Review of a comprehensive baseline survey using nutritional indicators in Ethiopia

Summary

This paper reviews a cross-sectional baseline survey conducted during 1998-1999 in the Southern Region of Ethiopia in the context of the Southern Region Co-operatives Development and Credit Project. The survey was undertaken prior to the water supply, health and basic sanitation component of the IFAD/BSF joint programme. Baseline surveys are an effective way of determining benchmark indicators for monitoring and evaluating projects. In order to visualise and measure changes in the nutritional status of the target population, common anthropometric indices such as weight-for-age, height-for-age, and weight-for-height of 1548 children less than five years were collected. A set of key indicators, as determinants of the nutritional status was obtained through 1408 household interviews. The survey was characterised by its holistic design and assessed need and supply, as well as demand at different levels. It was carried out using local structures and mobilising project implementation staff. Commonly encountered constraints are identified and options for improvement are documented. The experience in Ethiopia suggests that baseline surveys can achieve more than data collection alone and lead to capacity building and participation of stakeholders, thereby increasing overall project effectiveness.

Keywords: Nutritional indicators, Ethiopia, baseline survey, anthropometry.

Lachat Carl
International Course in Food Science and Nutrition
University of Ghent, Faculty of Agriculture and Applied Biological Sciences
Coupure links 653
B-9000 Ghent
Belgium
Tel: +32 (0) 9 2646180
E-mail: carl_lachat@hotmail.com

Introduction

The present paper assesses a baseline survey, conducted in the context of the International Fund for Agricultural Development - Belgian Survival Fund (BSF)-Joint Programme in the Southern Nations, Nationalities and Peoples Region of Ethiopia. Its aim is not to document outcomes in terms of data collected and indicators identified. It appraises the value of a baseline survey that uses nutritional indicators, substantiated by the field experiences in Ethiopia.

The baseline survey was undertaken from September 1998 till August 1999, and served as inception of the Water Supply, Health and Basic Sanitation component of the Southern Region Co-operatives Development and Credit Project (SOCODEP). The SOCODEP project funded by IFAD and governed by the government of Ethiopia consists of three main parts: (1) development of service co-operatives, (2) provision of credit for agricultural and off-farm activities, (3) rehabilitation and construction of rural roads in the project area. The SOCODEP activities were strengthened with a BSF environmental health programme to secure a healthier life for the SOCODEP target group (IFAD, 1997). The BSF water supply, health and basic sanitation component aimed at enhancing the health, nutritional and social status of the target population in eight selected districts\(^1\) and ensuring sustainable use of water supply, sanitary facilities and primary health care services. It would have a direct positive impact on

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\(^1\) The eight districts selected for the BSF component were Konso Special Woreda, in North-Omo zone: Damot Galle, Sodo Zuria, Goffa Zuria, Offa (Gesuba), Chencha Zuria, and in Kaffa-Shaka zone: Chena and Tellocheta woreda.
the public health and well being of the rural communities involved. Beneficiaries participated in the design and implementation of the initiative in order to increase their sense of ownership.

During a participatory planning workshop of the component, the need for a baseline reference was recognised and a blueprint for the survey was prepared. Limited quantitative and qualitative data would be collected using a participatory methodology in order to aid the co-ordination management unit to track the impact of the project, as well as to enable community project committees to assess progress in implementation and results in terms relevant to themselves. The baseline was to be the benchmark for monitoring future impact of the component activities as a tool for planning, monitoring and evaluation.

Objectives

In brief, the baseline survey served two purposes:

1. Monitoring and evaluation by:
   - Aggregating a concise set of baseline reference indicators with their rational targets and;
   - Strengthening technical and organisational capacity of the implementing institutions by organising continuous training.

2. Streamlining and fine-tuning of planned activities through:
   - Identification of the main determinants of malnutrition and food insecurity, especially among the most vulnerable groups of the population like women and children;
   - Identification of priority areas for promoting nutrition programmes in order to reinforce the planned component with nutrition activities;
   - Creating awareness of the planned intervention at various levels and sectors of project implementation;
   - Characterisation of vulnerable population members, as specific target group of the BSF component and;
   - Identification of human resources, skill gaps and training needs at government, non-government and community level.

