices are now recorded separately; a new set of item weights based on Ghana Living Standards Survey GLSS5 replaces the older weights based on GLSS4; the base year was set to 2012 (=100); a new market questionnaire was introduced; markets surveyed were expanded from 40 to 42; items considered were extended from 242 to 267.[6]

[5] http://www.statsghana.gov.gh/cpi.html
[6] CPI press release (rebasing), June 2013.

For the present report, in which we need to adjust prices between the baseline (April-October 2012) and the first follow-up (May-July 2013), we use the old GSS CPI series before the change. For the poverty analysis at mid-term we will use the new CPI series. In addition, we will use the food price data collected by the survey teams in project and control areas when these will be made available to us, and we will also calculate CPI from the household data collected using household specific consumption shares as recommended by Deaton.[7]

Price indices are used to deflate follow-up expenditure figures in order to make them comparable to baseline expenditures. The deflators are calculated by taking the ratio of the follow-up/baseline average overall CPI in the 12 months before the survey. The deflators are then applied to follow-up expenditure figures. This is conducted separately for the Builsa District (applying the Upper East/Upper West price index) and the West Mamprusi District (applying the Northern Region price index). The CPIs were averaged over the 12 months preceding the survey separately for the Builsa and West Mamprusi Districts. The reference period is from June 2011 to May 2012 for the baseline data and from May 2012 to June 2013 for the follow-up data. See Table 8 below.

Table 13. Price deflators and average CPI by district

	Av. Baseline CPI	Av. round 2 CPI	DEFLATOR
Builsa	385.4	414.9	1.0766
West Mamprusi	357.8	393.0	1.0986

An additional adjustment of the baseline data is required because the surveys in MV and CV areas were conducted three months apart. As a result, the CV areas experienced a three-month increase in prices not experienced in MV areas, which needs to be adjusted for (see **Error! Reference source not ound.**14). Hence, we deflated expenditure in Builsa by 1.0139 and in West Mamprusi by 1.0215 in order to account for the different average price change that occurred in the two areas.

Table 14. Distribution (%) of expenditure interviews by month, survey, and study area

	Baseline (2012)		Follow-up (2013)	
	MV	CV	MV	CV
April				
May	66.0		4.7	8.2
June	24.9		54.4	56.0
July	5.2		37.8	34.7
August	3.9	21.4	3.1	1.1
September		77.3		
October		1.3		
November				

Note that expenditure adjusted in this way results in an overestimation of the baseline figures. First, the regional CPIs are based on regional food shares that are lower than those observed in the study areas, and food prices tend to increase at a slower pace than non-food prices. The impact of the CPI increase at regional level is therefore less severe in the study area than captured by the price deflators. Second, the adjustment assumes that all households have the same food shares, but these vary across households and a correct welfare adjustment should be based on household-level prices based on household-specific shares. Again, expenditures by households that predominantly consume food end up being excessively penalised by the application of the overall regional CPI. Finally, expenditures in both survey rounds are somewhat overestimated, though not the year-to-year changes, for another

[7] Deaton, A., & Zaidi, S. (2002). Guidelines for Constructing Consumption Aggregates for Welfare Analysis. *Living Standard Measurement Study Working Paper, 135*(104).

reason. While food expenditures and low frequency non-food expenditures are based on a 12-month recall, high frequency non-food expenditures are based on a 30-day recall. The latter non-food expenditures, however, are deflated by the average CPI in the previous 12 months. In order to be consistent with other figures they should be deflated by a six-month non-food price index in each survey round.

Poverty

To calculate poverty rates we proceeded to adjust the national poverty line originally set up by the GLSS4 expenditure survey of 1999 (700,000 Cedis food poverty line and 900,000 Cedis overall poverty line) following a similar procedure to the one followed by GLSS5. The GLSS4 poverty line was updated during the GLSS5 by the recorded inflation rate between January 2000 and January 2006. These resulted in the GLSS5 poverty lines of 2,884,700 Cedis per person per year (food poverty line) and 3,708,900 Cedis per person per year (overall poverty line). In the same way, we updated the GLSS5 poverty line adjusting for the inflation rate from January 2006 up to January 2012 for the baseline data and January 2013 for the follow-up survey. The surveys collected data over the previous 12 months from May to July, and the month of January seems an obvious mid-point to use.

Table 15 shows the overall price index and the food price index that were used to adjust the overall and the food poverty line, respectively. The deflator in January 2012 is 2.04 for the overall poverty line and 1.71 for the food poverty line (the same deflators are 2.22 and 1.77, respectively, in 2013). Note that in July 2007 Ghana introduced a new currency (the new Cedi), which exchanged the old one at the rate of 1 new Cedi for 10,000 old Cedis. We therefore divided the figures by 10,000 in order to obtain poverty lines expressed in new Cedis.

Table 15. Consumer price indices in Ghana from January 2006 to January 2013

	Overall CPI	Food CPI
January 2006	185.8	179.4
January 2007	206.1	193.9
January 2008	232.5	214.5
January 2009	278.6	256.2
January 2010	319.8	279.5
January 2011	348.9	293.0
January 2012	379.3	306.3
January 2013	412.6	318.2

Old and new poverty lines are reported in Table 16. It seems unreasonable at this point to calculate poverty rates using the national poverty line, particularly considering that it is based on the prices prevailing in urban Accra in January 2006. Therefore, we decided to adopt the poverty line set for the Rural Savannah Region (which in the GLSS5 definition includes the Northern Region, the Upper East, and the Upper West) in 2006. We then applied the same price deflators derived from the national CPI. This assumes that price dynamics are the same in all areas of the country, which is probably incorrect as non-food prices might increase at a lower speed in deprived areas, but we had no access to regional price indices. However, the national change in prices should be a good approximation of the regional changes.

