

Environment Stress and Increased Vulnerability to Impoverishment in Rural Ethiopia: Case Studies Evidence

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Abstract: Integral to the global trends in climate change, there are slow but notable long-term changes in level of weather (e.g. slow increase in temperature and decline in rainfall) accompanied with increased weather extremes such as increased frequency and intensity of drought in Ethiopia. These changes are occurring over large geographical area including the most populous and arable highlands. Rural households in these environmentally stressed areas employ multiple strategies to manage environmental risk. However, as evident from the empirical regularities below, vulnerability to poverty persists because of households' diminished capacity to mitigate and cope with frequent occurrence of weather extremes. The key development challenge is to reduce both structural poverty and vulnerability to poverty.

Introduction

Ethiopia has a diverse biophysical environment. Its land formations fall broadly into highlands and lowlands with the highlands representing areas above 1500 meters above sea level. According to the latest agro-ecological mapping (NMSA, 1996), about 55 percent of the total land area constitutes moisture-stressed arid and semi-arid areas with crop growing period of less than four months. Areas with a longer and dependable crop growing period are found in the remaining 45 percent of the total land area, mainly in moist and humid highlands.

The majority of the population is rural and lives mainly in the highlands, particularly in the mid-elevation where the climate is hospitable and land resources are suitable to grow a large variety of crop and livestock species (Mesfin Woldemariam, 1991; Aynalem Adugna, 1987). However, land degradation is severe especially in the long settled highlands. Some of the highlanders are gradually abandoning the mid-elevation and moving upwards where the temperature is cold or descending onto the lowlands where the climate is less favorable for settlement and cultivation (for example, the cases of South Wello and Northern Shewa in Mesfin Woldemariam, 1991). The transition zone between the highland and lowland is increasingly encroached by highlanders descending into lower elevation and pastoral herders moving upwards from the arid lowlands in search of grazing lands and water.

Agriculture is the mainstay of the rural population. Farming systems are diverse corresponding with the heterogeneity of the physical environment; mixed farming systems where crops and livestock are combined with trees in the settled highlands, extensive pastoral-based

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livestock farming system in the arid lowlands, and agro-pastoralism in the highland and lowland transition zone where seasonal migration with livestock is combined with rain-fed cultivation.

But rural households are rarely purely agricultural households. Typically, their income sources are diversified comprising non-farm incomes where some are non-local involving migration. Environmental goods and services are significant in these diversified incomes; they are key inputs into agricultural production (e.g. soil and water), and sources of household incomes (e.g. sale of forest products) and consumption (e.g. fuel).

Living standards are low in terms of both economic and social deprivation metrics (e.g. income poverty, under or malnutrition, and poor health outcomes). Poverty¹⁶ is largely rural in terms of share of total poverty. The rural poor are found in all agro-ecological zones. Although the evidence on the relationship between poverty and production environments is not adequately established, it is plausible the majority of the rural poor are in areas favorable for agricultural production because of large concentration of population. However, incidence of poverty is higher in marginal agricultural areas such as arid and semi-arid areas (e.g. Elizabeth Woldemariam, 1997; Bigsten et al, 2003; and Getaneh Gobeze, 1999).

Furthermore, studies on vulnerability to poverty establish substantial presence of rural households whose mean income (or, consumption level) is above poverty line but sometime fall into poverty (transitory poverty). Such mobility of people into and out of poverty over time looms large particularly in marginal agricultural areas, which is often related to considerable exposure of the population to environmental risk. For example, Deracon and Krishnan (1998) find sizable transitory poverty related to fluctuation in rainfall, holding other factors constant.

The thrust of this short synthesis paper is to relate vulnerability to poverty from the perspective of household capacity to manage environmental risk. Section two presents case studies drawn from different agro-ecological zones to demonstrate the links between environmental stress and vulnerability to poverty. Section three attempts to decipher empirical regularities in the links. The final section reiterates the key environment and poverty links.

Environmental change and impoverishment

Ethiopia's natural resource base is continuously and cumulatively degrading. Natural vegetation including high forests and permanent pasture is depleting both in area coverage and loss of species. Soil degradation occurs extensively in arable land as manifested in soil erosion, biological degradation (i.e., loss of organic matter), chemical degradation (i.e., loss of nutrients) and physical degradation (i.e., poor water infiltration and restricted aeration in rooting system). The rangelands in the lowlands are undergoing similar deterioration including desertification in the arid margins.

¹⁶ There are different ways of defining poverty that capture different dimensions of household wellbeing. It is defined here in terms of inadequacy of income or consumption of basic needs such as food.