Rationale: a holistic approach

The approach of the baseline survey fits in the comprehensive bottom-up approach adopted by the BSF component. During the preparation of the component, a participatory approach was always a key issue. The survey focused on the demands of the community. In this context, demand refers to the behaviour by which an individual or community seeks relief for his or its suffering. Planning interventions, however, involves rational judgements. Project implementation has to be an objective and practical response to the demand, taking the need of the community into consideration. The concept of need differs from demand in that need is an objective assessment, usually put forward by professionals. A third step was to address supply: the available resources and structures. The survey was designed on the premise that efficient, well-targeted and sustainable interventions are to be found where need, demand and supply come together (Figure 1).
Methodology

The survey was undertaken using local resources and mobilising project implementation staff at different levels and health institutions. A core-team with responsibility for co-ordinating the survey was formed at the regional level. An external consultant was involved for the survey methodology, design of the forms, data entry and processing. The organisation of the survey was essentially broken down into two consecutive parts. A 'supply side survey' addressed the available structures and services at the lowest implementation level such as district offices and health institutions. Subsequently, a 'demand side survey' addressed the beneficiaries through household interviews and anthropometric measurements in the BSF target area.

Supply side survey

In each district, following groups of people were invited to participate in two-day workshops: focal persons for the BSF component at zonal level, health providers of the selected health facility, officials from district offices, community based health providers and service co-operative members. All workshops were conducted in Amharic, with translations to the local language whenever necessary. The methodology of the supply side survey was participatory as implementers of the BSF component at various levels sat together and discussed prevalent problems in their district.

Group discussions and a fixed questionnaire form were used. The questionnaire was designed to extract qualitative and quantitative information and inventoried what was locally available, including periodically compiled data from health institutions, district offices and other organisations in the area. In addition to this, it was probing for local traditional practices. After completing the questionnaire, the participants were asked to list and rank the main causes of malnutrition in the district. Important relations between the factors were discussed. Due to time constraints however, a complete causal model could not be put together.

Demand side survey

The second phase of the baseline survey was organised after processing the supply side data. It consisted of household interviews in each of the districts. As in previous steps, different administrative levels and sectors were engaged in the operation.

The demand side survey was a comprehensive cross-sectional study. The total number of households interviewed was 1408. The sampling was confined to the households in the catchment area (CA) of the health facility selected for the BSF component. The households living in the CA were deemed the main beneficiaries of the health component, and therefore the appropriate group for project impact assessment. The geographical boundaries of the CA were empirically defined during the supply side workshop. The staff working in the health facility agreed which villages were likely to benefit from the health component. Demographic characteristics of the target area collected during the supply side survey provided key information to construct the sampling frame for the demand side survey. The basic sampling unit was the household, which was arbitrarily defined as the group of people that usually live and eat together in the same place. The sampling was done in two stages:

1./ Random cluster sampling of villages in the CA and;
2./ Routing method or random walk in the village to sample households.
Cluster sampling

A list of the villages, as clusters of households, was compiled during the supply side workshop. The participants of the workshop discussed whether certain villages differed significantly from others in the CA, in order to identify if special attention was necessary during the sampling. Criteria such as religion, language, ethnicity, vulnerability of households, number of female-headed households and agriculture practices were used as examples. Since no noticeable differences between villages in the same CA were found, clusters were selected randomly.

Due to limited resources, the total number of households to be sampled was set at 200 for districts with a health centre and at 100 for health stations\(^2\). This gave coverage rates ranging from 0.7% (Sodo Zuria) to 3.4% (Chencha Zuria) of the households living in the CA. The administrative set-up of the villages resulted in a comparable number of inhabitants and land area for each village. Based on this, an equal number of households was sampled in each village, without the risk of over or under-sampling per cluster. Thirty households per rural village and fifty households in urban areas were considered statistically appropriate and practically feasible for the baseline survey.

Routing method and sampling interval

The households in the villages were selected using the Routing Method or Random Walk. This non-probabilistic sampling procedure did not require an exhaustive list of the population. Administrative lists of inhabitants for each village were available, but based on criteria like ownership of land and payment of taxes. It was agreed that these lists were flawed since in particular they missed vulnerable society members. Random walks were also more suitable for the vast and less accessible rural areas, where tracing randomly selected households would be time consuming and logistically complex.

