7-5

Managing Drought Risks in the Low-Rainfall Areas of the Middle East and North Africa

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CASE STUDY #7-5 OF THE PROGRAM:
"FOOD POLICY FOR DEVELOPING COUNTRIES: THE ROLE OF GOVERNMENT IN THE GLOBAL FOOD SYSTEM"
2007

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Executive Summary

The need to improve methods for managing drought risks in the low-rainfall areas of the Middle East and North Africa (MENA) has increased in recent decades as population growth and climate change have contributed to greater demands on the resource base and accentuated both the incidence and severity of drought losses. Government interventions have typically been initiated on an ad hoc basis in response to crisis situations, and little thought is usually given to their long-term impacts on the way farmers and herders manage resources and the productivity of agropastoral systems. There is now accumulating evidence to show that once drought management interventions are institutionalized, they lead to changes in how resources are managed, including the increased cropping and privatization of rangeland resources and more settled patterns of livestock production. These changes can contribute to greater productivity and improved livelihoods. If drought management interventions are subsidized, however, they can also lead to moral hazard problems whereby herders adopt excessively risky farm management practices, with increased losses in drought years and a growing dependence on government assistance. Drought management interventions need to be designed so that they assist farmers and herders to better manage risk and to improve their productivity and incomes, but without distorting incentives in inappropriate ways. The experience with feed subsidy and credit programs in the MENA region has had mixed results, and although they have helped protect incomes and food security in drought years, they have had negative impacts on the way resources are managed. Better alternatives could be area-based rainfall insurance, particularly if offered by the private sector; the development of more accurate and accessible drought forecasting information; and a switch to safety nets that are tied to poverty criteria rather than agricultural outcomes.

Your assignment is to propose an appropriate mix of drought management policies for the MENA region, giving careful thought to the kinds of additional information needed to inform these choices.

Background

Drought has long been a significant factor in the Middle East and North Africa (MENA) region, particularly for the low-rainfall crop-livestock systems and for herders in the vast grazing areas of the steppe. Unfortunately, the level of wealth accumulated in these agropastoral societies is inadequate to provide full protection from severe droughts, and the economic and human losses in drought periods can be severe. The problem has worsened with population growth, as more and more people seek to earn a livelihood from the meager resources available in these areas. It may also have been aggravated by more frequent and prolonged droughts associated with global warming.

The high cost of droughts and the increasing vulnerability of agropastoral societies have led many governments in the region to intervene with various forms of drought assistance. Many of these interventions, however, are encouraging farming practices that could increase both the extent of future drought losses and the dependence of local people on government assistance. They are also costly to governments and use resources that could otherwise be spent for development purposes. A key question for this case study is whether drought relief programs can be designed better to achieve their immediate objectives, but without distorting economic incentives for more sustainable management of natural resources.

Farming and Resource Use in the MENA Region

About one-third of the MENA region's total population is rural and depends on agriculture for important shares of household income. Yet agricultural land is extremely limited in the region. Arable land and permanent crops constitute only about 7 percent of the total land area; 25 percent is classed as pasture (mainly in areas with under 200 millimeters [mm] of mean annual precipitation [m.a.p.]); and 7 percent is forest and woodland (often in poor condition owing to grazing and fuel gathering). The remaining 60 percent of the area is essentially desert. The region has a Mediterranean climate with cool to cold winters and hot dry

summers. Most of the rainfall is in the winter, but it is highly erratic in space and time, making agriculture a risky business.

About three-quarters of the arable area is semi-arid with only 200–400 mm of m.a.p. The scope for crop diversification on rainfed land is limited in these areas. There is a sharp decline in the share of legumes, oilseeds, and vegetables and an increasing dominance of cereals—especially barley (grown mainly for animal feed)—as one moves from higher- to lower-rainfall areas. In the driest areas, barley is increasingly grown today in what were natural grazing areas.