Table 16. Old and new poverty lines for Ghana and Northern regions

Survey year	Poverty line Accra	Food poverty line Accra	Poverty line Rural Savannah	Food poverty Rural Savannah
January 1999	900,000	700,000		
January 2006	3,708,900	2,884,700	2,850,120	2,216,760
January 2012	756.6	493.3	581.4	379.1
January 2013	823.4	510.6	632.7	392.4

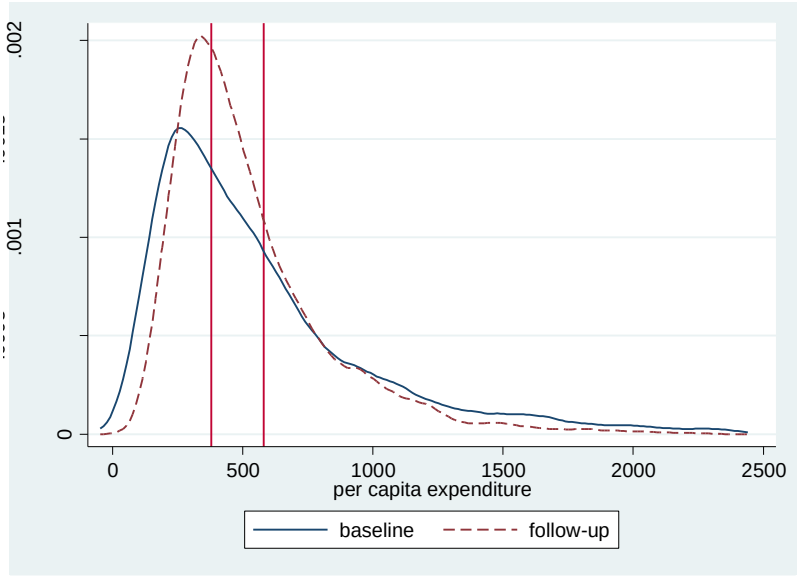
Changes in poverty

The poverty headcount increased over the survey round though the extreme poverty headcount decreased (Table 17). This strange pattern is the result of a large change in the dispersion of per capita expenditure, which can be read from a large reduction of the Gini coefficient across the two surveys, which is visible in the density chart of Figure 4. At follow-up there are fewer extremely poor households than at the baseline as well as fewer (relatively) rich households. It is difficult to explain this pattern without further analysis of the data. It might be a combination of better quality data collection and different patterns of agricultural production related, maybe, to changing weather conditions.

Table 17. Poverty measures by survey round

	Poverty headcount	Poverty gap	Poverty gap squared	Gini coefficient
Overall poverty				
Baseline	63.3	28.0	15.8	42.2
Follow-up	68.8	25.5	12.0	30.8
Extreme poverty				
Baseline	41.0	14.9	7.3	
Follow-up	37.8	9.8	3.7	

Figure 4. Density of per capita expenditure at baseline and follow-up



No differences in poverty rates emerged between MV and CV areas over the first two survey rounds (Table 18). We ran DD regressions employing three different models and including district and household size as covariates (standard errors are adjusted for the cluster structure of the data). The estimates point to a larger increase in poverty in the MV areas but the effect size is very small (between 1-1.5%), standard errors are very large, and the effect is never statistically significant.

Table 18. DD effects on poverty and expenditure

	Overall poverty	Food poverty	Per capita expenditure
Cross-sectional difference	0.022	0.021	-31.5
	(0.042)	(0.050)	(46.8)
Lagged model	0.011	0.004	-11.4
	(0.032)	(0.034)	(22.0)
Fixed effects model	0.015	0.008	-28.7
	(0.026)	(0.028)	(27.8)

Note: Poverty and food poverty are ratios (average poverty is 0.688 at follow-up); Per capita expenditure is in Cedis per person per year; Standard errors in parentheses.

5. Income and income changes

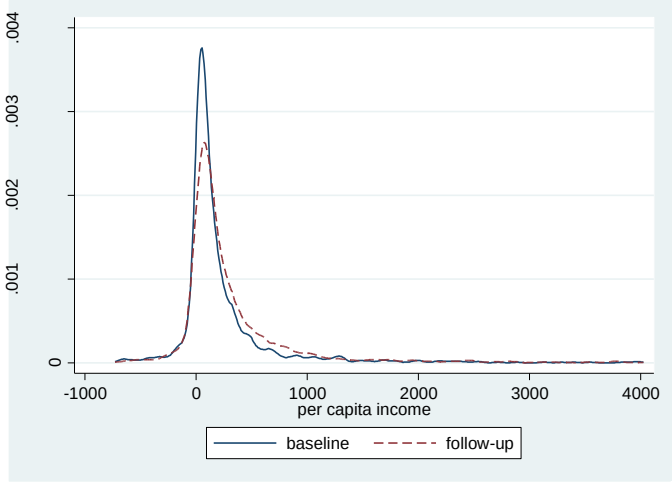
We adjusted income figures by price changes using the same deflators used to update expenditure figures. The pattern of income change over time contrasts with the pattern of expenditure change. Per capita income increased considerably over the two survey rounds and the variance of income also increased (see Table 19 and Figure 5)[8]. The increase in income was mainly driven by an increase in agricultural income and income from microenterprises. Despite the increase, per capita income still represents a fraction of per capita expenditure (per capita expenditure was estimated at 622 Cedis at baseline and 383 Cedis at follow-up).

