Impact Evaluation of Feeder Roads:

Inception Report and Survey Instruments

Report submitted to:

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1. Introduction and Summary

Agriculture is a very significant component of Ghana's economy accounting for about 40 percent of the country's gross domestic product (GDP), employing 60-70 percent of the labor force and generating more than 55 percent of the foreign exchange earnings. Overall, poverty rates in the target areas are generally above 40 percent (income of under US$ 1 per day). In the north, as well as in parts of the Central Afram Basin area, poverty among the rural population is as high as 90 per cent. With the poverty incidence so high in rural areas, any improvement in the agricultural sector will work to improve the economy of the poor.

MiDA's Agriculture Project within the Government of Ghana's Compact with the Millennium Challenge Corporation is design to improve farming in a number of areas including:

- Increasing farmer and enterprise training in commercial agriculture
- Irrigation development
- Land tenure facilitation
- Reducing post-harvest losses
- Improving access to credit, and
- Improving linkages to farmlands and markets by rehabilitating and expanding the transportation network.

Under the Agricultural Project some feeder roads are to be rehabilitated constructed. In the first phase, about 336 km of feeder roads in eight (8) districts in two intervention zones are to be rehabilitated to reduce transportation costs and time, and increase access to major domestic and international markets. The feeder roads activity will also facilitate transportation linkages from rural areas to social service networks (including hospitals, clinics and schools).

This document is the Inception Report for the project, Impact Evaluation of Feeder Roads, being conducted under contract number 4101106-01 by National Opinion Research Center (NORC) for the Millennium Development Authority (MiDA) of the Government of Ghana.

The purpose of the project is to conduct an impact evaluation of the MiDA's Feeder Roads Activity in eight of its 23 program districts.

The following documents are included in this document, by reference. The documents are listed in order of precedence.

1. Monitoring and Evaluation Plan, Millennium Development Authority (MiDA), 4th Floor Heritage Tower, 6th Avenue, Ridge West, Accra, Ghana, February 20, 2008. (See in particular Annex IV: Impact Evaluation Plan.)
2. Request for Proposals for Consultant for Market Surveys (Impact Evaluation of Feeder Roads), RFP Ref. 4101106/RFP/QCBS/06/08, Millennium Development Authority, Accra, Ghana, issue date 26 June 2008. (See in particular Section 6, Terms of Reference.)

3. Proposal, Impact Evaluation of Feeder Roads, National Opinion Research Center (NORC), 4350 East-West Highway, Bethesda, MD 20814.
4. Contract number 4101106-01 between NORC and MiDA to conduct impact evaluation of feeder roads activity.

As stated in the Terms of Reference of the request for proposals, "the primary data for the impact evaluation will be a series of surveys similar in scope to the Consumer Price Index (CPI) survey, examining changes in price over time…. Findings from the market surveys would complement the overall impact evaluation conducted by the Institute of Statistical, Social and Economic Research (ISSER). The Ghana Living Standards Survey (GLSS) 5+ is the primary instrument used in the overall evaluation, and 'Difference in Difference' is the proposed method of evaluation of data."

According to the Terms of Reference of the RFP ("B. Specific Tasks"), the Inception Report is to "confirm how the Consultant will test the hypothesis that roads improvement affects market prices. The Consultant will also confirm how it would test whether improved feeder roads lead to higher farm incomes in rural areas, through reduced input cost and higher producer price at the farm gate, that are associated with reduced travel time and vehicle operating cost." Section C. Technical Approach and Methodology, states, "Adopt a "Difference-in-Difference" strategy to evaluate the direct impact of the feeder roads improvement on prices in local markets…. Use spatial information from long-term monitoring surveys to evaluate the indirect impact of road improvement on farm sales, profits and farmer household income. It is essential to note that the Consultant is only responsible to take on this task if it is possible to utilize the GLSS5+ Survey data, and is not expected to collect any data related to farms or households."

Relative to the Inception Report, the Proposal states, "Within a week of returning from Ghana, NORC will submit an Inception Report to MiDA. The report will lay out a final evaluation design and model to test the hypothesis that roads improvements affect market prices; present the methodological aspects of the data collection (baseline and follow-up), including sample size calculations and potential data quality issues; and confirm whether or not the indirect effects of improved roads on farm income can be tested using GLSS5+ data. The report is also to lay out a timeline, revised as needed based on program implementation realities, and the interviewer training plan.

"The inception report will also include a preliminary inventory of digital maps, GPS coordinates for roads, and GIS data available from the Department of Feeder Roads and other sources, and describe how this data will be used in the evaluation design. The actual compilation of all GIS and GPS data into a usable data base will take be completed over the following 2 months."

2. Project Objectives and Scope

According to the Terms of Reference of the RFP, the project scope is as follows:
"The general scope of the feeder roads impact evaluation includes desk review of relevant literature, questionnaire development, sample size determination, collection of field data, data entry and verification, generation of clean data sets and production of analytical reports. All analyses of survey data will be done by the Consultant selected for this work."

As noted in the RFP, the purpose of the assignment is to conduct an evaluation of the Millennium Development Authority's (MiDA) Feeder Road activity in eight of its 23 districts. Under the proposed contract, the Consultant will be responsible for conducting three market surveys, similar in scope to the Consumer Price Index (CPI) survey, analyzing the survey data, and employing a difference-in-difference methodology to determine the impact of roads on prices over time. Findings from the market surveys and the evaluation are intended to complement the overall impact evaluation of the MiDA Program that is being conducted by the Institute of Statistical, Social, and Economic Research (ISSER).

The program being implemented by MiDA with funding from MCC has two major objectives: (a) increasing the production and productivity of high-value cash and food crops, and (b) enhancing the competitiveness of high-value cash and food crops in local and international markets. These objectives will be achieved through three projects in the areas of Agriculture, Transportation and Rural Development that will operate in 23 districts.

The Feeder Roads Activity, which falls under the Agriculture Project, identifies 336 km of feeder roads for improvements in eight (8) districts in the Central, Eastern, Volta, and Northern regions. As stated in the RFP, the central hypothesis of the roads investments is that improved feeder roads lead to higher farm incomes in rural areas, through reduced input costs and higher producer prices at the farm gate, which are associated with reduced travel time and vehicle operating costs and improved access to major domestic and international markets.

This study will focus on how prices of goods sold at local markets (that are transported on improved roads) change over time. It will also document the changes in goods transport tariffs and passenger fares to market places served by the feeder roads. To the extent that it is possible to do so using GLSS5+ survey data, the study will also document the indirect impact of the road improvements on farmer household incomes, and the direct impact on access to access to health establishments and schools, as measured by indicators such as use of health services and school attendance.

3. Inception Report Content

In view of the specifications listed above, the following items are to be included in the Inception Report:

- Evaluation design to determine how feeder roads improvement affect market prices, including sample sizes
- Discussion of sampling issues, including the feasibility of testing for improved feeder roads generating higher incomes using GLSS5+ data
- Identification of potential GIS data sources
- Data collection and processing (including interviewer training plan, data collection plan and survey instrumentation)
- Work plan and project schedule

The remaining sections of this report describe each of these items.

4. Evaluation Design

Randomized designs for road evaluations are rarely viable options because the roads selected for improvement seldom are chosen as a random sample – that is, the selection of the roads to be improved is almost never based on a randomized selection. The fact that roads are targeted geographically (to serve particular communities) suggests that there is an inherent problem for evaluation. Roads are built (or rehabilitated) in certain locations and not in others for a whole host of reasons, such as economic potential or political considerations. Unless the evaluation can control for those reasons, impact measures will be biased.

Given the nature of the Ghana feeder road project, where the locations and timing of road investments have been predetermined (i.e. the main road investment follows a pre-determined route and phasing based on geographic and engineering considerations), the treatment and control zones obviously cannot be randomly assigned or randomly phased in. Because of the non-random placement of the road investment, a simple comparison of prices in market villages that benefit from improved feeder roads (the treatment group) and prices in market villages that do not (the comparison group) would not correctly measure the impact of the investment.

For the reasons outlined above, neither random selection of communities within and outside the treatment area nor the comparison of communities in different stages of the project can provide unbiased comparisons of outcomes between communities in the treatment and non-treatment groups. In such a case, a non-experimental (quasi-experimental) approach to the evaluation, as proposed in the RFP, is a likely valid alternative.

The RFP specified that a "difference-in-difference" approach was to be used to assess the impact of the feeder roads improvement, and the proposal took no exception to this basic approach. In technical terminology, this approach is referred to as a "pretest-posttest with comparison-group" quasi-experimental design. In a true experimental design, the comparison group would be selected by a randomization process. As discussed in the RFP, use of randomized comparison (control) groups is rarely an option for road-improvement projects. As an alternative to randomization, NORC proposed determining of the control group using matching. With this approach, the comparison group is selected in a way such that the probability distributions of the treatment and comparison sample units are similar with respect to known variables that may have affected program-road selection and that may affect program outcome (other than the program intervention).

The quality of the matching is determined by the choice of matching variables. In general, the stronger that the relationship of the matching variables to program-road selection and program outcome is, the higher the precision of the estimate of program impact will be (and the greater the probability (power) of detecting impact differences of a specified size). Matching variables include data available from existing data sources, such as government databases, previous socio-economic surveys and geographic information systems. In it activities to date, NORC has identified a number of such data sources. During its initial visit to Ghana the team confirmed the feasibility of obtaining access to these data sources. These are discussed further in Section 6.

It was initially proposed that the primary sample unit (PSU) for the study will be the enumeration areas used in the Ghana Living Standards Survey. The principal reasons for this choice were the ready availability of a sample frame, comparability of data with previous surveys, and facilitation of the use of ancillary data in the analysis. In the GLSS5+ survey, the primary (first-stage) sample unit (PSU) is the census enumeration area (EA). In the discussion with ISSER, it was determined that some EAs contain no markets, some contain one market, and some contain more than one. Also, it was determined that local markets are not stable – they may relocate or combine over time. These conditions represent an undesired source of variation, which makes it more difficult to assess the impact of feeder roads. What is needed is sample units that are stable and will exist for the duration of the study. For this reason, it appears preferable to use *localities* rather than EAs or markets as the first-stage sample unit. Since this sample unit differs from that used in the GLSS5+, there is not a direct correspondence between the PSUs of the GLSS5+ and the impact evaluation project.