Despite its small area, irrigated agriculture accounts for significant shares of total agricultural production, value added, and employment. Problems of soil and water pollution from agricultural uses and urban and industrial wastes, overpumping of groundwater aquifers, accumulation of salts in the soil, and competition from other users are becoming major constraints, however, and the prospects for expanding irrigated area are very limited.

Livestock are both a principal component of agricultural incomes and the main source of family wealth in these low-rainfall and upland areas. Sheep and goats are most numerous on the low-rainfall rangelands of MENA. Cattle are more commonly maintained on farms or on grazing areas in higher-rainfall areas. Sheep numbers have increased by about 50 percent since 1961–1965, and cattle by about 5 percent.

Human population growth is high, currently around 3.3 percent a year for the MENA region as a whole, and although population is increasingly concentrated in urban areas, population density continues to increase in many low-rainfall areas. Poverty is also concentrated in these areas.

The Impact of Droughts

Although annual rainfall frequently falls below the mean, drought is associated with catastrophic rainfall shortages. Pratt et al. (1997) suggest that a drought can be said to occur in a year when rainfall falls below half the long-term average or when rainfall in two or more successive years is below 75 percent of that average. Drought of this magnitude stunts pastures, desiccates water points, greatly reduces crop yield, and kills livestock. It can lead to the liquidation of a significant part of the total flock in the absence of other sources of feed. Moreover, since the main commercial output of pastoral systems is meat, meat prices tend to be negatively correlated with drought (more animals are available for sale in drought years), and although this occurrence benefits urban consumers, it accentuates income shortfalls of producers. Producers also suffer a knock-on effect when they try to restock after drought, since prices for live animal skyrocket. As human populations grow, so do animal stocking rates—the number of animals kept on a given land area. Thus, pastures are put under increasing stress, which in turn increases their vulnerability to drought. What used to be a manageable rainfall outcome may now be considered a serious drought that leads to significant economic and social costs.

How herders traditionally manage droughts. Agropastoral societies have developed their own strategies for coping with drought. These strategies include

- mobile or transhumant grazing practices that reduce the risk of having insufficient forage in any one location;
- reciprocal grazing arrangements with more distant communities for access to their resources in drought years;
- adjustment of flock sizes and stocking rates as the rainy reason unfolds, to best match available grazing resources;
- keeping extra animals that can be easily liquidated in a drought, either for food or cash;
- investment in water availability—wells, cisterns, and water harvesting;
- diversification into crops and livestock (agropastoralism), especially in proximity to settlements, and storage of surplus grain, straw, and forage as a reserve in good rainfall years;
- diversification among animal species (sheep, goats, cattle, camels, donkeys) and different breeds within species; and
- income diversification into nonagricultural occupations, particularly seasonal migration for off-farm employment in urban areas.

These traditional risk management strategies have proved effective in managing drought and have enabled pastoral societies to survive for many centuries. The interplay between drought and traditional management systems has also helped to keep total flock sizes in equilibrium with the inherent productivity of the pastures, avoiding the long-term degradation of grazing areas. Stocking rates would trend upward between droughts as herders bred more animals and then would fall when the next drought occurred; fluctuations in herd size closely followed rainfall patterns; and peak stocking rates rarely reached unsustainable levels.

Despite their advantages, traditional drought management strategies can have associated opportunity costs. It is useful to think in terms of two types of such costs: those arising from inefficient use of resources within existing agropastoral systems, and opportunity costs arising from failure to exploit more productive agricultural development pathways.

Examples of the first type of opportunity cost are as follows: by liquidating animals during droughts, herders may end up with too few animals in the immediate post-drought period and hence miss out on important short-term production opportunities. On the other hand, given a sufficient respite between droughts, herders may build up excessive flock sizes in order to have a liquid asset as a hedge against the next drought. This practice can lead to overgrazing and the degradation of pasture, with reduced productivity. Herders also prefer to keep traditional breeds that are more drought tolerant but that might be less productive than exotics under more favorable management, and they are often reluctant to use or invest in modern inputs (such as feed and veterinary treatments) that could increase average profitability but that might lead to loss of capital investment if rainfall is unfavorable. There is a dearth of quantitative information about these costs.