Table 19. Average per capita income by survey round (Cedis per person per year)

	Income	Agricultural income	Livestock income	Wage income	Business income	Transfer income
Baseline	226 (1121)	87 (180)	32 (925)	58 (473)	45 (302)	3 (28)
Follow-up	299 (1853)	112 (299)	23 (1668)	35 (202)	126 (693)	4 (41)

Note: Standard deviations in parentheses.

Figure 5. Density of per capita income at baseline and follow-up



The data in Table 19 highlight an apparent contradiction in the observed data, whereby while per capita incomes are increasing, poverty is also increasing. In principle, an increase in incomes should be associated with an increase in per capita expenditure and therefore a reduction in poverty rates. This apparently contradictory result is partly explained by income quality data. Reported incomes are much lower than reported expenditure to an extent that cannot be attributed to household dissaving alone and must be the result of difficulties in reporting income figures. As the quality of the data collection improves over time there is also a possibility that this will result in changes in better and higher reporting of incomes. In addition, a closer look at per capita expenditure in Figure 4 suggests that the discrepancy between average income and expenditure is the result of changes in the distribution of expenditure.

Figure 4 shows a considerable shift of the distribution to the right, implying a considerable increase in consumption for the majority of the sample. Most of the shift to the right (meaning an increase in

[8] Notice that the per capita income figures reported in Table 14, as well as per capita expenditure figures, may differ from those reported in the baseline report because of corrections made to coding errors and treatment of outliers in between rounds.

consumption) occurs under the poverty line and therefore does not result in a reduction in the overall poverty rate though extreme poverty decreased as well as distributional poverty indices (the poverty gap and the poverty gap squared). The observed increase in poverty appears to be the result of a shift below the poverty line by households reporting extremely high levels of expenditure at baseline. It is difficult to say whether this latter phenomenon is the result of a real reduction in exceptionally large expenditures or of an improvement in the collection of expenditure data. In any case it does not contradict the fact that for a large majority of the population consumption has increased between baseline and follow-up, thus solving the apparent contradiction with the income data reported above.

We estimated the DD impact of the project on per capita income (Table 20). The differences between income changes in MV and CV areas over time are negligible and not statistically significant. However, there is significant improvement in agricultural incomes in MV areas, which is both large in size and statistically significant. Since agricultural income represents only about a third of total income in these communities, the impact is not sufficiently large to increase overall income. This result, however, suggests that the project is having an impact on the agricultural incomes of beneficiaries.

Table 20. DD effects on per capita income and agricultural income

	Per capita income[a]	Per capita agricultural income
Cross-sectional difference	25.3	361.8**
	(119.7)	(126.9)
Lagged model	-1.5	386.9***
	(118.8)	(125.6)
Fixed effects model	-1.4	398.5***
	(98.6)	(86.1)

Note: [a]Per capita income is in Cedis per person per year. Standard errors in parentheses.

6. Education

The data show a positive impact of the intervention on attendance rates in primary school. However, we believe that part of this effect is driven by seasonal factors. The attendance rates of primary school (excluding pre-school) children in school age (from 6 to 11 years) are reported in Table 21. There is a sizable and statistically significant difference in attendance rates at the baseline between the MV and CV areas and no difference at the follow-up. The changes show that attendance increased over the period by some 4% points in MV areas and decreased by the same percentage in the CV areas.

Table 21. Primary school attendance rates across treatment areas

	MV	CV	P-value
Baseline	58.7*	67.3	0.084
Follow-Up	62.4	62.8	0.967
% Change	3.7	-4.5	

The positive changes in the MV areas compared to CV areas are confirmed by the difference-in-difference analysis (Table 22), which shows a positive effect of the MV project of at least 7% points. As shown in Table 22, this is as much a result of an increase in attendance in MV areas as the result of a decrease in attendance in CV areas. While an increase in attendance in MV areas can be explained by interventions in school construction and rehabilitation, motivational factors related to the formation of PTAs and other forms of social mobilisation, the decrease in attendance in CV areas, appears more difficult to explain. Note that the difference observed (an increase in attendance rate in MV areas and a simultaneous decrease in control areas) cannot be explained by a process whereby children from villages near the MV areas are sent to live in families residing in the MV areas. Tables 26 and 27 in the next section show that the fraction of children moving in and out of the family to study are nearly identical in the project and control villages.