With the "difference-in-difference" approach, data are collected before and after the program intervention, for "treatment" and "non-treatment" sample units. For this study, the treatment sample units will be localities close to program roads and the non-treatment sample units will be localities far from program roads.

With the availability of GIS data, it is possible to develop more refined measures of program influence, such as travel-time and travel-cost measures that take into account the entire road network. Also, rather than simply specify that some sample units are "treatment" units and some are "non-treatment" units, it is practical to characterize program influence using continuous variables, such as travel time or travel cost. By doing this, it is possible to develop better models of program impact. This approach, of relating the impact of road improvement to continuous program-outcome variables such as travel time, is similar to the approach in medical evaluation of measuring dose response on a continuous scale. (See Section 6 for further discussion.)

Our approach to matching treatment and control localities is to apply it *before* selection of the sample units and the assignment of them to treatment and control groups. With this approach, it is possible to control the probabilities of selection of the treatment and comparison units. Note that matching is done on sample units that are as "close" (relative to stage of sampling) to the ultimate sample units as data availability permits.

In addition to using matching to identify the comparison group, we will impose controls on the sample selection probabilities to ensure that there is substantial variation in important model explanatory variables, and that the correlation among them is low.

The difference-in-difference design that will form the primary basis for the evaluation is as formulated as presented on page 69 of the RFP:

Y	=	Outcome (impact) measures
A	=	Villages "near" treatment road
B	=	Villages "near" control road
C	=	Villages "far" from treatment road
D	=	Villages "far" from control road
2009	=	Initial (pre-treatment) time period

2011 = Final (post-treatment) time period

The impact of the treatment for villages "near" the road is evaluated as:

$$\left(Y^{A}_{2011} - Y^{A}_{2009}\right) - \left(Y^{B}_{2011} - Y^{B}_{2009}\right)$$

The impact of the treatment for villages "far" from the road is evaluated as:

$$\left(Y^{C}_{2011} - Y^{C}_{2009}\right) - \left(Y^{D}_{2011} - Y^{D}_{2009}\right)$$

It then follows that the effect of a village being "near" the treatment road, compared to being "far" from the treatment road is given by:

$$\left(\left(Y^{A}_{2011} - Y^{A}_{2009}\right) - \left(Y^{B}_{2011} - Y^{B}_{2009}\right)\right) - \left(\left(Y^{C}_{2011} Y^{C}_{2009}\right) - \left(Y^{D}_{2011} - Y^{D}_{2009}\right)\right)$$

We now have an impact variable (change in price and change in transport tariffs) measure for every village in the sample. At this point, the GIS could be used to map the variation in road upgrade "impact" to see spatially and visually which communities are benefiting most from the road improvements, and in which areas.

The preceding model – a quasi-experimental design – is the basic one to be used to estimate program impact. In addition, a continuous-variable analytical model will be developed that relates program impact to continuous program outcome variables such as travel time and travel cost (estimated from the GIS model) and to other variables (such as physiographic and socio-economic variables from the GIS and other sources).

5. Sample Design and Sample Size Considerations

5.1 Sampling Considerations

The sample size for any study such as an impact evaluation is a trade-off of many factors:

- What is the available project budget?
- What are the analysis objectives (i.e., what estimates are of interest, such as difference-in-difference estimates)?
- What levels of precision are desired for these estimates?
- What tests of hypothesis? What levels of power for these tests of hypothesis?
- What is the nature and variability of the population of interest (variances, standard deviations) and correlations among sample units (villages, markets, enumeration areas)?
- What are the sampling costs (travel costs, observation costs)?

While it is difficult to develop sample-size estimates for analytical models, it is relatively easy to do so for simple estimates, such as for means, proportions, differences, and difference-in-differences. Our preliminary sample-size estimates were developed by specifying alternative precision levels for double-difference estimates and power levels for tests of hypotheses about difference-in-differences, using standard formulas from the theory of statistics.

Note that although we are focusing on "sample size," it is not the only factor of concern in research design. Research designs may include features such as stratified sampling, cluster sampling and multi-stage sampling. Other factors that may be controlled include allocation of the sample to strata; the number of first-stage (area) sample units relative to the number of second-stage sample units (markets); replacement of part of a panel to enhance the precision of over-time means (at the expense of precision of time-difference means); and the distribution of the sample units with respect to design variables (e.g., the number of treatment and control groups, or the distribution of the sample units over the design variables, such as distance from project roads or estimated change in travel time).

The quality of a research design is improved by taking into account as much relevant information as is available in the construction of the design. In the initial weeks of the project, we will identify the data sources that are available (e.g., sample frames, GIS data, prior related survey data (e.g., the GLSS), sampling cost data, data on variances and intra-cluster correlation coefficients) and make recommendations about the general nature of the design (structure; sample sizes; sample allocations). Also, in the data analysis, we shall make use of as much related data as we can (e.g., GLSS data, GIS data), to improve the quality of the estimates.

5.2 Preliminary Sample Calculations

There are several approaches to estimation of sample size. One is to specify a level of precision (size of confidence interval) for certain estimates (e.g., estimates of a mean price change between two time periods, or of a "difference-in-difference" estimate of program impact), and determine

the total sample size required to produce this level of precision (under various assumptions about the survey design and the values of unknown parameters such as sampling costs, variances, and correlations). A second approach is to specify a level of power for a test of hypothesis (e.g., that a double-difference is greater than zero), and determine the sample size required to produce this level of power (under various assumptions).

For this application, we adopt the approach of specifying a power level for a test about the value of an overall difference-in-difference (e.g., that it is greater than zero), and estimate the total sample size required to produce that power, under various assumptions about the values of unknown parameters and structure of the survey design.

The same number of sample units be selected for both the treatment and comparison sample. In the proposal, it was proposed that three waves of sampling be conducted, with 412 primary sample units in each wave (206 treatment and 206 non-treatment in each wave). These sample sizes were estimated to provide a 95 percent probability of detecting a difference-in-difference value equal to or exceeding ten percent of the standard deviation of local price changes. During negotiations the sample size was reduced to 308 total observations (154 for both treatments and controls) with an 85 percent probability of detecting a difference-in-difference value equal to exceed ten percent of the standard deviation of local price changes. These are the sample sizes to be employed.

5.3 Sample Design Considerations

Feasibility of Estimating Impacts on Farm Incomes. The primary objective of the Impact Evaluation of Feeder Roads project is to assess the impact of feeder-road improvements on prices of goods sold in local markets (that are transported on improved roads). One of the first tasks of the project is to determine whether the evaluation research design in support of the primary objective can also be used to assess the impact of road improvement on farm sales, profits and farmer household income. According to the Terms of Reference, "Use spatial information from long-term monitoring surveys to evaluate the indirect impact of road improvement on farm sales, profits and farmer household income. *It is essential to note that the Consultant is only responsible to take on this task if it is possible to utilize the GLSS5+ Survey data, and it is not expected to collect any data related to farms or households.*"

During the initial visit to Ghana, the project team met with members of the staff of the Institute of Statistical, Social and Economic Research (ISSER) to discuss the sample design used for the GLSS5+ survey. Based on these discussions, it was concluded that it will not be possible to make meaningful statements about farm sales, profits and farmer household income in the Impact Evaluation of Feeder Roads project. The following paragraphs explain the reasoning behind this conclusion.

The evaluation research design to be used to assess the impact of feeder-roads improvements is called a "pretest-posttest / comparison-group.quasi-experimental design." With this design, the estimate of program impact will be made by comparing the change in prices before and after the program intervention, between localities close to improved roads and roads far away. Localities near roads improvements are referred to as "treatment" localities and roads far away are called "non-treatment" (or comparison or control) localities. The sample units used for the impact

evaluation will not be selected to be generally representative of the population, but to maximize the precision of the double difference estimate (by eliminating as much variation in sample units as possible, for variables other than treatment (road improvement)).

The sample design for the impact evaluation is similar to an "analytical" survey design, not a "descriptive" survey design. The design is similar to an experimental design, and is set up to maximize the precision of the double-difference estimate of program impact. This objective is achieved by selecting sample units that are as similar as possible with respect to all variables except treatment. This is accomplished by statistical matching. In the selection process, it is attempted to promote "local control" by eliminating extraneous sources of variation. As noted, GLSS uses EAs while the design here employs localities as the sampling unit (for reasons discussed earlier).

In order to maximize the precision of the estimate of feeder-road improvements on prices, it is recommended that the sample be evenly distributed between treatment and comparison (control) experimental units (localities). The GLSS5+ survey, however, was conducted only in MiDA districts. For the evaluation design, it is expected that some, perhaps many, of the comparison units will be outside of MiDA districts. This may reduce, perhaps by about half, the number of sample units for which GLSS5+ data would be available, even if the PSUs for the two surveys were the same (which they are not). Worse, GLSS5+ data would be generally available only for treatment PSUs (localities), not for comparison PSUs (some of which are likely to be located outside of the MiDA intervention area). Furthermore, the number of EAs used for the GLSS5+ survey is not large, so that the likelihood of having "overlap" between the PSU areas of the GLSS5+ survey and of the impact evaluation would be low.

In summary, the primary sample units for the two surveys are different (for good reason), and the geographical overlap between them will be low (especially since the GLSS5+ is conducted only in MiDA districts). The sample designs for the two surveys are quite different, with the design for the GLSS5+ being oriented toward description of population characteristics and the design for the impact evaluation being oriented toward estimation of a double difference. Under these conditions, it will not be possible to construct an estimate of the impact of the program on farmer sales, profits or income, using the GLSS5+ survey data.

Sample Unit Selection. In using matching to construct a comparison group, it is desirable (as mentioned earlier) to use sample units that are as small as possible, relative to the ultimate sample unit (the vendor). The matching is performed on these sample units. There are several factors that determine the choice of sample unit, including cost, intra-unit correlation, and data availability. From the perspective of matching, the most important of these is data availability. Sources of pre-survey information are government data systems, previous surveys, and geographic information systems. In our initial visit, we identified several sources of data that could be useful in the survey design, including the Ghana Living Standards Surveys (GLSS) surveys, the Core Welfare Indicators Questionnaire (CWIQ), and a collection of geographic information system (GIS) data.