The sampling interval (or the number of households that the interviewers had to count to reach the next one to be interviewed) was obtained by dividing the total number of households in each village by the number of households to be sampled per village. This method ensures that households living in remote areas were not excluded and suppressed the risk of oversampling the centre of the village, where the random walk was started.

Questionnaire development

The demand side questionnaire was developed taking into account: available research findings, the output of the supply side survey and a draft set of indicators identified during the participatory planning workshop of the BSF component. The information extracted focused on variables such as water supply, health, basic sanitation and nutrition related to the BSF component. The questionnaire comprised mainly closed and pre-coded questions but there were also some open and probing questions. At the end of each section, the respondents had the opportunity to give comments and recommendations. At several times during the interview, the interviewers were asked to carry out specific observations, e.g. actual utilisation of latrines, their perception on the health status of children and general hygiene. Training on coding and registration of responses, interviewing techniques and random walk was provided for the team of interviewers. During the training session for the interviewers, the questionnaire was pre-tested in a neighbouring village.

Anthropometric measurements

At the same time as the household interviews, anthropometric data was collected in the districts. Anthropometry or 'the technique of measuring people' has been widely accepted as an appropriate tool to assess the nutritional status of a population. Anthropometric data reflect past events, current nutritional status and can even be prospective. Anthropometric data on vulnerable groups of society

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\(^2\) Health centres act as referral institutions for health facilities and have a larger CA.
i.e. children under five years and women is believed to be a sensitive indicator for the nutritional status of the whole population (WHO 1995). Hence, it was collected in this study for planning, monitoring and evaluation purposes. The survey measured 1548 children under five years of age, living in the CA of the selected health facility. Similarly to the household interviews the number of children measured was set at 200 in a CA of health centres and at 100 in a CA for health facilities. This sample size was considered appropriate given the limited resources, time and sample size calculations using Epi-table, a statistical program in Epi-info. As recommended for cluster sampling, the design effect of the survey was set at 2. The desired precision level was 10%. The expected prevalence of malnutrition was taken from regional averages and the total population was obtained from the supply side survey. The confidence level was 95%. The coverage of underfives sampled in the CA varied from 0,9% (Sodo Zuria) to 6,8% (Chencha Zuria).

The villages in which the measurements were conducted were the same as for the household interviews. At least 30 children were measured in each of the villages. As the lowest level of administration, the peasant association was actively involved in the anthropometric measurements. The peasant association was mobilised to collect the children in a fixed point of the village (e.g. clinic or village centre). The mothers usually accompanied their children. From this group, children were randomly selected. The methodology of doing this differed from supervisor to supervisor. In one district for example, thirty long straws were mixed in a bundle and only the children picking those straws were selected. At all times it was ensured that children from remote sites of the villages were not overlooked. Experienced health professionals from district level and health institutions carried out all anthropometric measurements and recorded all data immediately after reading the scales.

In this study, the common indices Weight-for-Height (W/H), Height-for-Age (H/A) and Weight-for-Age (W/A) were used. As widely recommended, the anthropometric results were computed as z-scores. Abnormal anthropometry was defined as a value below -2 standard deviations from the reference mean. This cut-off corresponds with 2,3rd percentile and 90% of the median for H/A and 80% of the median for W/H and W/A. Data analysis was carried out by using the computer program Epi-info (version 6.04a) and Statistical Package for the Social Science (SPSS) version 7.5. The anthropometric indicators were compared with the National Centre for Health Statistics reference.

Method of data recording

The age or birthday of the most children had to be estimated by the mother due to lack of underfive cards or other birth registration forms. An attempt was made to obtain accurate age estimations expressed in months using standardised local reference data.

International guidelines to record weight and stature were followed as much as possible. Before measurements started, the weighing scales were calibrated to zero. All weight recordings were done with flat weighing scales. The weight of the child was rounded up to the nearest 0,5 kg. The stature of the child was measured recumbent (length) for children below 24 months and standing (height) for children above 24 months. Height was measured with the fixed graduations of weighing scales from the clinics. Locally prepared boards were used for length recordings. All stature measurements were done to the nearest 0,5 cm. The heavy weighing scales with fixed graduated ruler could not be transported in two districts because of the difficult terrain. In these districts, a tapeline was utilised for stature measurements and a flat weighing scale for weight registrations. Signs of oedema were recorded and compensated for during the computing.