Table 22. Pre-school attendance rates across treatment areas

	MV	CV	P-value
Baseline	48.6	44.8	0.148
Follow-Up	59.9	47.2***	0.000
% Change	11.3	2.4	

In the first year of operations the project invested heavily in pre-school. Therefore, we calculated net attendance rates of pre-schools across treatment areas (attendance of schooling years 1 and 2 among all children of relevant school age: ages 3 to 5). There is a sizable difference in pre-school attendance between the project and the control group that was not present at the baseline (Table 17). We analysed the comparative change over time using a difference-in-difference estimator and we find again a considerable gain in project areas (Table 18). The size of the impact on pre-school attendance is not substantially different from the impact size on primary school attendance, suggesting that factors other than project operations may be at play in the area. Interviews with MV project staff suggest that no major investments were made in the first year to promote primary education so that the observed impact on primary school enrolment could be the result of a seasonal bias or expectation effects. The DD analysis of changes in primary enrolment thus serves as a sort of placebo test as it detects an impact where there was no specific intervention. Seasonal bias and expectation effects picked up in primary school enrolment may operate in pre-school attendance as well, so that the observed DD impact on pre-school is uncertain. An alternative interpretation is that increased attendance of primary school is an unintended benefit of promoting pre-school attendance as parents may feel encouraged to increase attendance of all their children regardless of age. It is difficult

disentangling expectations and survey effects from the data without conducting qualitative work in the field to better understand the issue.

Table 23. DD effects on attendance rates

	Primary school attendance	Pre-school attendance
Cross-sectional difference	0.086**	0.088**
	(0.031)	(0.048)
Lagged model	0.040	0.099**
	(0.028)	(0.048)
Fixed effects model	0.073**	0.086*
	(0.029)	(0.045)

Note: Standard errors in parentheses.

We suggest that this decrease in attendance in CV areas could be the result of seasonal factors, namely the fact that the baseline survey was predominantly conducted in the month of September in the CV areas at the baseline, while it was conducted in the months of May and June in all other occasions. School breaks in 2012 occurred between 17th April and 5th May, and from 27th July to 11th September. The different patterns of timing of interviews in relation to the school breaks in project and control areas may have had an impact on reported attendance figures. For example, more children of any given age are likely to be in school in September when the school year begins and this may affect parents' reporting of school attendance.

First, we conducted the same difference-in-difference analysis of Table 21 using retrospective attendance rates. When respondents report baseline attendance rates in follow-up interviews, no baseline differences are present. Attendance rates at baseline, reported retrospectively during the follow-up survey, are 55.0 in MV areas and 56.7 in CV areas (P-value= 0.705). Similarly, the difference-in-difference analysis comparing follow-up attendance and retrospective baseline attendance finds no project impact (Table 24).

Table 24. DD effects on retrospective attendance rates

	Primary school attendance
Cross-sectional difference	0.020
	(0.023)
Lagged model	0.014
	(0.029)
Fixed effects model	0.021
	(0.021)

Note: Standard errors in parentheses.

Second, there is some evidence from secondary sources which reports that attendance rates vary with the month in which the interview is administered. The GLSS5 of 2005 was implemented over a 12-month period and stratified by month. Questions on attendance rates were very similar to those employed by the EI survey. Table 20 shows that reported attendance rate varies considerably depending on the month of the interview and that the same survey conducted two months apart finds different attendance rates by at least 2% points. Rates are particularly high in the month of September, which is the month when the baseline survey was conducted in CV areas. It is difficult to interpret the attendance patterns observed in the GLSS5 data. It is possible that the respondent, though asked about attendance in the previous school year, is affected by attendance at the time of the interview. For example, there are school breaks from mid-April to early May and from end of July to early September, which could affect low levels of reporting in July and August. Censoring may also play a

part as some children start school in September for the first time and are therefore reported as not attending in the previous year.

Table 25. Attendance rate by month of interview

	All samples	Northern regions
Jan-Feb	88.0	56.1
Mar-Apr	78.5	58.3
May-Jun	83.3	68.0
Jul-Aug	84.2	62.3
Sep-Oct	86.0	75.3
Nov-Dec	88.5	68.5

7. Migration

This section considers the migration of households (relocation to other areas), as well as the migration situation for individuals (both in- and out-migrations).

Migration of households

Household migration outside the study area is limited. The numbers are so small that it is not worth looking at differences between treatment areas or at differences in characteristics of migrating households. Six households were reported as relocated in the 2013 survey. The EI survey team employed a protocol that required collection of information from neighbours on the new addresses of the relocated households and to interview relocated households at their new addresses if within the districts of Builsa and West Mamprusi. Four households from the CV village migrated outside the study area. Three households relocated to the Ashanti Region, two of which to the gold mining town of Obuasi. Another household migrated to the Presentia village. Two households from the MV villages relocated in the study area but it is unclear whether the reported villages of Luisa and Sariba are the villages of origin, the village of destination, or both.

Migration of individuals

There is sizable migration of *individuals* in and out of the study area. The baseline data showed many more out-migrants than in-migrants by a factor of at least four and about 5% of households with one in-migrant member and about 25% of households with an out-migrant member[9].

The main reason for in-migration is marriage, while the main reasons for out-migration are schooling and work. This is a reflection of the level of deprivation of the area. There are no demographic differences between in-migrants and out-migrants or in the reasons for migrating between MV and CV areas. A slightly larger proportion of migrants are female and they are normally young (average of 22-23 years old). At the follow-up survey the numbers of in-migrants and out-migrants are very similar (Tables 26 and 27). As already observed at the baseline, there are no differences in the proportions of in-migrants between MV and CV areas, and there is a larger proportion of out-migrants from MV areas compared to CV areas (34% of households have an out-migrant in MV areas compared to 29% in CV areas; the difference is statistically significant). Note that the differences reported in Tables 26 and 27 are not difference-in-differences but single differences and that similar single differences were observed at baseline (see the baseline report). Hence, the differences observed in out-migration should not be interpreted as project effects but possibly as reflecting underlying differences in characteristics of project and control areas.