The GLSS and CWIQ data were provided to NORC personnel during the initial visit to Ghana. A number of contacts were identified for GIS data. When all of the relevant data are obtained, work will proceed on matching and sample selection. The sample unit on which the matching

will be performed will be determined after the GIS data are reviewed. In the NORC proposal, it was assumed that the primary sample unit would be a village (the sample size estimates discussed in the proposal referred to villages). During the course of the initial visit, it appeared that the more general term "locality" is probably more appropriate than "village." The extent to which the various data sources will be useful in matching will be determined by the extent to which they provide data for localities in the areas of interest. At the present time, it appears that the GIS data will be very useful, but the GLSS and CWIQ data will be of limited usefulness.

Although the basic design for the impact evaluation is a pretest / posttest / comparison-group design (with the comparison group constructed using matching), we intend that the survey data will also be useful for estimating the relationship of program impact on variables of interest. In particular, it is planned to develop a statistical model that expresses impact as a function of travel time or travel cost. To construct such a model, it is desirable that the sample data reflect a wide range of variation in all variables (other than the treatment intervention, and that are known prior to the survey) that may have an influence on the impact of the program intervention or that may have affected selection for the program, and that the correlation among such variables be low. The survey design will be constructed to promote these conditions, to the extent possible. Note, in particular, that in addition to including sample units close to and far from the treatment roads, it is desirable to include some at intermediate distance, also.

Sample Size Limits on Tabulations. A comment is in order relative to the description of Item 20 of the list of contract deliverables (page 36 of the contract). That item states, "Final Report of Phase III Surveys with results disaggregated by Zone, District, Community, and other relevant socio-economic characteristics submitted." The sample size proposed for this project is not large, and it was determined by considering the power of tests of hypotheses about a double-difference measure of impact for the entire project. It was not intended to provide estimates for small geographic areas. Because the survey design will be an "analytical" survey design, a certain amount of control will be exercised over explanatory variables of interest (such as travel time), and it will be possible to estimate the relationship of program impact to these variables.

6. Identification of Potential GIS Data Sources

Spatial analysis, creation of spatial variables (such as variation in village spatial/travel-time proximity to infrastructure improvement projects) and use of GIS to support this were identified explicitly as key components of the evaluation methodology in the MCC Request for Proposals, and by the NORC team. Consequently, the identification and obtaining of key Ghana GIS datasets was a high priority of the initial site visit.

6.1 Key GIS Data Needed for Evaluation

The NORC team identified the following types of spatial digital data as high priority for the evaluation methodology:

- Digital Ghana road network data, including:
  - Geo-locations of MiDA road improvements (including MiDA Tranche A & B road improvement locations, and MiDA trunk road improvements)
  - Complete Ghana trunk road network
  - Complete Ghana feeder road network, if possible
  - Geo-locations of roads improved in the last 3 years, by Ghana Ministry of Transport and international Donor organizations, for statistical control purposes and sample selection
  - Geo-locations of road networks planned for improvement in the next 3 years, for statistical control purposes and sample selection
  - Data on variation in road quality, number of lanes, actual travel-time measures, etc.
- Ghana digital administrative boundaries (regions, districts and enumeration areas)
- Geo-locations of Ghana cities, towns and villages – "localities"
- Ghana physiographic digital spatial data, including:
  - Digital elevation and topographic data
  - Hydrology and hydrography
  - Digital spatial agricultural suitability
  - Digital spatial data on rainfall variation in Ghana or agro-ecological suitability mapping
  - Ghana landcover
- Data on Ghana traffic flows
- Geo-locations of Ghana local markets

These GIS data will allow us to characterize all Ghana villages and markets using

A. a wide range of variables describing variation in proximity/access to infrastructure and markets,
B. in terms of traffic flows,
C. in terms of proximity to road segments that have been improved in recent years or are planned for improvement (to provide controls for these impacts, allowing us to distinguish statistically from MiDA project impacts),

D. and in terms of a wide-range of important physiographic factors that are highly likely to impact agricultural and economic output

Once the markets and localities are characterized using these GIS variables, they can be used to draw the treatment and comparison samples for the evaluation, greatly improving the identification of treatment and comparison areas and improving statistical matching between treatment/comparison observations.

6.2 Identification and Acquisition of Ghana GIS Data

During the NORC site visit to Ghana in March, 2009, efforts were made with support from MiDA and from a local partner to identify the best possible sources for the above list of GIS data needed. To support this process, a local GIS expert with extensive connections to Ghana government and research agencies was hired, and MiDA formally requested most of this data through official government protocols facilitating the exchange of data between Ghana government agencies.

The following Ghana agencies were identified as sources for the needed data during the site visit, and by the GIS consultant hired by NORC after the site visit. Consequently, the NORC consultant, under supervision from NORC and with support by MiDA, contacted these source agencies to arrange for the acquisition of the data, through formal government data exchange protocols with MiDA whenever possible, or through purchase otherwise.

The Table 6.1 lists GIS dataset sources identified by NORC:

Table 6.1 GIS Data Sets Identified by NORC and under Acquisition

DATA CATEGORY	Data Description	Identified Source
GIS Vector Road Data	Ghana Feeder Road Network	Ministry of Transport
GIS Vector Road Data	GIS Data for MiDA Tranche A roads (362 km)	MiDA
GIS Vector Road Data	GIS Data for MiDA Tranche B roads (583 km)	MiDA
GIS Vector Road Data	GIS Data for MiDA TRUNK Road improvements (75.8 km)	MiDA
GIS Vector Road Data	GIS data for all Ghana Feeder roads improved in last 3 years (2006-2008) by Governmment of Ghana (GoG)	Ministry of Transport
GIS Vector Road Data	GIS data for all Ghana Trunk roads improved 2006-2008 by GoG	Ministry of Transport
GIS Vector Road Data	GIS data for all TRUNK and FEEDER roads improved by GoG Partners (World Bank, EU, etc.) in 2006-2008	Ministry of Transport
GIS Vector Road Data	GIS data for all PLANNED road improvements among GoG and GoG Partners for 2009-2011	Ministry of Transport
GIS Administrative Data	Ghana administrative boundaries: regions, districts, enumeration areas	CERSGIS
GIS Administrative Data	Ghana locality point locations (cities/towns/villages) with population values 2006	GSS
Data on Ghana MARKETS	Descriptive data for Ghana localities on whether they have permanent or temporary markets	CERSGIS
GIS Physiographic Data	Ghana Digital Elevation Model (DEM)	Ghana Soil Research Institute (SRI)
GIS Physiographic Data	Digital Topographic Map of Ghana, including hydrography,	Ghana Survey Department
GIS Physiographic Data	General Agricultural Suitability Map (function of soil quality, rainfall, elevation)	Ghana Soil Research Institute (SRI)
GIS Physiographic Data	Agro-Ecological Zones of Ghana	Ghana Soil Research Institute (SRI)
GIS Physiographic Data	Rainfall Variation in Ghana	Ghana Meteorological Department
GIS Physiographic Data	Ghana Landcover 2000	CERSGIS
Traffic Data	Traffic COUNT data for trunk roads	Ministry of Transport
Traffic Data	Traffic COUNT data for FEEDER roads	Ministry of Transport
Traffic Data	Traffic Origin-Destination Survey, trunk or feeder roads	Ministry of Transport
Traffic Data	road segment travel-time data	Ministry of Transport
Road Quality Data	road quality variables for FEEDER roads	Ministry of Transport
Road Quality Data	road quality variables for TRUNK roads	Ministry of Transport
Road Quality Data	HDM Variables: International Roughness Index (IRI) and Vehicle Operating Cost (VOC) for TRUNK roads	Ministry of Transport
GIS Physiographic Data	Soil map of Ghana - FAO 1990, scale 1/250,000	Ghana Soil Research Institute (SRI)
GIS Physiographic Data	user manual for SRI physiographic data	Ghana Soil Research Institute (SRI)

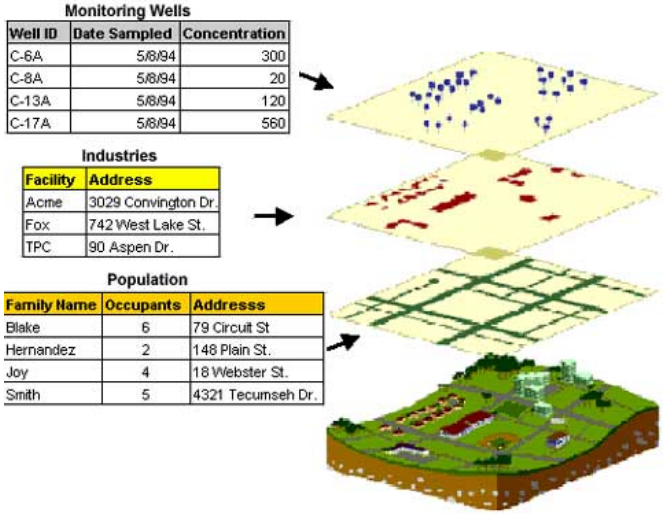
6.3 GIS Data Acquisition Status, May 2009

As of May 1st, 2009, the vast majority of GIS data listed in the above table had been acquired by NORC in digital format. However, some key datasets have still not been obtained by NORC. These include the following:

1. GIS Feeder Road network data from the Department of Feeder Roads. Formal request for this data has been made by MiDA, and NORC is waiting for official response from Department of Feeder Roads.
2. Data on traffic flows in Ghana from Ministry of Transport: NORC's consultant in Ghana has reported that this data is being processed and will be available "as soon as possible" according to the Ministry of Transport.
3. Locations and timings of roads in Ghana improved by international Donors. NORC established that this data was available at Ministry of Transport during site visit in March, 2009, and is currently working with its consultant to obtain
4. Geo-locations/GIS data for MiDA road improvement locations. Request has been made for this by NORC.

If the essential data, particularly the geo-coded locations of MiDA-financed road improvements, delays in this project's field work are possible.

6.4 GIS Systems



A Geographic Information System (GIS) is a computer geo-database system for capturing, storing, checking, integrating, manipulating, analyzing and displaying data related to positions on the Earth's surface. Each feature is linked to a position on the graphical image on a map and a record in an attribute table. By layering information such as road networks, village or community locations, and population, spatial relationships among the objects being mapped can be emphasized. A GIS differs from other information systems because it combines common database operations such as query and statistical analysis with the benefits of visual and geographic analysis offered by maps. In addition, tabular data can be attached to each GIS object, and is incorporated into the central GIS database in "attribute tables." Thus, for example, if cities or towns are represented by spatial point objects, then any of a host of socioeconomic variables describing those cities or towns can be included in the database and integrated (such as city/town population, number of households, date of incorporation, etc.). In the case of a curvilinear line segment in a GIS road network, variables describing the pavement type, approximate road quality, legal speed limit, or date of last maintenance can be included in the GIS database.