Training

Several training sessions were organised for the staff members involved in the baseline survey, so that the implementing team would be able to organise future surveys itself. The aim was also to prepare the team for follow up and evaluation of the project. Specific training manuals, with theoretical
background and exercises, were prepared for this purpose. Training sessions were provided parallel to the implementation of the survey and addressed following topics:

1./ Interviewing techniques and coding of data (2 days training, for interviewing teams at district level);
2./ Computerising questionnaires, entering and processing of anthropometric results using Epi-info (10 hours, for regional health bureau);
3./ Data processing using SPSS for windows (40 hours, for statistical offices in regional bureaus) and;
4./ Data entry for the demand side survey (4 hours, for data entry teams at regional level)

Outcome

Anthropometry

With respect to the features of the project in SNNPR and the objective of the survey, H/A was considered as the key index. A high prevalence of low H/A is correlated with overall poor and socio-economic conditions. It might therefore be used to assess the response of specific and non-specific -like agriculture- interventions (WHO 1995). Several tests however, showed that the age recordings, which are based on estimations, are inaccurate. In general, when age recordings are estimations from the mother rather than the exact date of birth, the quality of the data is inadequate for assessment of indicators that are dependent on age such as H/A and W/A$^3$ (WHO 1995). Frequency distributions visualise the quality of the age recordings. Figure 2 clearly shows the heaps at multiples of 6 or 12 months, which illustrate that the age of the children is merely a rough estimation rather than the accurate figure. Exclusion criteria for impossible values as provided by Epi-info were used. Approximately 8% of measurements were considered invalid for at least one index.

A common way to tabulate population based anthropometric findings is to document cut-off based prevalence data (e.g. 35% falls below -2 z-scores of H/A). Another way is to plot the calculated z-scores in a frequency distribution or histogram. This provides an overview of the entire population, rather than focusing on a proportion classified as malnourished. The thesis behind this is to accept that not only those individuals below the cut-off are affected. A z-score distribution was therefore an appropriate tool for this population-based study assessing nutritional status. Figure 3 is an example of a W/H z-score distribution of the baseline survey.

$^3$ W/H is more accurate since it is independent from age. The index however, is too sensitive and cannot substitute H/A for long-term assessments.
Changes in mean z-scores of W/A, H/A and W/H of under five children are considered as appropriate criteria to measure the impact of a non-specific intervention (WHO 1995). Furthermore, using mean z-scores makes it easy to interpret and compute significant differences in nutritional status of sub-populations (e.g. female and male, rural and urban, above and below 85 centimetre) or evolutions in the course of time using basic statistical tests.

The bad weather conditions and the vast area did not allow measuring children in Tellocheta district. In general, the dropout of sick and severely malnourished children during the anthropometric measurements is expected to be high. No special efforts were directed to include this group. For this reason, it can be expected that the anthropometric results were somewhat optimistic. It was the intention to compile birth weight data and anthropometric data on pregnant and lactating mothers. Due to lack of specific, representative and accurate records in the health facility however, the nutritional status of mother could not be assessed.

**Duration of the survey**

In total, the survey lasted one year. Most activities were undertaken complementary to the normal duties of the staff. Moreover, continuous training, weather conditions and budget constraints required extra time. Retrospection reveals that a large share of the time was spent on data entry and cleaning (Figure 4). Although specific training was provided for local staff (mainly secretaries), minute entry of the coded survey results in data sheets proved to be difficult.

**Survey expenses**

The total cost of the baseline survey amounted to USD 17564 (Table 1). Fees for local staff take the lions’ share of the costs. These include the financial compensations for participants of the supply side workshop, trainers, interviewers, field guides, honoraria for write-up etc. A budget breakdown like this is rarely reported, which did not allow further comparison with similar studies. However, it is clear that a baseline survey using local means and resources saves considerable financial means.