There is also evidence of slow but notable climate change as evident from long-term trend in weather variables, particularly in rainfall and temperature (Tesfaye Haile, 1986; Workineh Degefa, 1987; NMSA, 1996; Mahdi Osman, 2001). Level of temperature is increasing over time. Drier conditions are particularly notable in arid and semi-arid areas. And level of rainfall is declining accompanied by increasing spatial and temporal variability. These weather changes are pronounced in arid and semi-arid areas and extending to the most populous and arable highlands (e.g. Mahdi Osman, 2001 for the central highlands).

The degradation of the natural resources combined with the climate change have rendered some of the areas of the country to serious environmental stress. Households living in these areas employ multiple strategies to manage environmental risk; smooth income (e.g. selective disposal or dispersal of assets, diversification into non-farm income and migration for employment) and consumption (budget-reallocation, switching to low-cost diet, reducing size and frequency of meals, dependency on borrowing or transfers). But still some of the households fall into poverty as evident from the case studies below.

The Case of South Wello

South Wello zone in northeast Ethiopia represents areas of long-settled northern highlands with variable topography, severe land degradation, frequent droughts and increased impoverishment. The zone is mostly mountainous and plateaus with rugged tops, and severely broken and long steep slopes. The soils are variable and commonly low in soil organic matter and macronutrients, particularly in the degraded landscapes. The rainfall regime is mainly bimodal. The eastern parts of South Wello, the lowlands in particular, experience low rainfall, high variability and frequent droughts.

South Wello is long settled with the majority living in rural areas. The rural population is mainly concentrated in the mid-elevations with better rainfall and soil. But the numbers are growing in very fragile and marginally areas within the highlands. And, in spite of problems of low and erratic rainfall, the highland farmers are encroaching the lowlands and compete for scarce land and water with agro-pastoral and pastoral population.

Land degradation is extensive and severe (Belay Tegene, 2000). Very little natural forests exists in the mid to high elevation except in remote steep lands with gradients of more than 60 percent (see in particular the studies in Mesfin Woldemariam, 1993; Kebrom Tekle and Hedlund, 2000). The process of deforestation has progressed to the lower elevations with significant contraction of woody biomass.

Nearly all the arable land is already converted into farmland, especially in the most populated highland plateaus. Farmers are pushing land expansion onto topographically marginal areas marked with steep slopes and shallow soils. The indigenous soil fertility practices are on decline and application of improved technology is not adequate to compensate for loss of nutrients. Both crop and forage productivity is on long-term decline caused mainly by falling soil fertility.

With increasing land scarcity, and declining soil fertility and farm productivity, farmers are under subsistence pressure particularly in moisture stressed areas where there is a strong link between rainfall and agricultural productivity. Secular decline in rainfall translates into large decline into agricultural production as evidenced in South Wello in 1973/74 (Mesfin Woldemariam, 1984), in 1984/85 (Dessalegn Rahamato, 1991) and in 1999/2000 (Yared et al, 2000).

There are signs today that the ability of the rural population to mitigate and cope with recurrent droughts remains tenuous: physical assets are depleting, farm productivity is declining, non-agricultural income sources are not sufficient to compensate the loss in farm income, “freely” available forest resources are thinning, long-distant employment is scarce, social support networks are falling, and surviving on lowered food intake is constrained by low body adaptability.

The Case of Wollaita Zone

The administrative zone represents the southern highlands that are commonly characterized by diverse agro-ecology, high population density, scarce arable and grazing lands, intensive agriculture, chronic food deficit, and increasing vulnerability to poverty. It has a variable topography. The climate is sub-humid in the highlands and semi-arid. The rural population is long settled and it is distributed vertically with the largest concentration in mid-elevation where population density is high (exceeding 500 persons per km in some districts). The pressure on arable land is intense in these high-density areas (e.g. Eyasu Elias, 2002).

The population is dependent on farming for its livelihoods. Outside agriculture, the rural households generate income from non-farm sources including remittance from migrants. Although income sources are diversified, the majority of the population lives on subsistence margin: own little or no land and livestock, deficit in food production, and dependent on marginal non-farm income (Bush, 2002). The rural population is vulnerable to frequent occurrence of droughts (as in 1984, 1987, 1994, 1999 and 2000). Based on reports of oral historians in Wollaita district in southern Ethiopia, Dagnev Eshete (1995) identifies seven major food shortage and famine years over the period between 1963 and 1991: 1963/64, 1965/66, 1970/71, 1980/81, 1983/85, 1987/88, and 1990/91.

There are signs of increasing vulnerability to poverty, particularly in the drier areas. First, the resilience of onset as ‘famine crop’ has diminished since the major droughts of the mid-1980s. Second, ownership of livestock has declined because of shortage of grazing areas and feed availability, drought and animal disease, and forced liquidation in time of crop failure and slow recovery. Third, non-farm income opportunity is scarce.