6.5 GIS Accessibility

This sub-section describes several methodologies for calculating relative locality or market accessibility to markets or cities that will likely be used by NORC in the Ghana evaluation for characterizing observations (by variation in accessibility) and for drawing treatment/comparison samples.

There is extensive spatial economic theory (agglomeration theory) that describes the fact that spatial access to markets, controlled by transportation costs, is crucial in economic development. In this sense, evaluation of impact of the Ghana road upgrades is unlike other impact evaluations in that the level of treatment is not a discrete binary function (road or no road) but a continuous one, particularly where the treatment is not the construction of a new road where one did not previously exist, but the upgrading of an existing road. In such cases, the degree of treatment varies in two ways:

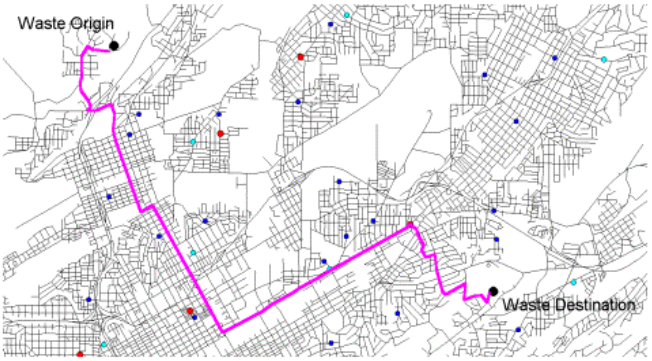
- ***Degree of access to the road.*** Because roads have a fixed spatial placement, access to a road of a particular household or community is a function of location. The level of access for a household located adjacent to the road is better than that of a household located some distance from the same road.

- ***Quality of access to the road.*** The second dimension of access is quality; is the means of access one that allows for easy and efficient travel and transport of good to the road? Higher quality access to the road is expected to yield a greater impact.

In general, "access" to markets is determined by the household's or village's true cost of traveling to or accessing market centers. This could include the cost of transporting goods for sale, transporting (back to the village) key inputs for production or consumption, or the cost of transporting people for migratory or more permanent employment. Thus, effective access to urban markets also depends on the willingness and ability to afford transport costs, and these in turn are directly a function of road quality as well as actual measured road distance, topography, climate, rivers or any other potentially inhibiting (and thus more costly) exogenous geo-physical barriers.

GIS can be used to assess accessibility as a function of road quality, the time of road building, geography, topography, and other factors that aid or hinder access ("quality of access"), including political or administrative policies or traffic congestion.[1] Using GIS to give continuous accessibility values to observational units, regressions between continuous indices and selected impact variables could be run, to illuminate trends and patterns, establish correlations, and bolster and support conclusions. Furthermore, multivariate regression models could be constructed with the inclusion of controls that might influence or mitigate true accessibility, such as tax policies or after-effects of natural disasters.

There are several options for developing accessibility indicators depending on the choice of distance variables used in the computation. These include: (a) indicators based on "straight-line" or Euclidean distance; (b) indicators incorporating topography; (c) indicators incorporating the availability of transport networks; (d) indicators incorporating the quality of transport networks; and (e) movement across a "cost surface". The best alternative is to use actual measured distance along road networks as the basis of the inverse weighting parameter and to incorporate information on the quality of different transportation links. Feasible travel speed and thus travel times will vary depending on each type of network link. A place located near a national highway will be more accessible than one on a rural, secondary road. The choice of the friction parameter of the access measure will therefore strongly influence the shape of the catchment area for a given point—i.e., the area that can be reached within a given travel time. This, in turn, determines the size of potential market demand as measured by the population within the catchment area.



[1] See, for example, Harvey J. Miller and Yi-Hwa Wu (2000), "GIS Software for Measuring Space-Time Accessibility in Transportation Planning and Analysis," *GeoInformatica* , 4, pp. 141-159 and Luis Rosero-Bixby, "Spatial Access to Health Care in Costa Rica and its Equity: A GIS-based Study," *Social Science & Medicine*, 58, pp. 1271–1284

Calculating accessibility or distance through a road network is sufficient if one is only interested in locations that are on that road networks. However, what about locations for which accessibility must be calculated that are not located on the road network? Or, what about calculating travel time/cost across areas for which there are no road networks? There are a variety of approaches to this, but it is usually accomplished by creating a GIS *cost surface*.

The cost surface establishes the impedance for crossing each *individual* unit of space, even if there is no road network data for that area, as a function of other variables (such as elevation, land cover, etc.). If we then want to incorporate into the cost surface road network travel time estimates from our road network (including data on road quality or road speed), then that network would also be included with the approximate road speed for each road segment mapped to the corresponding (spatially overlying) grid cell. Then, the averaged road speed would be used to calculate the cell crossing time by using the following equation:

$$CCT = \frac{P \times 60}{TS \times 1000}$$

where:

CCT - Cell Crossing Time (minutes)
P - Pixel Size
TS - Traveling Speed (Km/h)

For example if one is traveling in a 2-lane highway with average road speed of 80 kilometers per hour through pixels 100 meters across, the result is the following:

$$CCT = \frac{P \times 60}{TS \times 1000} = \frac{100 \times 60}{80 \times 1000} = \frac{6}{80} = 0.075$$

or .075 minutes (4.5 seconds to cross 100 meters). The following table shows the resulting pixel travel times for a variety of potential road speeds:

Road Category	Average Speed	Cell Crossing Time (minutes)
IP highway	110	0.0545
IP 2 lane	80	0.0750
IC highway	110	0.0545
IC 2 lane	70	0.0857
National Road	60	0.1000
Regional Road	55	0.1091
Municipal Road (former national)	50	0.1200
Municipal Road	50	0.1200

For land outside the road infrastructures, pixel crossing speeds are estimated based on the combination of input layers going into the overall construction of the cost surface. For example, a base "walking time" of 6 kilometers per hour might be established, but be altered depending steepness of slope, elevation, landcover, etc. Other considerations are important, such as the fact that highways can typically only be entered or exited at specific points, whereas dirt or smaller paved roads could theoretically be entered at any point. Specific GIS algorithms exist to model these situations.

6.6 Incorporating Physiographic Data

Once the physiographic data layers are assembled in the GIS, along with geo-locations of impacted localities (such as villages), then the GIS can quickly "map" to each community variables describing the respective physiographic conditions for each. Also, these data inputs can be used to weight the road network segments, as well as the areas of land leading to the nearest road network (in the case of villages that have no road network connection, if these exist).

7. Data Collection and Processing

7.1 Defining and Measuring Impact Variables: Market Prices and Transport Tariffs

Market Prices

Items to be Priced. The key evaluation task is to estimate changes in the prices of a standard list of goods at local outlets in treatment and control areas. To help increase comparability and continuity, NORC intends to price a subset of items that were priced in the GLSS-5 and GLSS-4. Our current survey has approximately 93 items divided between food and non-food items. Our price survey instrument specifies the quantity of each item to be priced and, where applicable, the specific brand to be priced. For all items and observations, data on unit sizes (both standard and non-standard) will be collected. In cases where non-standard measurements are encountered (such a pricing a 'standard bunch' or an 'olanka'), one weight measurement per market will be collected per item,[2] in addition to the unit size, to protect against changes to non-standard measurements over time. Draft instruments are included in Annex A.

Field Procedures. The goal is to obtain three independent price observations on each item, one from each of three retail outlets in each sample location, as was done in GLSS-4. Interviewers will be instructed to go first to relatively formal retail establishments to obtain prices and then to progressively less formal outlets. They will continue this process until they obtain three observations for each item. Interviewers will record the name, location, and contact information of the outlet for each observation of each item as well as the price. We foresee using the following scale to identify stores to take part in the survey:

1. Large retail outlets or supermarkets, followed by;
2. Kiosks of a smaller size, followed by;
3. Individual traders or stalls

In the follow-up survey rounds, interviewers will go to the same outlets to record the prices of the items. If the outlet no longer exists or no longer stocks an item, they will search for another outlet following the procedure outlined above and record the outlet's name along with the item's price.

It is very important that the surveys be done at the same time each year to avoid seasonal effects. This procedure is indicated in the TOR.

Constructing Price Indices. We will generally follow the procedures used in estimating a classic CPI, except in our case items' prices will not be weighted by their importance in a typical household's consumption. The field work will produce a price (based on the average of the three observations) for each item at each location. The index number then is simply the ratio of the price in time t+1 to the price in time t.

[2] The assumption is that within a market competition will keep "bunches" quite uniform in size at a point in time.

Two types of indices will be constructed: basic indices and aggregate indices. Basic indices are for one item at one location (sampling point). An example for one item in one location is a kilo of fresh cassava. Basic indices track the price change in the single item over time. On the other hand, aggregate indices are for groups of item-location observations. The following four types of aggregate indices will be constructed.

- An index for a single item across all locations in treatment and control areas separately.
- An index for major groups in a single location. "Major groups" are tentatively defined as food items, non food items, passenger transport costs, and freight transport tariffs (the later two described below).
- An index for each major group in all treatment and control locations separately.
- An index of all items across all locations in treatment and control areas separately.

Differences between treatment and control areas will be tested for single items and the four major groups.[3] As indicated above, due to differences in transportation costs among different items, one may observe variations in significant differences among product types.

In project Phase I, analysis will focus on differences in price levels. (It is not possible to construct an index with single point-in-time price observations.) In Phases II and III the analysis will focus on differences-in-differences between treatment and control locations for the variety of indices outlined above.

Transport Tariffs and Passenger Fares

General Approach. The first step in measuring tariffs and fares will be to identify for each sample location served by feeder roads the most frequent destinations for shipped goods and passenger travel. Our plan is for the interviewers to first locate the transport hub for each sampled location. After locating the transport hub (possibly two hubs one servicing individuals and one dedicated to transporting goods), interviewers will locate 3 knowledgeable informants to identify the 3 most common transport locations for individuals and goods. Knowledgeable informants will not be ticket sellers but rather individuals who work in close proximity to the transport or tariff hub (most likely workers in small kiosks near the hub) and would have a working knowledge of where people and goods are going. After asking for a ranking of locations (1 being is the most visited or shipped to place), interviewers will identify the 3 most common responses (based on the ranking) which will serve as our data collection points. Three independent observations for each location will be collected with locating information collected as indicated in the discussion of market prices. Our intent in defining 'common destinations' is less concerned with reaching perfect validity in identifying the three most common destinatations rather than in identifying destinations that should remain stable between data collection phases.

