

IV-4: District Level Analysis of Drought Responses and Resilience Index

Chieko Umetsu (Research Institute for Humanity and Nature)
Lekprichakul Thamana (Research Institute for Humanity and Nature)
Takeshi Sakurai (Policy Research Institute)

1. Purpose of Research

District level analysis is playing an important role in decision making by policy makers, international organizations and NGOs for identifying target areas and population for planning and implementing relief programs. However, the statistical information at the district level in Zambia is quite insufficient. The purpose of the research in this sub-theme is to analyze regional differences on drought shocks and responses by utilizing official statistical information of Zambia, information provided by other project themes together with our large-scale surveys. The final goal is to integrate the climatological, ecological, and socio-economic information with geographical information for identifying policies for enhancing resilience in the region.

2. Outline of Research

1) District level statistical data on socio-economic indicators, agricultural production and grain prices are collected from Central Statistical Office (CSO) and Department of Agriculture; 2) Crop Forecast Survey (CFS) and Post Harvest Survey (PHS) of CSO are combined with our own reanalysis planned in year 2006; 3) District level data will be analyzed with socio-economic and institutional factors as well as agro-ecological factors to provide mapping of resilience index; 4) The statistical information would be supplemented by the field interview survey of farm households. Socio-economics indicators are overlaid with agro-ecological information such as rainfall and soil conditions.

3. Research activities in FY2006

In this FY2006, we focused on the following issues. We identified statistical information available at CSO; conducted preliminary analysis for the impact of 2004/2005 Drought on Zambia's agricultural production; and planned for the large-scale household survey in Eastern and Southern Province.

3-1. Statistical information available in Zambia

CSO conducts various surveys in Zambia with different time intervals. CSO has provincial HQs and enumerators are trained and employed for various CSO surveys. The main work of District Agricultural Coordination Office (DACO) also includes implementation of CFS and PHS.

Crop Forecast Survey (CFS; annual):

Usually CSO conducts CFS in April-June for about 8000 households throughout Zambia. This annual survey is purposed to provide information of the level of domestic food crop production and used by the government to forecast the necessary amount of food crop import. Ministry of Agriculture and Cooperatives is the primary agent in this survey.

Post Harvest Survey (PHS; annual):

Usually CSO conducts PHS in October. The year 2000 PHS was conducted with new framework. Each district has 3-5 standard enumeration areas (SEAs) and 20 households per SEA are selected for the survey. Although SEA remains the same for some years, every year they select new households within SEA. The same households are selected for CFS and PHS.

Supplemental Survey by MSU/USAID:

Food Security Research Project (FSRP) of Michigan State University (MSU) and United States Agency for International Development (USAID) conducts supplemental survey (2001, 2004, 2007 planned) for the year 2000 PHS sample households. This survey is focused on post-harvest activities and other non-farm incomes.

Living Condition Monitoring Survey (LCMS; every 2 years):

Sample size: 10,000 households (1998), 15,000 households (2002-2003), 20,000 households (2004)

Households in LCMS are categorized into i) non-agriculture, ii) large (commercial) farm, iii) medium farm, iv) small farm, which categorization is different from agricultural census. The LCMS includes consumption data which has a potential for useful analysis for our project.

-Priority Survey (1991, 1993)

-Living Condition Monitoring Survey (1996, 1998)

-Census of Population and Housing (1969, 1980, 1990, 2000, 2010)

-Living Condition Monitoring Survey (November 2002-Oct 2003: 12 months longitudinal survey)

-Living Condition Monitoring Survey (December 2004: 1 month cross-section)

-Living Condition Monitoring Survey (November-December 2006)

National Census (every 10 years):

-1969 Population and Housing Census of Zambia

-1980 Population and Housing Census of Zambia

-Zambia Census of Population and Housing and Agriculture 1990

-Zambia 2000 Census of Population and Housing

3-2. Preliminary analysis for the impact of 2004/2005 Drought on Zambia's agricultural production

Based on 2003/2004 PHS and 2004/2005 PHS conducted by CSO, the Zambia's agricultural production during the 2004/2005 drought was analyzed (please see Thamana 2007 in this report). Chief purpose of this examination is to understand the picture of the drought episode of 2004/2005 from the statistical numbers.

Agriculture is an important sector in Zambia. Its contribution to GDP of 14.2 percent is only second to wholesale and retail trade of 18.3 percent (CSO, 2006). Among the real sector, however, agriculture is by far the biggest real sector in Zambia. It is estimated that livelihood of 75 percent of population directly or indirectly depends on the agricultural sector (FAO/WFP, 2006). According to PHS, production of staple crops which include maize, millet, sorghum and rice dropped by 22 percent. The decline was due mainly to drought effects on production of maize which is the main staple food and accounted for more than 90 percent of cereal production.