The second type of opportunity cost is more speculative. If mobility and transhumant grazing practices remain the primary strategy for managing drought risk, then communities must retain large areas of land as common property and make reciprocal grazing arrangements with other communities for use in drought years. This requirement necessarily restrains the enclosure and privatization of land, which in turn can impede investment in land improvements and the development of more intensive and settled farming systems in areas where rainfall, soils, and topography make settlement a rational goal.

Without a shift to such intensification strategies, it is not clear how rural communities can continue to absorb increases in their populations. One alternative is more effective management of common property grazing areas by local communities, with collective investment in land improvements. But the absence of many successful examples in the region despite numerous donor-funded projects suggests that such local management is extremely difficult to organize, manage, and sustain, particularly in the context of rapid population growth, uncertain property rights, and the increasing commercialization of agriculture, which make cropping increasingly attractive in the less drought-prone areas.

Policy Issues

Governments throughout the region have intervened in various ways to help farmers and herders cope with drought. There are several compelling economic and humanitarian reasons why such interventions might be undertaken.

- The covariate nature of drought risk makes more efficient risk spreading difficult within agropastoral societies. All members suffer when drought occurs, and local sources of credit dry up just at a time when they are most needed. Also, livestock prices plummet during droughts when everybody is trying to sell (destock) and then rise rapidly afterward when everybody is trying to buy to rebuild their flocks (restock). Credit and insurance markets for diffusing this covariate risk are weak in the rural areas of the MENA region. These problems, as well as the poor transportation and market infrastructure for livestock products in the pastoral regions, are major obstacles to implementing more orderly destocking and restocking of rangelands as a solution to managing drought and preventing resource degradation.
- Property rights problems over the ownership of cropland and rangeland may prevent the spread of management practices

and investments that lead to more efficient drought management strategies. Without adequate property rights, population growth can lead to excessive stocking rates and to encroachment of cultivation into traditional rangeland areas. These changes in turn can induce degradation of range vegetation and soils and, by restricting the spatial mobility of flocks, increase herders' exposure to drought risk. Moreover, the inability to protect sown pastures, community-managed rangeland, private shrub plantations, and forests from wandering flocks shows that unrestricted grazing can also be damaging.

- Government has an obligation to alleviate human misery in drought years and to help protect the stock of breeding animals for the future.
- Herders and farmers may default on loans in drought years, causing difficult problems for lending institutions and reducing the average amount of credit available for agriculture.
- Overgrazing of pastures that are already drought stressed, and soil compaction in areas around water holes, may contribute to wind erosion and local climate change that have negative externality costs for a country.

Although there may be good reasons for government intervention, policies need to be carefully designed if they are to provide assistance without jeopardizing the long-term efficiency and sustainability of the farming systems. Moreover, simply being able to fix an underlying problem is not sufficient to ensure that action is economically worthwhile. It also needs to be shown that the problem can be fixed in ways that give a reasonable rate of return on public funds.

Where drought relief is required as a result of market failures (such as inappropriate property rights systems or a poorly developed financial market), it may be more cost-effective to fix the underlying problem (for example, reform property rights or strengthen rural financial markets) rather than to incur the repeated costs of drought relief. Similarly, public investment opportunities to reduce drought losses (such as by improving surface water capture and drilling more wells) may also be more cost-effective over time than drought relief. Unfortunately, these kinds of opportunities are typically quite limited in many drought-prone areas.

The cost of public drought management interventions is relatively easy to determine, but the benefits are much harder to assess. One-time interventions can provide significant humanitarian relief. But once drought management policies become institutionalized so that farmers and herders begin to take them for granted, they can lead to important changes in farming practices that affect productivity.