It is therefore clear that the MV project has so far not exerted any significant attraction from neighbouring communities and that the changes in the demographic composition of the population across treatment groups are minimal and not the result of the project intervention.

[9] Information on household members migrating out of the households is collected from the non-migrating household members (normally the head of household) during the household interviews. This information is collected in Section B2 of the household questionnaire (questions 40 to 64).

Table 26. Characteristics of in-migrants across treatment groups at follow-up

	MV	CV	P-value
In-migrants %	7.6	6.0	0.187
Households with in-migrants	7.4	6.1	0.294
Female	48.0	49.7	0.640
Age	22.3	23.7	0.217
Migrated for work	1.6	1.3	0.937
Migrated to study	2.5	8.2	0.169
Migrated to marry	53.6	50.6	0.800
Number of in-migrants	408	621	

Note: migration rates by column do not add up to 100% because the following categories were not included: 'migrated in care of other family members or friends', 'don't know', and 'other'.

Table 27. Characteristics of out-migrants across treatment groups at follow-up

	MV	CV	P-value
Out-migrants %	8.1*	6.6	0.074
Households with out-migrants	34.4*	28.6	0.072
Female	53.7	56.7	0.356
Age	19.7	20.8	0.135
Migrated for work %	35.9	40.1	0.205
Migrated to study %	36.6	37.3	0.672
Migrated to marry %	3.7	2.6	0.333
Number of out-migrants	458	706	

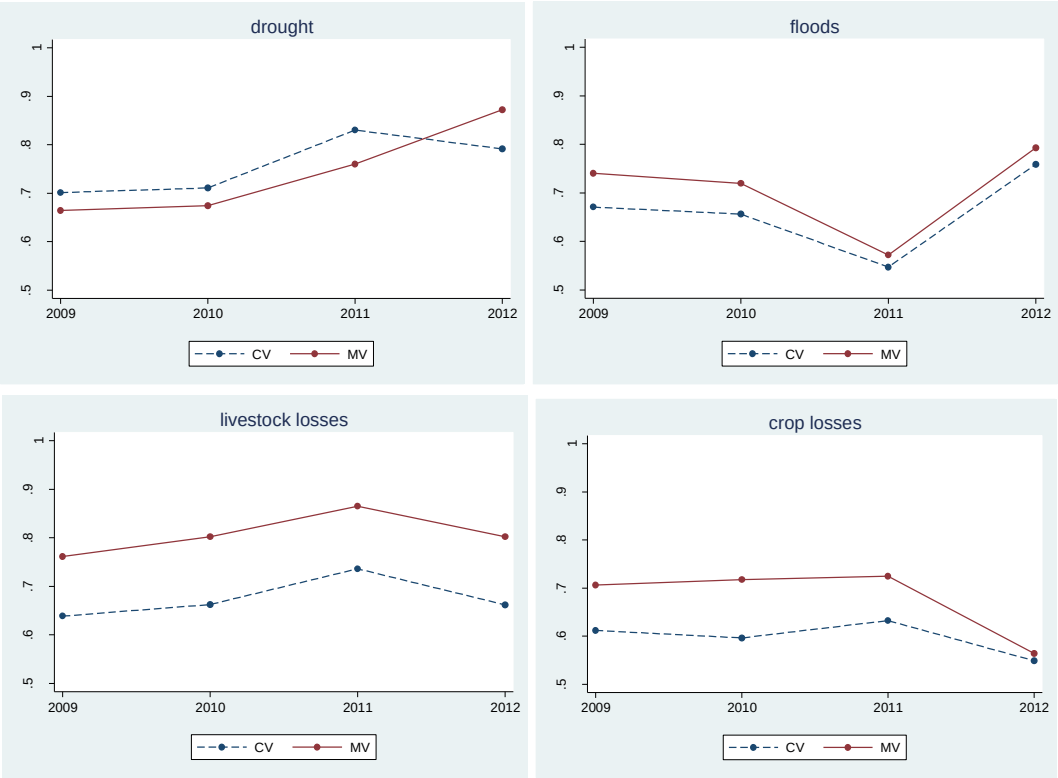
Note: migration rates by column do not add up to 100% because the following categories were not included: 'migrated in care of other family members or friends', 'don't know', and 'other'.

8. Covariate shocks

The MV localities are concentrated in a small geographic area while CV localities are more dispersed. If MV areas are affected by covariate shocks that do not affect the CV areas, then the validity of the comparisons between project and control group over variables directly or indirectly affected by shocks is compromised. Figure 6 shows the prevalence of covariate shocks reported by households in the MV and CV areas. The charts include four data points: the first two were collected retrospectively at the baseline while the other two were collected at baseline and follow-up.

