Experiences with the Development and Use of Poverty Maps

Case Study Note for BURKINA FASO*

1. Background information on the poverty mapping initiative

The development of poverty mapping in Burkina Faso has been predominantly research-driven. A methodology was developed by Bigman et al. (2000) that integrates data from several sources and uses econometric modeling to determine poverty distribution at a high resolution (e.g., rural village and urban community levels) (see Section 2). The methodology is particularly useful for countries where there are constraints—on the availability of census data on individual households or on the quality of census data—that make it highly desirable or even necessary to rely on additional data sources.

In Burkina Faso, as in many other developing countries, census data are available only as averages at the village (or even the district) level, but not for individual households. The poverty mapping method applied here combines survey data with additional data from other sources to estimate the incidence of poverty in small areas, such as districts, townships or even villages. The data from the different sources are brought together and arranged as GIS (geographic information systems) data. These data may include not only socioeconomic information (e.g., on the population in these areas, their income, etc.), but also agro-climatic information and geographic information (e.g., the distance from the village to other villages, the quality of the access road, the distance to the nearest town, school, and health clinic, etc).

2. Process of poverty mapping

The methodology used in Burkina Faso consists of collecting data from several sources at different geographical levels (e.g., the village, county, or regional level) and representing these data as a GIS according to their geographical coordinates. The data used for Burkina Faso included: the individual households' consumption data from the 1994 Household Income and Expenditure (HIE) Survey; demographic data from the 1985 census; household-level data from a variety of surveys;[1] community-level data on local road infrastructure, public facilities, and water points; and department-level data on agroclimatic conditions.

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[1] A variety of data sources were used including the Ministry of Water Management and Infrastructure (1995), Ministry of Education (1995), Ministry of Agriculture (1993), and Directorate of Meteorology (1961-95).

In the first stage of the analysis, an econometric model was used to estimate the impact of household-, community-, and department-level variables on the level of household consumption and the probability that this level of consumption falls below the poverty line. This step is aimed at identifying the key explanatory variables for household consumption and the incidence of poverty in rural and urban areas. Such econometric analysis can only be done for households included in the HIE survey.

In the second stage, the coefficients estimated for the explanatory variables, along with the values for these variables in communities not included in the HIE survey, were used to estimate the incidence of poverty in *all* communities. In Burkina Faso, several of the data sources were incomplete: the census missed one or more national regions,[2] and Ministry of Water data were limited to 25 of 30 provinces. For this reason, the analysis in this study was limited to 3,871 villages (57% of the country's total number of villages). The model's coefficients were used in the second stage to predict poverty indicators for the rural and urban communities in Burkina Faso for which the other data were available.[3] Constraints on data availability and quality may increase the prediction errors of these estimates and reduce the statistical significance of the results.

Finally, the villages were ranked in four categories according to the degree of poverty (i.e., poorest, lower-middle, upper-middle, and least poor). Results indicate that nearly two-thirds of poor people in Burkina Faso are concentrated in fewer than 20% of the villages.

Michael Lambotte of I-mage, a consulting group in Belgium, and two consultants from Burkina Faso compiled the data used in the poverty mapping exercise. Various data sources were used (e.g., Priority Survey, national census, and data from the Ministry of Water Management and Infrastructure, Ministry of Education, Ministry of Agriculture, and Directorate of Meteorology) at numerous agencies (e.g., *Institut National de Statistique et de Demographie*, Famine Early Warning Systems, *Institut Geographique du*

[2] Data were missing for approximately 15% of the country.