Additionally, for passenger travel, the interviewers will ask if how long the trip normally takes. This information on travel time is of interest in its own right as another indicator of road improvement outcomes but also will be used to calibrate the GIS models.

[3] The items in the groups will not be weighted. The existing CPI weights are not appropriate because items priced are used for both household and business consumption. For aggregation the observed mean price of each item at a location will be normalized by the mean of all price observations for that item to avoid higher priced items being given greater weight.

Passenger Fares. The price of a trip by bus or other modes should be available locally. If tickets are only sold by the vehicle driver, the interviewers will ask drivers about prices and try to confirm them with passengers, depending on whether trips are originating while the interviewers are in town. If tickets are sold at a transport hub kiosk, interviewers will survey kiosk employees after identifying the 3 most common locations traveled to. Bus type will also be designated during training and interviewers will only ask about prices for one type of bus. (The draft form is in Annex A.)

Goods Shipments Tariffs. With respect to obtaining information on the cost of transporting goods from the village to the city, it is important as a first step to identify what good and what quantity should be priced. Interviewers will ask about shipping 100 kg of dry cement, a common shipped good with a standard weight. Similar to the steps outlined above, interviewers will locate up to 3 knowledgeable informants to rank the most common destinations for transported goods from the sampled location. 3 independent observations (where possible) will be collected for each identified final destination. (The draft form is in Annex A.)

The supervisor for each location will consult with interviewers about which sources appear to be most knowledgeable information sources and rank them by perceived reliability.

7.2 Data Collection

Development of Operational Plan and Manuals. NORC will prepare a detailed operational plan for data collection and data delivery. The operational plan will include, but is not limited to, the following:

- Roles and responsibilities of field staff. NORC will develop detailed position descriptions for all field workers. The position description will include, but is not limited to, identifying the project objectives, defining the scope of the project, listing all critical project deadlines, stating the client and project stakeholders, listing the key roles and their responsibilities, creating an organizational structure for the project, documenting the overall implementation plan, and listing any risks, issues and assumptions that are necessary for the field workers to understand in order to carry out their duties at the highest level.
- Data security plan. According to the International Compilation of Human Research Protections, 2008 Edition, compiled by the Office for Human Research Protections of the U.S. Department of Health and Human Services, Ghana does not have any statutory requirements for security of sensitive survey data. The operational plan will therefore develop a data security plan that meets standards for U.S. institutional review boards with respect to data sets containing sensitive data and management of paper forms containing sensitive data.
- Field work schedule and management reporting. NORC will develop a schedule for each field team and outline the case management process for tracking the status of cases (complete, incomplete, refusals, unavailable), the need for any follow-up interviewing, and reporting on data collection progress.
- Defining quality assurance and data delivery process. NORC will define a plan for reviewing data as it is collected. This plan will include daily reviews by field supervisors

and coders and frequent reviews of data extracts by NORC and Pentax staff as well as case validation.

NORC has extensive experience in both developing training materials and implementing field training in international contexts which will ensure the process runs as efficiently as possible; we will work closely with Pentax to take advantage of their existing training materials. (NORC's survey staff will work closely with the Pentax team on development of manuals and will be in Ghana for the training, pre-test, and first week of data collection to provide support to Pentax.) Interviewer and supervisor manuals will address all aspects of data collection, beginning with identification of respondents, data collection once identification is completed, and all aspects of questionnaire administration and human subjects protections. The interviewer manuals will include modules on gaining cooperation, interviewing techniques, a study overview, section by section description of the questionnaire, keeping records and bookkeeping, respondent confidentiality, and exercises to utilize each job skill learned. The importance of recording clear and concise information will be stressed during the training. Naming protocols and accurate data entry will be stressed.

Institutional Review Board (IRB). An IRB is a group of senior survey experts that reviews all survey plans to ensure that respondents' privacy is respected and that access to the collected data is such that individual respondents cannot be identified.

NORC has extensive experience in preparing the documentation necessary to secure Institutional Review Board (IRB) approval. NORC has its own IRB, which follows a formal process for examining all research projects to assure human subjects protection. NORC's IRB is registered with the HHS Office of Human Research Protection and has a Federal-wide assurance (FWA 00000142). The NORC IRB Administrator and Chair are responsive to the need for timely reviews, and all Board members take an active role in helping guide protocols to meet the highest standards for human subject protections. NORC's IRB requires that research protocols provide sufficient detail to ensure that (1) the selection of subjects is equitable, subjects' privacy is protected, and data confidentiality is maintained; (2) informed consent is written in language that study participants can understand and is obtained without coercion or undue influence; and (3) appropriate safeguards protect the rights and welfare of vulnerable subjects. Prior to beginning field work, NORC will submit a formal research protocol that provides the purpose of the evaluation, procedures to which respondents are subjected, and the research benefits and risks. The protocol will detail the methods used to ensure confidentiality of the data and the process of obtaining informed consent from respondents.

Recruitment and Training of Field Staff. The key to the successful execution of a survey is in the quality, commitment and training of the field staff—field interviewers and supervisors. Field interviewers must be drilled to deliver the questions in exactly the way that they were designed and must fully understand the meaning and context of the questions. The uniformity of survey application is best ensured by keeping the field team as small as possible consistent with the time available for the study.

Pentax, with the oversight of NORC, will be responsible for advertising for, interviewing, and hiring all interviewing and data entry team members. To the maximum extent possible, Pentax will draw on its roster of field interviewers and supervisors with whom it has previously worked

in order to ensure the highest level of field staff quality. We will recruit the appropriate number of team leaders and interviewers to oversee and conduct the survey tasks within a relatively short four-week data collection period. All field interviewer and supervisor candidates will be interviewed by Pentax's Data Collection Field Manager to establish their experience, interpersonal skills, understanding of the basic concepts used in socio-economic surveys, ability to record accurately information on the questionnaires, capability to identify the appropriate people for the interviews, professionalism and neutrality, and capacity to understand the necessity of avoiding directing the respondents replies. Interview staff will have to be proficient in the local language of the areas in which they will be conducting the survey.

For the Supervisor candidates, their leadership qualities and objectivity will also be evaluated. Supervisors will be responsible for ensuring that respondents are correctly identified, making certain interviewers comply with all consent and confidentiality requirements as approved by the IRB, and to verifying the completeness and internal consistency of the questionnaires before they are returned from the field to the central office for data entry.

Based on these criteria, the best candidates will be invited to participate in the training. We will invite more field interviewers than required for the data collection to attend the training. The purpose of these supplemental interviewers is to allow for possible attrition during the training process as well as to supply replacements in the event field interviewers drop out during the data collection period. Should a field supervisor need to be replaced during the field period, we propose to promote a superior interviewer from within the team to the supervisory role, provide appropriate in-service training, and then substitute for him or her with a replacement interviewer. All trainees must complete the entire training session, including the field certification, in order to be eligible to work on the study. Those who complete the training but are not chosen as field interviewers may be used as coding or data entry staff.

Although the specifics of field staff requirements can only be finalized once the sample is drawn and the questionnaires finalized, we expect that each field team, consisting of four interviewers plus one supervisor. The four interviewers will be divided into two, two-person sub-teams; each having one person to collect price data and one to collect data on shipping tariffs and passenger fares per village. Each team will be able to collect data from four villages each day, with sub-teams of two interviewers covering two villages per day. As noted above, we will attempt to obtain 3 observations for each point of price data sought. Assuming approximately 100 villages per region, we will plan on using two teams per region and completing data collection in 25 work days, or approximately 4-5 weeks. The total number of field staff required will be 16 interviewers and 4 supervisors.

Training the field teams is a critical component for ensuring data quality. A successful training will provide the interviewer with a clear understanding not only of the design and content of the instruments, but also on how to administer the instruments in a manner that avoids introducing bias into the responses.

NORC will conduct a two stage training whereby team leads are trained first by an experienced NORC field staff trainer (Training of Trainers, or TOT). In the first stage Team leaders will receive comprehensive field management training from NORC's survey expert on all aspects of the project and data collection tasks, including enumeration, sampling, case management, quality

control, field supervision, and interviewer training. This training is estimated to take one day and will give us a pool of individuals who can then be tapped to take part in the training of field staff. NORC and Pentax will make every effort to recruit individuals to the team lead posts who have some level of experience in data collection or management.

The second stage of training is estimated to take four days and both interviewers and supervisors will participate (Table 7.1). The training will begin with an introduction to the Impact Evaluation of Feeder Roads and the goals of the project. It is important that interviewers as well as supervisors understand and believe in the study in order to ensure the highest level of data collection. In training, we must gain the interviewers' cooperation and interest from the start. Over the course of training, interviewers will learn how to gain cooperation; determine what constitutes an eligible unit for sampling (both for market surveys as well as tariff surveys), administer the survey to the appropriate respondents; correctly enter survey information; and conduct record keeping of all visits and contacts with the sampled respondents.

Table 7.1 Training Schedule

Day	Agenda
Day 1 – Field Managers	• Opening and logistics of training • Introduction to Ghana Market Survey • Survey design and methodology • Sampling and enumeration • The Price Module • The Passenger Transport Module • The Tariff Module • Field supervision • Tracking and Reporting
Day 2 – Interviewers & Managers	• Introduction to Ghana Market Survey • Survey design and methodology • The Price Module • The Passenger Transport Module • The Tariff Module • Role playing and interview techniques • Sampling exercises
Day 3 – Interviewers & Managers	• Survey Logistics • Survey Review • Exercises and role playing
Day 4 – Interviewers & Managers	• Field Pilot Test
Day 5 – Interviewers & Managers	• Pilot Test Debriefing • Interviewer Assignments

NORC's Interviewer training places great emphasis on using the skills field staff are learning. The training will require that interviewers perform repeated exercises to ensure that they fully understand the materials and are able to apply what they have learned in the field. Developing modules that test and hone the skills interviewers need in the field is a key component of NORC's training plan. Field Staff will be required to succeed when performing these exercises or have to repeat them until they are able to implement the skills at the highest possible level. NORC typically trains about 10 percent more staff than it will need, since a small percentage will not pass the exit exercises. Only those interviewers who pass the exit exercises will be hired as interviewers. In addition, some individuals find it difficult to interview and they only discover this when they are in the midst of training.