The main difference when comparing prevalence of covariate shocks over time (and abstracting from differences between project and control areas) is an increase in the incidence of floods at the follow-up compared to the baseline. This large occurrence of floods might be related to observed change in expenditure patterns which were found to decrease in both MV and CV areas. A larger incidence of floods may have resulted in an overall reduction in incomes (largely related to agriculture) and therefore explains the observed reduction in household expenditure. There are modest differences between MV and CV areas, whereby MV areas are generally more likely to be affected by covariate shocks. The trends, however, are very similar, suggesting that the two areas are subjected to similar weather conditions and shocks.

Figure 6. Covariate shocks in project and control areas (2009-2012)



That the two areas are subjected to the same covariate shocks is reassuring because the validity of the difference-in-difference strategy relies on the assumption of similar trends in MV and CV areas. This is particularly important in relation to weather-related variables that are likely to play an important role in the determination of income and health outcomes. Similarity in the trends, however, does not preclude the occurrence of differences in each particular year. We investigated the emergence of differences in the occurrence of shocks between the baseline and the first follow-up. The regression results (Table 28) show that only in the case of drought is there a statistically significant

difference in the change in the occurrence of shocks. This difference is also clearly visible in the top left chart of Figure 6. There was an increase in the prevalence of households affected by drought in the MV areas over the year preceding the follow-up.

Table 28. DD effects on household shocks

	Drought	Flood	Livestock loss	Crop loss
Cross-sectional difference	0.082**	0.024	0.132**	-0.010
	(0.025)	(0.045)	(0.053)	(0.074
Lagged model	0.151**	0.010	0.012	-0.077
	(0.049)	(0.055)	(0.050)	(0.080)
Fixed effects model	0.148**	0.004	0.012	-0.086
	(0.049)	(0.057)	(0.049)	(0.079)

Note: Standard errors in parentheses.

9. Spillover effects

In this section we use the stratification adopted at the sampling stage to assess the presence of spillover effects. Control villages were stratified into 'near' and 'far' based on their distance from the project villages. This is a very imprecise definition of vicinity to project area and a source of potential contamination. The analysis plan outlines a strategy to address spillover effects in a more rigorous way. However, the stratification by distance of the control villages offers a convenient crude approximation of spillover effects. If spillover effects are in operation we should observe effects in 'near' villages when we observe effects in project villages.

We calculated difference-in-difference project effects for the most relevant outcome variables considered in this report: poverty, per capita income, agricultural income, primary school attendance, and pre-school attendance. We report the estimates obtained using the most conservative method (ANCOVA) in Table 29. In the Table, DD effects in MV villages and in near CV villages in comparison to faraway CV villages are reported. Among the outcomes that show a positive effect in the MV area, only agricultural income appears to increase in 'near' CV areas. The only mechanism for the project benefits to extend to CV areas in this case is likely to occur if farmers from villages near MV villages have access to farm inputs (fertiliser) and other agricultural services offered by the project.

Table 29. DD effects in MV and 'near' CV villages compared to faraway CV villages

	MV villages	Near CV villages
Poverty	0.015	0.008
	(0.039)	(0.041)
Per capita income	87.9	124.7**
	(119.6)	(62.0)
Agricultural income	568.1***	412.7**
	(121.4)	(163.4)
Primary school attendance	0.047	0.014
	(0.037)	(0.035)
Pre-school attendance	0.136**	0.072
	(0.061)	(0.061)

Note: Standard errors in parentheses.

10. Conclusions

The evaluation is based on a difference-in-difference design whose validity rests on the assumption that changes in the outcomes observed in the control villages offer a good description of what would have happened in the project areas without the project. The validity of the control group may be compromised by differential trends in the outcomes, attrition and changes in the composition of the project and control groups. Hence, one of the goals of the report was to analyse the data in order to check the validity of the difference-in-difference design against these potential threats. We found that the project and the control groups were exposed to the same covariate shocks over recent years. We found negligible attrition rates between the first and second round of data collection. The overall attrition rate between the two rounds was 0.51%, and very similar in the MV group (0.56%) and in the CV group (0.48%). We found interesting patterns of migration of individuals and large changes in household composition between the two rounds. These patterns however do not significantly differ between the project and the control group and we have modified the household questionnaire in order to be able to track and understand changes in household composition with greater accuracy.

There are also signs that the quality of data collection has improved, particularly in the collection of income and expenditure data, which will allow a more precise estimation of project effect and the detection of differences between the project and the control group. This has been as a result of: (i) running the survey simultaneously, hence there are no seasonality issues; (ii) changing the household roster to better track changes in household composition; and, (iii) better monitoring and observing the data collection process in real-time. These changes will continue during subsequent rounds and no other changes are expected at this point in time.

For the most part however, the second round of quantitative data collection occurred too early in project implementation to demonstrate any meaningful change that might be attributed to the MVP's interventions. In terms of the analysis of key variables, the following are highlighted in this report:

Household **migration** from the area is negligible, being less than 0.5% of the sample on a year-to-year basis. Only two households of the original sample relocated within the study area and tracking was not possible. For individual migration, however, there is sizable migration both in and out of the study area – and yet there are no differences in the demographic characteristics of in-migrants and out-migrants or in reasons for migrating between MV and CV areas. This suggests that the MV project has so far not exerted any significant attraction from neighbouring communities, and is not the result of the project intervention.