With declining farm size and productivity, livestock ownership and non-farm income opportunity, the capacity of the rural population has diminished to cope with drought risk, particularly among the already poor.

The Arid and Semi-arid pastoral areas

The arid and hot semi-arid zones cover a large mass of land area with distinct biophysical characteristics: low and variable rainfall, low inherent soil fertility, severe moisture stress, and sparse vegetative cover. Water is scarce. And moisture stress is the chief limiting factor for crop production. There is no growing season or there is a growing season but not sufficient to grow crops (Engida Mersha, 2000).

The majority of the pastoral population, who accounts 12-13% of the Ethiopian population, inhabits these agro-climatic zones (e.g., the Afar in northeast, the Somalis in east and southeast lowlands, and the Borans in the south).

The pastoral system is based on extensive livestock husbandry involving raising mixed herds that are resistant to drought conditions, moving between wet-season and dry-season grazing areas to take advantage of spatial variation in forage and water availability, adjusting herd composition and size according to climatic condition (for example, Desta Solomon et al 2002 noted a shift from cattle towards goats and camels to increase drought resistance, flexibility in grazing requirements, and ease of converting into cash). Livestock are the major sources of income (e.g., exchange livestock and products for grains), diets (e.g., milk and meat) and social status. Small-scale crop production is practiced along riverbanks, and pockets of land that are suitable for cultivation.

The pastoral economy is continuously diversifying. As the recent evidence shows, agro-pastoralism involving livestock and crop production is rapidly growing. The numbers of pastorals shifting towards trading in livestock (i.e., business of selling milk, live animals and butchery), trading in beverages and crafts, wage employment, gathering and selling collected firewood and charcoal, renting property, and retail shops (e.g. Little et al 2001). There are more people diversifying into low-return income sources with increased risk exposure such as wage employment (men), collecting and selling forest products, trading beverages and crafts (female).

Despite continuous diversification, however, the pastoral population now faces elevated environmental risk and impoverishment. Several factors work in tandem. First, environmental stress has increased due to aridity and frequent droughts. Second, shrinkage of pastoral territory amidst increased aridity limits pooling climatic risks over a large geographic space and thereby increases likelihood of decline in range production and livestock. Third, the traditional drought management mechanisms (e.g., diversification of herds, mobility, livestock sharing, and reciprocal grazing) are not as effective to mitigate drought-induced excess depletion of livestock. Fourth, frequent occurrences of droughts in a context of ineffective drought management system cause substantial decline in livestock population due to excess deaths and distress sales. Fifth, the shift to other income sources is mean-income reducing while simultaneously increasing income risk. Sixth, indigenous institutions that effectively managed common property resources, support networks, and conflicts are falling apart without a viable replacement. Finally, livestock markets,

particularly in local/primary markets where the participation of pastoralists is high, are poorly developed.

Key Processes Underlying Vulnerability to Poverty

In all the above cases, there are notable regularities that indicate increased environmental risk (frequent and intense occurrence of droughts in particular), diminished household capacity to mitigate and cope with drought risk, and loss in household welfare (income poverty and hunger).

Increased frequency of droughts

The location-specific case studies confirm the long-term changes in level of weather variables accompanied with increased extremes such as increased frequency of drought. Critical to performance in agricultural production is the low predictability of the distribution of the weather variables like rainfall during crop growing period.

Declining soil fertility and crop productivity

The evidence from the above cases points to at least three factors contributing to declining crop productivity: (1) extensive soil erosion, (2) continuous cultivation without adequate soil fertility management (i.e., abandoning gradually the practices of fallowing land, growing leguminous crops in crop rotation, and application of organic fertilizers such as crop residues and manure), and (3) expansion of cultivation into marginal areas (i.e., steep slopes, low rainfall zone, shallow area) that are inherently deficient in essential soil properties. With both farm size and yield declining, crop production falls from already low initial level. In addition, crop production is also highly variable in moisture stressed areas where there is a strong link between rainfall and crop yield. Frequent occurrences of droughts thus mean farmers are faced with both declining production level and downside variability in production.

Income from livestock is weak to buffer income

Income from livestock is an important source of income among the sedentary farmers, but more prominently among the pastoral population in the lowlands. Ability of livestock to buffer crop income is much reduced in time of crop failure because periods of droughts are often marked by poor pasture and water conditions, decline in livestock production (low birth, delay in maturity, decreased milk production), worsened disease environment, and increased livestock loss through death and distress sales. And reconstituting lost livestock is slow and costly under prevailing conditions of increased periodicity of droughts and poorly functioning markets where prices tend to rise rapidly in post-drought period.