Following the classroom training, there will be one day for a pilot trial, which will also serve as the pre-test for the survey, giving the opportunity to test the survey instruments and protocols under realistic conditions (and adjust thereafter as needed). During the pilot each field interviewer and supervisor will be observed by the NORC/Pentax team responsible for managing the field work. The pilot will take place in villages near Accra that are not part of the sample, but that have similar characteristics. Once the pilot is concluded, the best candidates will be chosen as field interviewers/supervisors and substitutes will be identified.

Implementing Data Collection. The field teams will be supplied with their assignments and schedules at the start of each day. All equipment will be provided to the field teams at this time as well. Each field team will be supplied with enough materials (questionnaires, interview aids, etc.) to cover their daily assignment. Team supervisors will have a cell phone to be in permanent contact with the field manager, to solve any doubt or unexpected situation in the field.

The field interviewers will collect the data and return the completed questionnaires to the supervisor for review. The supervisor will check the work to ensure that the proper person was interviewed and for completeness before receipting the questionnaire as a complete case. Upon the successful completion of each interview, the team supervisor will identify the next respondent/location for survey administration. Team supervisors will be responsible for handling issues as they arise, such as gaining cooperation, and resolving questions about survey administration,.

Supervision and Quality Control. NORC and Pentax place a strong emphasis on guaranteeing the quality of data gathered in the field. To this end, fieldwork will be continually supervised by the Field Manager. Errors arising from field interviewers' mistakes are an under-rated source of error in statistical surveys. Often, great trouble is taken to design sample sizes that will produce acceptable expected errors (given expected variances) but little attention is paid to avoiding mistakes in the data gathering process as such.

During each day of data collection, team leaders will collect the completed surveys from each interviewer. The team leader will then select a small subsample of responses (5%) for data quality follow-up. He/she will revisit the retail outlets the interviewers visited to ensure that the items were collected from that outlet and priced correctly. In addition, the team leader will review all of the work of the interviewers each day to ensure legibility and consistency in filling

out the survey forms. After field editing the surveys, team leaders will seal the surveys in manila envelopes with the locality information filled out on the front of the envelop for delivery to the central office.

Field control sheets will be updated to reflect the day's work and this information relayed to the central office at least twice a week by cell phone communication. (An example of the control sheet is in Annex B.) In addition, each team will be visited at least once during data collection by the central office data collection manger who will collect completed forms (manila envelopes) to be returned to the central office. These forms will then be re-checked by central office staff to ensure data quality. The central office will consistently track the progress of each team using a specific form (Annex C).

At the end of the field period all surveys will be returned to the central office in manila envelopes for data entry. Locating sheets will be stored in the central office in a locked file cabinet between data collection phases.

The mechanisms for quality control in the field will include the following:

- Supervisors and field interviewers will be paid per day and not per questionnaire, to avoid fraud incentives.
- Team supervisors will review all questionnaires *in situ* to ensure that the information is complete and internally consistent. This will reduce the expected rate of incomplete questionnaires subject to follow-up visits.
- The supervisor will conduct case validation on a sample of respondents for verification purposes. (Given the close supervision of field interviewers that will be possible given the small team size and the ability of supervisors to carry out quick in situ reviews of questionnaires at the end of each interview, we believe a 5% validation rate is adequate.) We will develop a critical item validation list that will be used to validate key elements of the survey, ensuring that high quality data is being collected by the field interviewers. Case validations will include confirmation that the interview took place; the approximate time taken by the interview; and checking of key data of each questionnaire and will be carried out.

The supervisors will be responsible for completing a Work Log to document any issues with particular respondents or locations. This log will ensure we have a record of the field activities and will be especially useful in documenting missing data/anomalies in the final report. The log will also prove useful to the supervisors as a tool for recognizing problems or patterns related to the field interviewers during data collection. Each supervisor will be provided with a cell phone in order to relay information to the main office and in case of emergencies.

Data Processing. Data processing will take place in the Pentax central office in Accra. A database will be created for analysis in SPSS or other similar format. The data entry system will include controls that avoid the input of inconsistent data. Data processing will consist of the coding and input of data and in cleaning the database. To avoid the transcription errors all data will be input twice by separate data input clerks and inconsistencies in data entered identified and resolved. Data cleaning will be carried out for detecting and correcting, removing, or flagging incorrect data, errors in format, incomplete data, inconsistent data, etc. NORC survey

staff and the Team Leader will conduct on-going data extracts and methodological analysis of the questionnaires during the data collection field period to assess the completeness of responses, the consistency of responses, the quality of data captured, the effectiveness of the instruments in capturing the measures of interest, and the performance of the field staff, which will be summarized in the data collection report.

8. Work Plan

Because of the change in the Government of Ghana, the signing of the contract for this work was delayed. NORC proceeded to conduct the initial field visit, part of the Phase 1 activities, before the contract was signed. The period of this initial work done referred is referred to below as Phase 0, i.e., a portion of the work called for in Phase 1 in the RFP. The balance of the Phase 1 work is described under Phase 1 below. The numbering and content remaining Phases then correspond to those in the RFP.

8.1 Prior to Contract Signing

Background Review and Preparation. NORC moved quickly to complete necessary arrangements with subcontractors and to organize internally once the decision was taken to proceed. During the first two weeks, team members reviewed all Compact documents, including the MiDA M&E Plan and the economic analyses pertaining to the main hypotheses that the impact evaluation will test. We also reviewed the limited documents produced by ISSER regarding the overall impact evaluation of the MiDA Program and the GLASS5+ data. During this two-week period, the NORC team worked closely with our local subcontractor to make all necessary arrangements, including appointments with local counterparts, to make the initial trip to Ghana as efficient and productive as possible.

Initial Visit to Ghana and Inception Report. NORC's Team Leader, Economist/GIS-GPS Expert, Survey Expert and Statistician traveled to Ghana to organize the project. During this initial visit, the NORC team worked closely with MiDA, NORC's local subcontractor, Pentax, and local counterparts, including the implementers of the Feeder Roads activity to coordinate evaluation activities with implementation schedules, reach consensus on the evaluation design, and define data collection needs. Specific activities accomplished during this trip included the following:

- Met with the MiDA M&E team to discuss the proposed evaluation design, and review and identify any necessary changes to the proposed evaluation work plan.
- Met with the implementing for the Rural Roads Department to gather information on specific locations, operational details and implementation schedule for feeder road improvements.
- Met with ISSER to learn about overall MiDA impact evaluation and identify synergies and overlaps, if any. This meeting also included a discussion of the GLSS5+ data and this data set and full documentation was obtained for it.
- Gather information about factors taken into account in selecting feeder road segments for improvement to inform the selection of controls and the analysis.
- Confirmed the feasibility of our plans for selecting the samples of treatment and control location, refine the sampling plan as needed; begin background work on selection of treatment and control areas.
- Explored the availability of the information necessary to calculate sample sizes such as price variance within and among eight intervention districts. Discussions were held on

the definition of the sample points, the results of which are reflected in the discussion in Section 5.

- Worked closely with Pentax to:
  - Orient them on the details of the evaluation design and requirements
  - Discuss and reach consensus on methodology for conducting the price and tariff surveys;
  - Discuss and agree on requirements for interviewer training, including necessary training materials; develop training plan.
  - Discuss and agree on specifications for data sets including data cleaning requirements, aggregated and derived variables, data file format(s), metadata, and documentation.
  - Begin developing the field protocols and procedures for data collection and survey instruments.

- Identified available GIS data sets and the associated requirements for acquiring them. Because of the complexity of the acquisition process, with Pentax we engaged a local consultant to assist us in acquiring these data sets. The status of this activity is described in Section 6 of this report.

Project activities ceased when the team returned from the field and were resumed when the contract between MiDA and NORC was signed. The official contract start-of-work date is March 30, 2009.

8.2 Phase I (M+0 to M+9.5)

Data Collection Activities: Baseline. Under the guidance of the Team Leader, the Survey Design and Implementation Expert, Statistician, and GIS Expert will work closely with Pentax's data collection leader and team to conduct the following activities related to the market price and transportation tariff surveys:

- Finalize sample design and sample size calculations, making final decision on the level of disaggregation that MiDA requires in the analysis of the data; draw sample of market villages in the districts – this set of activities will be led by NORC's statistician.
- Develop survey protocols and procedures specifying exactly how price and tariff data will be collected at each sample villages or other sales locations.
- Design and test survey instruments - data collection forms – for both surveys. The market price instrument will be largely based on the questionnaire/form used for the GLSS5+. However, actual items to be priced for this evaluation will be determined in conjunction with MiDA and local experts. Once developed and pre-tested, draft instruments will be submitted to MiDA for review, and revisions will be made accordingly. Revised version of the instrument will be pilot-tested and finalized in time for interviewer training.
- Recruit and train field supervisors and interviewers. NORC's Survey Expert will work closely with Pentax to design a comprehensive training program, develop training

materials, and conduct two separate trainings for supervisors and field interviewers. The Survey Expert will spend a week in Ghana overseeing the training.

- Data collection – baseline collection of data on prices of food and farm inputs at markets in sample locations (treatment and comparison sites); collection of transport fares and tariffs to major markets from the same locations. NORC's Survey Expert will spend a week in Ghana observing the first week of data collection for quality control purposes. We anticipate that the week for oversight of interviewers training and the week for field observations may be combined into one two week trip.
- Data cleaning and entry and preparation of field work report – Pentax will be primarily responsible for cleaning and entering the data and documenting the dataset in accordance with specifications agreed to with NORC. NORC's Survey Expert will work with Pentax data collection team leader to review completed data sets to identify possible quality issues that could compromise the evaluation. Any data quality issues that varies will be addressed either through *ex post* transformation of the data or through changes in data collection for future rounds. In conjunction with the Survey Expert, the Data Collecion Team Leader will also produce a Fieldwork Report that describes field protocols and procedures followed, problems encountered, solutions implemented.
- Prepare and submit to MiDA the preliminary report of Phase I Survey. The report will include (1) descriptions of the sampling methodology and reliability; field methods and protocols followed for the survey; problems encountered and addressed during field work; and (2) a full description of baseline findings on price and tariff/fare variations across sample locations, presented in the form of cross tabulations and frequencies. The report will also contain detailed GIS-based accessibility and topographic information for every sample location. Final survey instruments will be presented in the Annex.
- Disseminate findings of Phase I Surveys – NORC and Pentax will share findings from the baseline surveys with local stakeholders at a half-day workshop. The Team Leader will travel to Ghana for one week for this purpose. Feedback, comments and recommendations received during the workshop will be incorporated into the final document, as appropriate and relevant.
- Finalize Phase I report.