There are also considerable changes in the **demographic composition of the households** across survey rounds. This is the result of: the natural pattern of births and deaths; the combination of in-migration flows (predominantly for marriage) and out-migration flows (predominantly for work and schooling reasons); and errors in household reporting of household members. Similarly, most of the observed differences have emerged over time because of demographic factors or changes in survey implementation, regardless of the MV/CV treatment status.

A large proportion of the survey population **participates in project activities**, particularly in the health sector (visits by community health workers, distribution of mosquito nets, and NHIS registration) and in the productive sector (formation of farmers' cooperatives). Households interviewed one year into the intervention do not, however, report receiving significant direct project benefits such as medications or NHIS membership, though in the case of vitamin A and food supplementations higher

rates of participation in project supported activities are observed in CV areas. And, in terms of targeting, the project appears to target all households in the area in the same way. Although there are signs that the lowest quintile of the income distribution is not fully reached by most project activities. In contrast, it appears that visits by community health workers tend to target poorer households.

Households in MV areas appear to be more likely to be affected by **covariate shocks**, such as floods and crop and livestock losses, though the trends in the occurrence of shock are very similar in MV and CV areas and should therefore not affect impact estimates. **Expenditure poverty** appears to have increased over time in all areas although extreme poverty has reduced. Difference-in-difference shows no programme impact on poverty or per capita expenditure after one year in the programme. Similarly, there are no differences between MV and CV areas in changes in per capita income. The data does, however, show a sizable project impact on **primary school attendance** – although there are signs that this effect is partly explained by the seasonal circumstances of the baseline interviews rather than by project interventions.

Appendix 1. Sample characteristics and attrition rates

This annex provides an overview of the characteristics of the sample collected during the second round of data collection (2013). In particular, given that this is a panel survey, this annex explores the extent to which the households/individuals targeted in the baseline are the same (or otherwise). It also considers the issue of duplicates, the panel structure, and panels of individuals.

Duplicates

During the mop-up of the second survey round, the Earth Institute (EI) survey team discovered that six households had been interviewed twice during the baseline and are therefore duplicate households. The M&E coordinator visited all pairs of duplicate households and checked the accuracy of the data collected. From each pair the baseline household record with the best information was retained, while the household with poorer data was dropped[10].

Panel structure

The baseline survey targeted a sample of 755 households in the MV villages and 1,496 households in the CV villages. However, not all these households were found at the baseline; the baseline sample comprises 711 MV households and 1,461 CV households. During the planning phase of the first follow-up survey it was decided that rather than replace the households missed at the baseline, the survey would make efforts to re-interview the households not found at the baseline. The final panel of households will be therefore composed out of the pool of households originally targeted at the baseline. For some of these households data will be missing for some of the survey years.

The number of panel households at follow-up is large (see Table 30). This is the result of a relatively low attrition rate from Year 1 to Year 2. The overall attrition rate between the two rounds is 0.51% and it is very similar in the MV group (0.56%) and in the CV group (0.48%).

Table 30. Completed household interviews

Sample	Target	2012	2013
MV interviews	755	711	743
MV panel	*755*	*711*	*707*
CV interviews	1,496	1,461	1,487
CV panel	*1,496*	*1,461*	*1,454*
ALL interviews	2,251	2,172	2,230
ALL panel	*2,251*	*2,172*	*2,161*

We cross-tabulated households interviewed at baseline and follow-up (Table 31). It is interesting to observe that 10 of the 21 households not interviewed in 2013 had not been found at the baseline, while 69 of the 79 households not found at the baseline were found at the follow-up.

Table 31. Completion matrix between baseline and first follow-up

	Completed 2013	Uncompleted 2013	Both
Completed 2012	2,161	11	2,172
Uncompleted 2012	69	10	79
Both	2,230	21	2,251

[10] Codes of households dropped from the baseline: 35674652988; 35207459972; 35476910978; 35323866675; 35824953386; 34275280135.

Completion of household surveys is somewhat related to treatment status (Table 32), although there is not enough difference to draw anything conclusive from the data at this stage. More households were not found in MV areas compared to CV areas in both survey rounds, though the numbers of households not found are very small in the follow-up survey.

Table 32. Households not interviewed by treatment status

	2012		2013	
	Number	%	Number	%
MV villages	44	5.8	12	1.6
CV villages	35	2.3	9	0.6

Table 33 reports the reasons for not conducting interviews at the baseline and follow-up. The two surveys used a slightly different coding and are not strictly comparable. A much larger number of households were missed at the baseline compared to follow-up. The rate of refusal of the interview is negligible. Locating the dwelling seems to be the main challenge common to both survey rounds. In other cases, particularly at the baseline, the household was absent for a long period of time or no member was available for the interview. The cases of household relocation reported at follow-up are few (only six households relocated).

Table 33. Reasons for not finding households

	2012		2013	
	Number	**%**	**Number**	**%**
No competent household member	21	26	2	10
Household absent	22	28	1	5
Interview postponed	10	13		
Refusal	1	1		
Dwelling not found	19	24	9	42
Dwelling is vacant/destroyed			3	14
Household relocated			6	29
Other	6	8		
TOTAL	79	100	21	100

Panels of individuals

A larger number of individuals were listed at follow-up compared to the baseline (Table 34). This is the result of a larger number of households interviewed at the follow-up and of changes in household composition. There are also some ambiguities regarding people listed as household members that are not easy to resolve. For example, Table 29 excludes in the computation of people listed in 2013 all deceased people between the two surveys but not people who moved away between the two surveys.