Other income sources are thinning and risky

As the importance of income from crop and livestock declines, rural households move towards other income sources. Among the pastoral population, for example, increasing numbers

are shifting towards crop cultivation, trading (e.g. livestock and livestock products), renting property, wage employment, and gathering and selling collected firewood and charcoal. However, the possibilities for income expansion through these income sources are demand constrained mainly because of the poor performance of the farm economy.

In addition, exposure to covariate risk looms large in the income sources. Income sources such as trading beverages and food are linked to crop production, and hence positively co-vary with crop income. Agricultural wage employment is marginally available in rural areas. More people are moving to rural towns and market centers to settle and work in low-skilled casual wage employment. However, wage employment is generally scarce because of strong link to agriculture dominated local urban economy. Distant migration as an alternative source of wage income has diminished in recent years because of constrained labor mobility related to the existing land reform program (access to land is restricted to place of permanent residence) and formation of ethnic regions (e.g. diminished incentive to migrate due to jurisdictional uncertainty).

Local markets are under continuous stress

Rural markets are poorly developed, as evident from their thinness and large swings in prices under distress. Often, prices for food crops increase markedly in these markets while prices of livestock, wages, and prices of collected or gathered products drop appreciably. Relative to price of food crops, the terms of exchange in these markets thus move in ways that erode the real purchasing power of sellers of assets (livestock in particular), labor and forest products. In other words, returns from these sources (livestock, labor and forest products) are positively correlated with crop income because of poor functioning of the markets under distress (for example, it is not possible to compensate loss in crop income through sale of livestock since the return to livestock falls in period of decline in crop production). Some of the markets disappear in some cases for lack of effective demand.

Options for smoothing consumption are getting fewer

With income sources getting thinner and most of them co-varying positively with crop production, farmers are increasingly left with fewer options to smooth consumption in times of crop failures. There are also limits to lowered food consumption through rationing food consumption such as adjusting diets to basic (or, cheap) food items and reducing frequency of meals and serving.

Increased impoverishment

Despite the multiple strategies to stabilize income and consumption, some of the non-poor households fall into poverty (the new poor). And those who are already poor experience deepening poverty due to: (1) decline in income and asset level (from already low level), (2) diversification into low-return income sources with increased exposure to drought risk, (3) constrained access to

credit and social support network including complete exclusion, and (4) decrease in food consumption and body adaptability to survive on low food intake.

The most vulnerable are the very poor (the destitute). These are households who are unable to generate income and assets on account of lack of labor due to aging, poor health, and physical incapacitation. Hence, they are heavily dependent on community support networks and/or relief food aid. But, as the evidence from South Wello points, some of the support institutions fall apart under prolonged food stress and increased impoverishment (Dessalegn Rahamato, 199; Yared et al, 2000).

Conclusions

There are important long-term environmental changes; degradation of natural resources, falling rainfall level accompanied with large variability, and rising temperature. Occurrence of weather extremes such as droughts has increased over time notably in arid and semi-arid areas but also extending to the most productive highlands of the country. The rural population living in environmentally stressed areas are subjected to frequent and intense climate extremes, particularly drought.

Although the rural households undertake deliberate actions (measures) to smooth income and consumption, their capacity to prevent loss in their wellbeing has diminished over the years. This is evident in the efficacy and outcomes of their risk management. First, the drive towards diversifying to non-farm income sources has not been effective in compensating loss in farm income sources because of their exposure to common environmental risk and reliance on local markets under duress. Second, there are fewer instruments for households to mitigate and cope with frequent droughts because of depletion of assets, erosion of forest resources, scarcity of long-distant employment, deterioration of social support networks, and constrained body adaptability to survive on lowered food intake. Third, some households are engaging early in high-cost strategies such as selling productive livestock whose opportunity cost in terms of future forgone income is high. Finally, the increasingly vulnerability of the drought affected population to poverty is a proof of diminishing capacity to effectively manage the risk. The least capable to manage risk are households who live at the margin.

The prospect of impoverishment and hunger thus persists. The key development challenge is to reduce both structural poverty and vulnerability to poverty. From a household perspective, the challenge is enhancing the capacity of rural households to manage risk effectively. Improving such capacity means, for example, reducing positive co-variation between income sources (e.g. removing policy and legal constraints to long distance migration as a way to ease population pressure on land and spread livelihood risk), reducing co-variation between income and assets (e.g. prevent distress asset sales), and enhancing household consumption smoothing (e.g. through targeted income transfer and/or productive employment). For such capacity to develop and sustain, it is also crucial to enhance public response capability to monitor and intervene timely without crowding out private effort.

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