[3] More specifically, poverty incidence in all communities in the country was determined in two steps: (1) Using the Priority Survey data, together with the pre-selected data from all the other sources on the characteristics of the 'areas' in which the households reside, a probit analysis was conducted to determine the probability that individuals in a given community are poor as a function of their own personal characteristics and the characteristics of the community:
$P\{y_{ij} < z\} = F(H_1 \ldots H_m; A_1 \ldots A_k)$
(where y_{ij} is the income (expenditures) of the i-th individual that resides in the j-th 'area' (community)). This probability is a function of the individual/household characteristics ($H_1 \ldots H_m$) and the community/area characteristics ($A_1 \ldots A_k$). The household's characteristics include all the relevant information on the individual households that was collected in the Priority Survey, such as the number of persons/children in the household, the age/gender of the head of the household, etc. The community/area characteristics include information from all the other sources on the household's own community (village/township) or on the wider administrative region and agro-climatic area, such as the distance to the nearest town, the road conditions, the crops grown in that area, the soil conditions, etc..
(2) To provide complete mapping of all the poor communities in the country, the coefficients of the probit function, that were estimated in the first step, were applied with the information on the community/area characteristics ($A_1 \ldots A_k$) that was available for all communities in the country from all the other sources.

Burkina Faso, and *Direction Generale de l'Hydraulique*).[4] Econometric modeling was conducted by David Bigman of the International Service for National Agriculture Research and by Stephan Dercon and Dominique Guillaume from the Department of Economics at the Catholic University of Leuven in Belgium. Michael Lambotte was involved in GIS-related work and the development of the poverty map itself. Aside from data compilation, the statistical estimations and poverty mapping were conducted outside Burkina Faso. The development of the poverty map took approximately one year (1996-97). The World Bank and Belgium Trust Fund provided funding for this initiative.

3. Use and impact

As one of the earliest research initiatives on poverty mapping, the Burkina Faso poverty mapping exercise placed little emphasis on the ultimate use of the poverty data. Rather, the initiative focused on developing a methodology that could be used to estimate the distribution of poverty in instances where detailed census data are not available (see Section 1).

A paper describing the methodology and results was published by the World Bank (Bigman et al. 2000) and included in a book on geographic targeting for poverty alleviation (Bigman and Fofack 2000). In addition, a workshop was organized by David Bigman in late 1997 that entailed primarily World Bank participation (e.g., country economists within the Africa region). The Burkina Faso poverty map methodology and results, as well as other papers on the use of mapping and econometric modeling, were presented at the workshop.

The workshop and Burkina Faso papers helped raise awareness among various groups of poverty mapping and its potential uses in targeting national development programs. This work is thought to have helped spark long-term interest in further exploration of poverty mapping methodologies. The methodology used in Burkina Faso has been referenced by several poverty mapping initiatives (e.g., see the Malawi case study) and is being used in other countries, especially those with data constraints. David Bigman is currently involved in using a similar methodology to develop highly disaggregated poverty data for India, which are expected to help improve the targeting of poor areas in India's agricultural development strategy.

Dissemination of the Burkina Faso methodology and results have been focused primarily on an international and donor-community audience (e.g., World Bank country economists). Although results of this study could potentially be used to target villages

[4] Specifically, household-level income and expenditure and village level infrastructure and communal services data were obtained from the 1994 Priority survey; village-level demographic data were obtained from the 1985 National census; health, water infrastructure, distances to infrastructure, public administration, and social groupings 1995 data were obtained from the Ministry of Water Management and Infrastructure; primary school infrastructure and teacher-pupil ratio 1995 data were obtained from the Ministry of Education; 1993 cattle per household and average vegetation indices to literacy rates was obtained at the Ministry of Agriculture; and temperature, evapotranspiration, and rainfall data were obtained from the Directorate of Meteorology.

for anti-poverty and cost-recovery programs in Burkina Faso, there have been no specific efforts to disseminate poverty map results in Burkina Faso and no uses of the map are known. The Burkina Faso effort did, however, provide evidence that the use of village- and urban community-level targeting by decision-makers can substantially reduce leakage (inadvertent inclusion of non-poor in poverty reduction programs) and under-coverage (inadvertent exclusion of poor people). By conducting a simple simulation experiment, Bigman et al. (2000) indicated that the use of targeting could reduce leakage by 56% relative to an untargeted transfer.

Bibliography

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