Table 34. Individuals listed in the surveys

Sample	2012	2013
MV individuals	5,231	5,576
MV panel		*4,930*
CV individuals	10,337	10,649
CV panel		*9,869*
ALL individuals	15,568	16,225
ALL panel		*14,799*

The number of panel people is smaller than the number of listed people in 2013. This is partly the result of changes in household composition resulting from patterns of births and deaths, partly the result of individuals moving in and out of the household, and partly the result of errors in listing household members either at baseline or follow-up.

Households underwent a change in composition between the two survey rounds, albeit the change is too small to draw definitive conclusions from the data. For our purposes, individuals who resided for longer than 5 months outside the home over the previous 12 months are considered non-household members unless they are household heads or infants. The fraction of non-household members identified in this way is very small in both surveys and similar in size (after removing from the 2013 data deceased individuals and individuals who moved away from the household over the previous 12 months and who therefore would not have been considered members if interviewers were following the same protocol used in 2012).

The demographic characteristics of non-members, however, have slightly changed from one survey to the other (Table 35). Non-members are more likely to be female, younger, and less likely to be part of the "nuclear" family. We defined the nuclear family as composed of individuals that are household heads, spouses, or children. Parents, brothers, sons/daughters-in-law, and other relatives are considered members of the extended family. Using this definition, about 80% of individuals belong to the "nuclear" family. Note, however, that the differences in characteristics between members and non-members are nearly identical in the MV and CV groups. The observed differences have therefore emerged over time because of demographic factors or changes in survey implementation and regardless of treatment status.

Table 35. Characteristics of non-household members

	2012		2013	
	Members	Non-members	Members	Non-members
Share	98.54	1.46	98.84	1.16
Female	50.2	57.4**	50.5	57.9**
Age	23.4	24.6	23.6	19.8**
Nuclear	81.0	78.1	81.0	64.0***

The demographic composition of the average household is relatively stable. A small percentage of individuals are moving in or out of the original family (Table 36). Figures are presented only for individuals classified as household members in the 2013 listing using the definition outlined above. The figures suggest a small decrement in population between the two surveys as a result of movements in and out of families and of the balance between births and deaths.

Table 36. Changes in household composition between the two surveys

	Numbers	%
Original members	14,739	93.7
Births	250	1.6
Deaths	143	0.9
Moving in	122	0.8
Moving out	481	3.0

Another major reason for changes in household composition consists of errors in reporting. During the second round of interviews it became apparent that a considerable number of individuals listed as household members in 2012 (about 4% of the total sample) were not household members. In addition, a similar number of individuals reported as household members in 2013 had not been reported as household members in 2012. The EI survey team has taken the view that the household listing conducted in 2013 is the "right" one and that it corrects the one conducted in 2012. The reality is probably more nuanced. It is likely that errors in reporting were also committed in 2013 so that the 2013 roster cannot be assumed to be entirely correct either. In addition, there are difficulties in the interpretation of the concept of household among respondents. The characteristics of household members wrongly listed and missed out show that errors are more likely to occur when members do

not belong to the "nuclear" family as defined above (head, spouses, and children) – see Table 37[11]. This suggests that respondents may have an inherent difficulty in classifying individuals belonging to an extended household into the household definition adopted by the survey.

There are some implications for the analysis of the data. While the sample average household size might be the same across surveys as errors of both types can balance out, there might be considerable changes in household composition for some households. Since household size is the denominator of several relevant indicators, this can result in changes in outcome variables that are difficult to explain. To address this problem it was decided that further codes should be employed in the third round of data collection in order to identify more correctly the household members.

Table 37. Demographic characteristics of household and non-household members

	Correct	Wrongly listed	Correct	Missed out in 2012
Share	15,481	682	15,246	638
Female	50.4	49.1	50.4	58.5**
Age	23.4	24.7	23.3	21.3**
Nuclear	82.1	53.7*	80.5	63.6***

[11] Polly Hill observed in a famous book (*Development Economics on Trial: The Anthropological Case for a Prosecution*, Cambridge University Press, 1986) that the use of a single "average statistical household" is inappropriate in West Africa where household composition differs greatly with important implications on what decisions are made and how. Polly Hill suggested categorising households (e.g. conjugal households, joint households, household headed by widows, etc.) and analysing them separately. Following economic anthropology recommendations, the household questionnaire was designed in such a way to capture the variety of household types in the area (Table 38). About 25% of households are polygamous and about 10% are headed by women. The remaining households are mostly nuclear or headed by single males. This suggests that we should focus on three main household categories: male-headed households, female-headed households, and polygamous households. The decision making processes of different household types will be described in the qualitative work and the classification will be adopted at the analysis stage to account for differences in decision making.

Table 38. Household types

Household type	Numbers	%
Male headed/single wife	1,310	60.31
Male headed/polygamous	535	24.63
Female headed widowed-single	157	7.23
Female headed widowed-polygamous	17	0.78
Female headed husband away	12	0.55
Female headed with husband	24	1.1
Male headed, divorced or single, widowed	98	4.51
Female headed, divorced or single	12	0.55
Child headed (Age 16 or under)--Orphan	4	0.18
Other (specify)	3	0.14
Total	**2,172**	**100**

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