Zambian agriculture has two important characteristics. First, agricultural system has dualistic sub-sectors, a mixture of small land holders and large to very large scale corporate farmers. While 85 percent of the total farming households hold less than 5 hectares of land and use simple and somewhat primitive production technology, about 10 percent of them cultivate 20-150 hectares of land and use mechanized farming techniques. Secondly, the vast majority of farmers are heavily dependent on rain-fed farming. Their livelihoods are especially vulnerable to drought which unfortunately has become more frequent during the past two decades.

In the past 16 years from 1990 to 2005, Zambia experienced six droughts in 1991/1992, 1994/1995, 1997/1998, 2000/2001, 2001/2002 and 2004/2005. While the 1991/1992 drought is continental, the 2004/2005 drought is local. Maize production failures in 2005 were estimated at 740,000 metric tonnes (MT), the biggest production losses in recent history. Maize failures in the 1992 drought stood at 730,000 MT, only about 10,000 MT less crop losses than that in 2005. As far as assessment of severity of drought is concerned, magnitude of crop loss alone can be a misleading indicator especially when planted area significantly differs. Such is the case for the two drought episodes. In 1992, farmers planted maize on 660,000 hectares of land, whereas 875,000 hectares of maize crop was grown in 2005, a 30 percent more maize land exposed to climate variability over the 1992. Roughly, a 10 percent increase (decrease) in maize yield will result in approximately 7 percent decrease (increase) in maize price.

The southern and eastern provinces are key players in Zambia's agricultural sector. About 40-50 percent of planted land and 35-45 percent of all agricultural production are from these two provinces despite being drought prone areas. In 2003/2004 season, the pair contributed 50 percent of maize and cereal productions. About 90 percent of cereal land in the southern and eastern provinces was devoted to maize production and the remaining 10 percent for millet, sorghum and rice. The percentage yield losses of sorghum and millets were significantly higher than maize during drought in the southern region, according to the aggregation of PHS data. Whether this odd pattern of production failure among dried weather tolerant crops like

millet and sorghum and water-hungry crop like maize actually occurred is not verifiable from the data in the existing survey. More field research is needed to uncover possible explanations for this unusual occurrence. In Southern province, cereal crop share of land dropped from 80 percent in 2003/2004 to 70 percent in 2004/2005. Farmers in southern province reportedly are engaged in petty trade more intensely than those in the eastern.

There are two key research questions to assess household and community resilience to climatic shock: actual drought impacts on agricultural production and market and measurement of household resilience. Resilience can be redefined as household coping capability. Resilience can then be defined by degree of vulnerability. Many studies operationally define vulnerability based on consumption shortfall. There are two main methods of measuring resilience. The first is an *ad hoc* index method, and the second method is based on welfare or consumption theory. Although the latter approach is still evolving, assessing resilience of Zambian farming household by using consumption approach may be recommended.

3-3. Large-scale household survey in Eastern and Southern Province

In order to obtain information in wider geographical areas of Eastern and Southern Provinces, household survey is conducted during March-April 2007. The villages and households to be surveyed are those surveyed in 2004/5 PHS in selected districts in the Eastern and Southern Provinces of Zambia. The total size of the sample will be 1,180 households from 59 SEAs spread over 8 districts (Eastern Province: Nyimba (4 SEAs), Petauke (14 SEAs), Katete (11 SEAs), Mambwe (3 SEAs); Southern Province: Monze (7 SEAs), Gwembe (2 SEAs), Choma (8 SEAs), Sinazongwe (3 SEAs), Kalomo (7 SEAs)). This survey also collects anthropometric information such as height, weight, and Mid-Upper Arm Circumference (MUAC) for children under five.

4. Summary of Research and Forthcoming issues

We identified the characteristics of damages on agricultural production during 2004/2005 drought event using PHS. Maize production failures in 2005 were estimated at 740,000 MT, the biggest production losses in recent history. The comparison between 1991/1992 drought and 2004/2005 drought may be important by considering the socio-economic conditions in two major drought events.

5. Research Plan for FY2007

- i) Analysis of CSO statistics (LCMS and other CSO data when available)
- ii) Conduct household survey and preliminary analysis
- iii) Compare 1991/1992 drought and 2004/2005 drought in agricultural production as well as socio-economic and political environments.