<table>
<thead>
<tr>
<th>Table 1: Cost ventilation of field related expenses of the baseline survey (US Dollar)</th>
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<tbody>
<tr>
<td><strong>Stationary</strong></td>
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<tr>
<td>Supply side survey</td>
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<tr>
<td>Training and preparation of demand side</td>
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<tr>
<td>Demand side survey and anthropometric data collection</td>
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<tr>
<td>Write-up of reports</td>
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<td><strong>Total</strong></td>
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**Relative share (% of total)**

- Stationary: 13%
- Fees: 78%
- Fuel: 9%
- Total: 100%

Remark: All costs are expressed in USD, at a conversion rate of 1S=7.5 Ethiopian Birr. A contingency factor of 5% has been added to all costs.

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4 In order to compare the nutritional status of different age categories and given inaccurate age recordings, the data was stratified in below and above 85 cm. This cut-off value is the average height of a child of 24 months (Gorstein et al. 1994).

5 Fees for the external consultant are not included in this analysis.
Discussion

Merits of a baseline survey

In addition to the sheer advantage of providing benchmark indicators, carrying out a baseline survey presents considerable opportunities.

1. It enables the setting of rational objectives, therefore rendering project monitoring and evaluation more accurate. A baseline survey aids programme planners to set rational targets for key indicators tailored to the local context. Programme objectives should be defined in a participatory way, with the persons responsible and all the levels involved in the implementation. Local people might be more able to define which objectives are attainable within a given time period. Indicators for evaluation can be identified in the same way.

2. Baseline surveys generate geographic representative data. Commonly, available sets of data are nationally or regionally representative but are not locally representative. Adequate specific or local data on the nutritional status is often not available so planners may turn to national findings as proxies for the nutritional status within local areas. It is clear that representative data are a prerequisite to establish a sound system for impact assessment.

3. Incorrect (or simply lack of) identification of the users from the outset undermines the relevance of several information systems. Hence, considerable efforts need to be deployed to increase the utilisation of information by potential users (Mairie et al. 1999). Baseline surveys can be used to identify the users of the M&E information. Who needs what? When, why and in which form? Mobilising project implementation staff in a baseline survey introduces valuable opportunities to familiarise them with the nature and role of monitoring and evaluation (M&E). It might lead to stronger commitment, which could enhance flow and quality of data from the implementation level to M&E unit. Furthermore, constraints and shortcomings of the M&E system can be identified from the onset. Ideally, the M&E officer should therefore co-ordinate the baseline and follow-up surveys.

4. As illustrated by the experience in Ethiopia, it can be used as a platform for beneficiary participation in tailoring project activities to local conditions.

5. It avoids duplication by surveying what is available. Furthermore, by identifying what other organisations are doing in the area, it may promote collaboration.

Shortcomings and bottlenecks

1. Baseline surveys can be expensive, thus hampering subsequent organisation of surveillance activities due to a shortage of funds. Establishing a baseline reference using a survey is not an absolute prerequisite for the inception of project activities. When a baseline reference is at hand, it is useful. Its absence however, should not delay project implementation. When it is thought necessary i.e. in the light of future assessments, it can be carried out after the inception of the activities. It can then be integrated in the overall process. In fact, it is preferable to conduct baseline surveys after the identification of users, after the definition of principal objectives and after the first selection of indicators (Mairie et al.1999). When the survey delays project implementation, its opportunity cost can be substantial.

2. Carrying out a comprehensive survey may require a minimum level of resources, time and skills. In settings where local technical and institutional capacities are weak or limited, survey design, data management and interpretation is a predictable bottleneck. For that purpose, the survey in Ethiopia was consolidated with specific training for local implementing staff. The rotation of staff and the risk of 'knowledge drain' are important parameters for the success of any attempt to build
technical capacity. As for monitoring and evaluation surveys, assurances should be sought to secure long-term availability of trained staff.

3./ A baseline reference ought to be representative for the target population. Defining the appropriate population and a sampling frame that accurately represents the target population is a crucial element of establishing reference data. Often, the actual target population is not yet identified when the baseline survey is conducted. The population included in the sample may therefore differ from the actual group of beneficiaries, inducing a bias when assessing impact later. As mentioned before, the target population of the survey in Ethiopia was defined with respect to the health component. Since beneficiaries of the sanitation and water supply component may differ from the select group which makes use the health centres, only the health indicators can truly be compared with the results of the baseline study for monitoring purposes.