8.3 Phase II (M+15 to M+23) and Phase III (M+24 to M+30)

Activities that will be conducted during Phases II and III will largely mirror those described under Data Collection Activities for Phase I. They will consist of:

- Adjust survey protocols and field procedures, as deemed necessary, based on observations made during baseline data collection
- Adjust survey instrument, based on experience during baseline data collection. Note, however, that these adjustments should be minimal, to preserve comparability of baseline data to subsequent data collection.
- Train interviewers – interviewers retained from Phase I will receive a refresher training, while new interviewers will undergo the comprehensive five-day training. Training materials and techniques from Phase I will be repeated/reused. Lessons learned and

problems encountered during the baseline data collection will be highlighted and addressed. The Survey Expert will spend a week in Ghana overseeing the training.

- Data collection – Phase II and III data will be collected at the same sample locations as the baseline, respectively 12.5 and 25 months after the previous round of data collection. NORC's Survey Expert will spend a week in Ghana observing the first week of data collection in each Phase for quality control purposes.
- Data cleaning and entry, data documentation, review of datasets for quality, and preparation of field work report.
- Prepare and submit to MiDA the preliminary report of Phase II Baseline Survey findings. The report will include (1) descriptions of any changes instituted during Phases II and III in field methods and protocols, problems encountered and addressed during field work; and (2) an analysis of changes in prices of goods and transports fares/tariffs computed using the difference-in-difference methodology described in Section A.2 above. GIS-based accessibility data will be fully integrated into the analysis. Geographic and socioeconomic disaggregation of impact findings will be presented in accordance with decisions made at in Phase I. Household income data from GLSS5+ will be integrated into the impact evaluation if possible, depending on timing and coverage of available data.
- Disseminate findings of Phase II and III Surveys – NORC will disseminate findings on the impact of the Feeder Roads activity on prices and transport tariffs at a one-day workshop for local stakeholders. Feedback, comments and recommendations received during the workshop will be incorporated into the final reports for each Phase, as appropriate and relevant.
- Finalize Phase II and III reports.

9. Project Schedule

Owing to the delay in executing the contract for this work, the Timeline has been pushed back approximately two months from that shown in the draft Inception Report. The first field visit, which took place before the contract was in place, is recorded at the top of the following chart. The project start date is March 30, 2009.

Table 9.1 Ghana Timeline

Tasks and Deliverables		Timelines	Staffing
Pre-contract Activities			
a	Background review and preparation: review of Compact, sector and background documents; internal organization and preparation of team; planning for initial trip to Ghana	Feb 2 – Feb 20, 2009	Team Leader Economist/GIS expert Statistician Survey expert Data Collection Team Leader
b	Initial visit to Ghana (2-3 weeks): meet with MiDA team, roads implementer, ISSER, GLSS5+ team; work with Pentax to define terms and requirements of data collection activities.	Feb 23 – March 6, 2009	Team Leader Economist/GIS expert Statistician Survey expert Data Collection Team Leader
Phase I (M+0 to M+9.5)			
1	Commencement of Services	March 30, 2009	
2	Inception Report covering all three phases of the evaluation of data, including Consultant's Work Plan which addresses all methodological aspects, Training Plan Submitted.	May 12, 2009	Team Leader Economist/GIS expert Statistician Survey expert Data Collection Team Leader
	Draft survey instrument for Phase I submitted to MiDA for review	May 26, 2009	Team Leader Survey expert Data Collection Team Leader
	Sample sizes finalized; samples drawn; survey protocols and field procedures developed	June 26, 2009	Team Leader Economist/GIS expert Statistician Survey expert Data Collection Team Leader
3	Feeder Roads digital maps and GPS coordinates within MiDA Intervention Zones reviewed and integrated into Evaluation design.	July 10, 2009	Team Leader Economist/GIS expert Statistician Data Collection Team Leader
4	Approved Survey Instrument for Phase I Submitted.	June 26, 2009	Team Leader Survey expert
5	Field supervisors and interviewers trained Field work for periodic surveys in Phase I conducted Field work Report Submitted.	Training (July 6-10, 2009) Phase 1 Fielding (July 13 – Aug 14, 2009) Field Work Report (Sept 4, 2009)	Team Leader Survey expert Data Collection Team Leader Field supervisors Field Interviewers

Tasks and Deliverables		Timelines	Staffing
	Data entry, cleaning, quality review and documentation completed	Sept. 25, 2009	Survey expert Data Collection Team Leader Data entry clerks
6	Preliminary Report of Phase I surveys including methodological approach, problems encountered during data collection, and description of findings, conclusions and recommendations presented to MiDA (data analysis and write-up).	Nov 6, 2009	Team Leader Economist/GIS expert Statistician Survey Expert Data Collection Team Leader
7	Findings of Phase I Surveys Disseminated to Stakeholders in Workshop Format.	Nov 25, 2009	Team Leader
8	Final Report of Phase I Surveys with results disaggregated by Zone, District, Community, and other relevant socio-economic characteristics submitted[4]. (Deliverable 3)	Dec 24, 2009	Team Leader Economist/GIS expert Statistician Survey Expert Data Collection Team Leader
Phase II (M+13 to M+21)			
9	Commencement of Phase II – review and adjust field procedures/protocols and questionnaires, as needed	April 26, 2010	Team Leader Economist/GIS expert Statistician Survey Expert Data Collection Team Leader
10	Approved Survey Instrument for Phase II Submitted.	May 27, 2010	Team leader Survey Expert
11	Field supervisors and interviewers trained/retrained Field work for periodic surveys in Phase II conducted Field work Report Submitted.	June 25 – Aug 26, 2010	Team Leader Survey expert Data Collection Team Leader Field supervisors Field Interviewers
	Data entry, cleaning, quality review and documentation completed	Sept 10, 2010	Survey expert Data Collection Team Leader Data entry clerks
12	Preliminary Report of Phase II surveys including methodological approach, problems encountered during data collection, and description of findings, conclusions and recommendations presented to MiDA.	Oct. 27, 2010	Team Leader Economist/GIS expert Statistician Survey Expert Data Collection Team Leader
13	Findings of Phase II Surveys Disseminated to Stakeholders in Workshop Format.	Nov. 26, 2010	Team leader
14	Final Report of Phase II Surveys with results disaggregated by Zone, District, Community, and other relevant socio-economic characteristics submitted.	Dec. 27, 2010	Team Leader Economist/GIS expert Statistician Survey Expert Data Collection Team Leader
Phase III			
15	Commencement of Phase III – review and adjust field procedures/protocols and questionnaires, as needed	Jan 25, 2011	Team Leader Economist/GIS expert Statistician Survey Expert Data Collection Team Leader

[4] This extent of disaggregation may not be possible with any degree of statistical validity unless we have prohibitively large sample sizes. Issues of sample size requirements for subgroup analyses will be addressed earlier in the process, prior to initiating data collection.

Tasks and Deliverables		Timelines	Staffing
16	Feeder Roads digital maps and GPS coordinates within MiDA Intervention Zones reviewed and integrated into Evaluation design – updating, as necessary.	Feb 27, 2011	Team Leader Economist/GIS expert
17	Field supervisors and interviewers trained/retrained Field work for periodic surveys in Phase III conducted Field work Report Submitted.	April 26 – May 28, 2011	Team Leader Survey expert Data Collection Team Leader Field supervisors Field Interviewers
	Data entry, cleaning, quality review and documentation completed	June 26, 2011	Survey expert Data Collection Team Leader Data entry clerks
18	Preliminary Report of Phase III surveys including methodological approach, problems encountered during data collection, and description of findings, conclusions and recommendations presented to MiDA.	July 28, 2011	Team Leader Economist/GIS expert Statistician Survey Expert Data Collection Team Leader
19	Findings of Phase III Surveys Disseminated to Stakeholders in Workshop Format.	Aug 25 , 2011	Team Leader
20	Final Report of Phase III Surveys with results disaggregated by Zone, District, Community, and other relevant socio-economic characteristics submitted.	Sept. 27, 2011	Team Leader Economist/GIS expert Statistician Survey Expert Data Collection Team Leader

Annex A:
Draft Survey Instruments

Survey Form Descriptions

1. The Market Price Survey Module

This survey collects market prices on a predefined set of items. Interviewers will enter locating information and distinct IDs on the cover page for markets as a whole. The cover page will also collect interviewer and supervisor IDs as well as general comments on the market as a whole.

Data will be entered on the following pages for three observations per item.

2. The Store Locating Module

This module collects locating information for each respondent/store visited. Interviewers will have multiple forms in order to collect information on all possible respondent/stores visited. Interviewers will collect the store name, owners name, stall number, and other identifying information first. Following data collection using the Price Module, interviewers will fill in the item number for each item priced at a particular store as well as the observation number for that particular item.

In subsequent rounds of data collection, interviewers will be able to use the locating sheet to find the same store again and price the same items there.

3. The Tariff & Transport Module

This survey collects information on transported goods and passenger fares using separate sheets for each.

For passenger fares and tariffs, interviewers will identify the 3 most common destinations from each market/location. After identifying the 3 most common destinations, interviewers will locate ticket sellers (or knowledgeable informants) and collect tracing information for each respondent (observations 1 -3). Interviewers will survey respondents for the cost of travel to each of the three locations identified. In the case of tariffs, the cost of transporting a standard bag of dry cement will be collected. This process will be repeated until three observations for each location identified have been collected.

Millennium Development Authority

REPUBLIC OF GHANA

GHANA MARKET SURVEY
PRICE MODULE

PHASE 1: 2009

REGION: ☐☐☐ **MARKET NUMBER:** ☐☐☐☐

GHANA MARKET SURVEY
PRICE MODULE

PHASE 1: 2009

REGION..... ☐☐ DISTRICT ☐☐
.....……..