4./ Lack of standardised and appropriate methodology makes baseline surveys somewhat tentative efforts. This inhibits the reproducitvity of the survey and allows shifts of key variables or changes in the procedure for measuring them.

**Recommendations and lessons learned**

**A stringent selection of data**

Typically, surveys yield large data sets and little information, thereby wasting considerable time and resources. The survey in Ethiopia learns that considerable efforts, such as specific training, long-term technical assistance and time were related to the treatment of the large set of quantitative information generated by the household interviews. Furthermore, the extra workload of vast survey may become a burden. In absence of any theoretical foundation, the temptation to collect data for academic interest risk becomes substantial. Baseline surveys have to be rooted in a preliminary theoretical framework, so as to rationalise data collection and ensure the relevance of the indicators collected. Determinants of nutritional status are abundant and will differ according the situation. It is therefore necessary to make a rational choice of the determinants that will be considered, through an overall view of the nutritional problem. This approach will only be possible when a conceptual framework adapted to the particular situation and the requisites of the project is at hand. A conceptual scheme or framework enables merging all perceptions on the situation into one common representation. It ensures the pertinence of selected data, whether it is qualitative or quantitative, and facilitates the identification of external factors. Moreover, rationalisation of information that is to be supplied, collected, and pooled can also prevent disillusion and loss of motivation of staff members involved in the M&E systems, who may cease to see its relevance (Mairie et al. 1999).

A well-designed framework significantly reduces the risk of overlooking factors. Several models can be used for this purpose. Various field experiences have shown that a causal model as devised by the Comprehensive Participatory Planning and Evaluation methodology\(^6\) provides an effective tool to rationalise data collection. Building a causal model also has the advantage that it can be used to identify confounding factors (Lefèvre et al. 1998). Concomitant changes in confounding factors ought to be considered during the interpretation of anthropometric findings when the response to specific and non-specific intervention is assessed (WHO 1995). Hence, conceptualisation of the baseline survey ideally starts in a participatory situation analysis during project planning. The baseline information will thus visualise and measure these structural factors of specific nutritional problem.

The aim should be to minimise collection of primary data by rigorous selection of data during the design of the survey. In addition, tapping existing data sources and the use of qualitative data methods like Participatory Rural Appraisal (PRA) techniques, adopted from the social sciences should be encouraged. The PRA approach advocates that local people have a wealth of knowledge that they can express.

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\(^6\) Developed by the nutrition unit of the Institute of Tropical Medicine of Antwerp in Belgium.
**Improvement of data quality**

H/A is an essential index in the context of this baseline survey. Due to the inaccurate age recordings however, it has to be interpreted carefully and its validity is questionable. A prerequisite for its use is to improve the quality of age recordings. If no accurate system to record the age is in place, one might consider to establish one. Otherwise, additional efforts such as the construction of a standardised and local calendar as a long-term reference are required.

A non-probabilistic survey methodology such as a random walk greatly increased the risk to induce of sampling errors, therefore compromising the representativity and reproducibility of the study. Bearing in mind that the study will act as a reference for monitoring and evaluation, it is evident that the sampling frame of a baseline survey should be constructed carefully. In rural settings where specific data is virtually absent however, this will be a difficult challenge.

The duration of comprehensive surveys may easily take several months. It is essential that a study of this kind is completed in a limited period of time in order to reduce the seasonal bias. A cross-sectional survey like a baseline survey does not assess the chronic or transitory character of food insecurity of the studied households. Hence, in order to allow optimal comparison, any follow-up survey should be undertaken in the same period, preferably with the same interviewing teams.

**Conclusion**

Surveys are typically conducted for the sole purpose of generating data. The experience in Ethiopia illustrates that a baseline survey can serve as a preliminary step to improve project effectiveness. Integrating baseline surveys in the project cycle is not only a solid foundation for monitoring and evaluation. When devised well, it offers a valuable opportunity for participation of stakeholders, capacity building and tailoring interventions to the local context. Empowering beneficiaries and involving local implementers in establishing a monitoring and evaluation system may lead to rational and feasible project design.

This paper is a preliminary review of a baseline survey in Ethiopia. It documents its value in the project planning, implementation and management. Similar documents were found to be scarce if not absent. In order to investigate the full significance of a baseline survey, specific research is required.
References