NAME OF LOCALITY:_____

MARKET NUMBER: ☐☐☐

DATE: ☐☐ ☐☐ ☐☐☐☐
DAY MONTH Y E A R

INTERVIEWER:_____ CODE: ☐☐☐

SUPERVISOR:_____ CODE: ☐☐☐

REMARKS: _____

_____

_____

I. FOOD PRICES

CODE	ITEM	1ST OBSERVATION		2ND OBSERVATION		3RD OBSERVATION	
		SIZE	PRICE	SIZE	PRICE	SIZE	PRICE
001	Guinea corn/sorghum						
002	Maize						
003	Millet						
004	Rice (Local)						
005	Rice (Imported) Texas Long Grain Medium Size Bag						
006	Bread – sugar bread (1 loaf)						
007	Biscuits (Digestive – Medium)						
008	Flour (wheat)						
009	Maize ground/corn dough						
010	Corned beef (Exeter – Large)						
011	Beef						
012	Goat meat						
013	Mutton						
014	Chicken – fresh/high quality						
015	Red Fish (fresh)						
016	Fish (smoked tuna)						
017	Fish (fried)						
018	Fish (Titus canned sardines) Normal Standard Size						
019	Milk (powder)						
020	Baby milk (Lactogen –Medium)						

I. FOOD PRICES (Continued)

CODE	ITEM	1ST OBSERVATION		2ND OBSERVATION		3RD OBSERVATION	
		SIZE	PRICE	SIZE	PRICE	SIZE	PRICE
021	Tinned milk - Ideal (unsweetened)						
022	Tinned milk – Ideal (evaporated)						
023	Chicken eggs (1 dozen)						
024	Coconut oil						
025	Groundnut oil						
026	Palm kernel oil						
027	Palm oil						
029	Margarine (Blue Band – Medium)						
030	Kolanuts (Small Basket)						
031	Coconut (high quality – medium size)						
032	Banana (1 standard bunch)						
033	Oranges/tangerines (Small Basket)						
034	Pineapple (Small Basket)						
035	Mango (Small Basket)						
036	Avocado pear (Small Basket)						
037	Cocoyam leaves (kontomire/standard bunch)						
038	Garden eggs (Small Basket)						
039	Okro (Small Basket)						
040	Carrots						
041	Pepper (fresh)						
042	Large Onions (Small Basket)						
043	Fresh Tomatoes (Small Basket)						
044	Tomato puree (Salsa canned – medium size)						

I. FOOD PRICES (Continued)

CODE	ITEM	1ST OBSERVATION		2ND OBSERVATION		3RD OBSERVATION	
		SIZE	PRICE	SIZE	PRICE	SIZE	PRICE
045	Sugar (cube, granulated)						
046	Local Honey (Large Bottle)						
047	Ice cream (Vanilla Fan Ice - Large)						
048	Chocolate (Golden Tree– medium)						
049	Salt (1 Satchet)						
050	Ginger (Small Basket)						
051	Cassava (small bunch/10 pieces)						
052	Cocoyam (small bunch/10 pieces)						
053	Plantain (high quality/5 fingers/non-ripe)						
054	Puna Yam (1 tuba)						
055	Red Beans						
056	Groundnuts (raw)						
057	Groundnuts (Paste)						
058	Palm nuts						
059	Cassava - dough						
060	Gari						
061	Coffee (Nescafe – medium tin)						
062	Chocolate drinks (Milo – medium)						
063	Lipton Tea (25 bags)						
064	Soft drinks (Coke or Fanta)						
065	Malt drinks (Malta Guinness)						
066	Mineral water (Voltic bottled - large						

I. FOOD PRICES (Concl'd)

CODE	ITEM	1ST OBSERVATION		2ND OBSERVATION		3RD OBSERVATION	
		SIZE	PRICE	SIZE	PRICE	SIZE	PRICE
067	Akpeteshie (Beer bottle)						
068	Palm wine/Raffia palm wine (Beer bottle)						
069	Pito/Brukutu (Beer bottle)						
070	Beer (Star Lager)						

II. NON - FOOD PRICES

CODE	ITEM	DESCRIPTION	1ST PRICE	2ND PRICE	3RD PRICE
071	Cigarette (1 pack)				
072	Charcoal (small bunch)				
073	Key Soap (by the bar)				
074	Lux (1 bar)				
075	Dettol (medium)				
076	Insecticides – 1 PACKET (coil)				
077	Matches (1 small box)				
078	Toilet papers (1 roll)				
079	Candles (1 stick)				
080	Pain killers (1 sachet/10 capsules)				
081	Anti malaria medicines (Malafin/4 piece sachet)				
082	Condoms (champion 3 pack)				
083	Petrol (1 liter)				
084	Diesel (1 liter)				

II. NON - FOOD PRICES (Concl'd)

CODE	ITEM	DESCRIPTION	1ST PRICE	2ND PRICE	3RD PRICE
088	Exercise books (small exercise book)				
089	Mesh/wigs (Nina weaves)				
090	Toothpaste (Pepsident large)				
091	Razor blades (5 blade sachet)				
092	Sure deodorant				

Millennium Development Authority

REPUBLIC OF GHANA

GHANA MARKET SURVEY

LOCATING SHEET

2009

REGION: | | | MARKET. NUMBER: | | | | |

Owners Name	
Store Name	
Stall Number	
Locating Information	

Market ID:_____

Items Priced

ITEM CODE	Please Select the Observation Number for Each Item Recorded (select one only)		
	1ST OBSERVATION	2ND OBSERVATION	3RD OBSERVATION

Owners Name	
Store Name	
Stall Number	
Locating Information	

Market ID:_____

Items Priced

ITEM CODE	Please Select the Observation Number for Each Item Recorded (select one only)		
	1ST OBSERVATION	2ND OBSERVATION	3RD OBSERVATION

Millennium Development Authority

REPUBLIC OF GHANA

GHANA MARKET SURVEY

TARIFF & TRANSPORT MODULE

PHASE 1: 2009

REGION: | | | MARKET. NUMBER: | | | | |

GHANA MARKET SURVEY
TARIFF & TRANSPORT MODULE

PHASE 1: 2009

REGION..... ☐☐ DISTRICT ☐☐
.....……..

NAME OF LOCALITY:_____

MARKET NUMBER: ☐☐ ☐☐

DATE: ☐☐ ☐☐ ☐☐☐☐
DAY MONTH Y E A R

WHAT IS TRANSPORTED PEOPLE ONLY….1 ☐
GOODS ONLY….2
PEOPLE & GOODS…3

INTERVIEWER:_____ CODE: ☐☐☐

SUPERVISOR:_____ CODE: ☐☐☐

REMARKS: _____

_____

_____

Transport Costs

Market ID:_____

1ST OBSERVATION	
Location Name	
Respondent Name	
Locating Information	

DESTINATION 1			
Starting Point	Ending Point	Travel Time	Passenger Cost

DESTINATION 2			
Starting Point	Ending Point	Travel Time	Passenger Cost

DESTINATION 3			
Starting Point	Ending Point	Travel Time	Passenger Cost

Was information on goods also collected at this location?

☐ Yes

☐ NO

Transport Costs

Market ID:_____

2ND OBSERVATION	
Location Name	
Respondent Name	
Locating Information	

DESTINATION 1			
Starting Point	Ending Point	Travel Time	Passenger Cost

DESTINATION 2			
Starting Point	Ending Point	Travel Time	Passenger Cost

DESTINATION 3			
Starting Point	Ending Point	Travel Time	Passenger Cost

Was information on goods also collected at this location?

☐ Yes

☐ NO

Transport Costs

Market ID:_____

3RD OBSERVATION	
Location Name	
Respondent Name	
Locating Information	

DESTINATION 1			
Starting Point	Ending Point	Travel Time	Passenger Cost

DESTINATION 2			
Starting Point	Ending Point	Travel Time	Passenger Cost

DESTINATION 3			
Starting Point	Ending Point	Travel Time	Passenger Cost

Was information on goods also collected at this location?

☐ Yes

☐ NO

Tariff Costs

Market ID:_____

1ST OBSERVATION	
Location Name	
Respondent Name	
Locating Information	
Type of goods transported	

DESTINATION 1			
Starting Point	Ending Point	Travel Time	Tariff

DESTINATION 2			
Starting Point	Ending Point	Travel Time	Tariff

DESTINATION 3			
Starting Point	Ending Point	Travel Time	Tariff

Was passenger transport information also collected at this location?

☐ Yes

☐ NO

Tariff Costs

Market ID:_____

2ND OBSERVATION	
Location Name	
Respondent Name	
Locating Information	
Type of goods transported	

DESTINATION 1			
Starting Point	Ending Point	Travel Time	Tariff

DESTINATION 2			
Starting Point	Ending Point	Travel Time	Tariff

DESTINATION 3			
Starting Point	Ending Point	Travel Time	Tariff

Was passenger transport information also collected at this location?

☐ Yes

☐ NO

Tariff Costs

Market ID:_____

3RD OBSERVATION	
Location Name	
Respondent Name	
Locating Information	
Type of goods transported	

DESTINATION 1			
Starting Point	Ending Point	Travel Time	Tariff

DESTINATION 2			
Starting Point	Ending Point	Travel Time	Tariff

DESTINATION 3			
Starting Point	Ending Point	Travel Time	Tariff

Was passenger transport information also collected at this location?

☐ Yes

☐ NO

Annex B:
Draft Control Sheet

Ghana Market Survey Tracking Sheet[5]

Team Name: _____ **Locality ID: _____**

Locality Name	Locality ID	Current Date	End Date	Dispositions		Notes
				Market Survey	Transport and Tariff Survey	

Disposition Codes

No action (no contact has been attempted yet): 00

Completed (survey complete): 01

No competent respondent located: 02

Postponed/Rescheduled (survey was postponed and a new time scheduled): 03

Location was not found(final incomplete): 04

Location does not exist⊗final incomplete) 05

Partial Complete/Will Return (survey was stopped but will continue later): 06

Partial Complete/Interview Finished (interview was stopped and will not continue): 07

[5] Each day the team is on the site, enter the disposition code listed below that best describes the situation in the columns headed "dispositions."

Annex C:
Home Office Control Sheet

Annex C

Home Office Control Sheet

Central Office Receipt Control Sheet						
Locality ID	Locality Name	Team Name	Date Updated	Current Disposition - Market Survey	Current Disposition - Transport and Tariff	Notes