Any good risk management aid should enable farmers and herders to take greater risks in their quest for higher average returns. If farmers are risk averse, then they trade off some level of expected income for lower risk (through, for example, risk diversification strategies). The amount of expected income forgone to reduce risk can be viewed as a risk premium paid, or a production cost. If this cost can be reduced by the introduction of an improved risk management aid, then the farmer may be able to change strategy (specialize more in the most profitable activities, for instance) and obtain a higher average income for the same amount of risk. This change not only improves expected farm incomes, but can also lead to spillover benefits to consumers at an aggregate level through lower prices as the supply function shifts downward by the amount of the reduction in the risk premium per unit of output. This effect is similar to the effect of a new cost-reducing technology, and provided that the new risk management aid is not subsidized, then there is always a net gain to society. But if the new risk management aid is subsidized, then the effect is similar to a subsidy on any other farm input (such as fertilizer or credit). The reduction in unit cost is partly paid for by the subsidy, and the cost of the subsidy is always greater than sum of the additional producer and consumer welfare that it generates (Siamwalla and Valdes 1986).

What does this mean in practice? It means that subsidized drought management interventions can reduce risk costs to farmers to below their true social value, leading to excessive risk taking and increased exposure to future drought losses. Not only is there a built-in dependence on future drought assistance from the government, but the net social return to the subsidy is negative. The

bottom line is that wherever possible, public interventions should be limited to drought management interventions that farmers pay for themselves, although it might be necessary for governments to devise arrangements that allow deferred payment in installments. Subsidies, when used, should be targeted specifically to the poor who cannot otherwise afford the drought protection they need and who control few resources so that any undesired distortions in resource allocation can be ignored.

Another potential problem with poorly designed drought management policies is that they can lead to moral hazard, a well-known problem in the insurance literature. Moral hazard refers to the incentive problems that arise when an insurer underwrites risks whose outcomes can be influenced by the insured's behavior. For example, if an insurance company contracts to compensate a farmer for yield losses against pest and disease damage, then the farmer will have reduced incentive to be diligent in protecting or treating her crop once she realizes that the insurance will compensate for losses anyway. In the case of livestock insurance, problems can arise because supposedly dead animals may "walk" elsewhere or their bodies may be sold for meat. Moral hazard leads to greater losses than necessary, increases the risk exposure of the insurer, and makes actuarial calculations of those risks almost impossible. Similar problems can arise if a government indiscriminately compensates for drought losses that could have been reduced or avoided by herders. Unless appropriately targeted, feed subsidy programs could, for example, lead to reduced incentive to exploit remaining grazing opportunities, particularly in more remote areas that require greater time and expense to reach. Debt forgiveness in drought years can also generate moral hazard problems. Once farmers know that their debt will be forgiven, they have increased incentive to borrow more than is prudent and reduced incentive to minimize their costs during droughts. Such behavior leads to greater losses than necessary and makes feed subsidies and credit programs more expensive than they need to be.

Governments throughout the MENA region have intervened to help manage drought losses, but usually on the basis of crisis relief once the drought has set in (interventions have included distribution of subsidized feeds for livestock, well drilling, and debt forgiveness). Since the primary motive is typically humanitarian assistance, not much thought has been given to the longer-term impacts of drought interventions on farming practices and productivity.

The result is often an inappropriate set of economic signals to farmers and herders, leading to unsustainable farming practices in drought-prone areas that increase both future drought losses and farmers' dependence on government assistance, as well as to moral hazard problems that further add to the government's cost of providing drought compensation. A good analogy is the experience with hurricane disaster assistance in the United States. By routinely stepping in to compensate homeowners for their losses after a hurricane, the government encourages home construction in vulnerable coastal areas where prudent investors would not otherwise build and encourages fraudulent practices within the home repair and construction industry. These problems add enormously to the cost of government assistance over time.

Stakeholders

The main stakeholders are the farmers and herders whose welfare is most at stake in drought years. But because drought interventions have longer-term impacts on the way resources are managed, they also generate environmental outcomes that are of concern to the populace in general and they affect meat and cereal prices, which are of concern to consumers. The interests of these different stakeholders are not always complementary, and trade-offs can arise. For example, consumers may prefer more abundant supplies of meat and cereals, but this desire may not be consistent with sustainable land and pasture management in the low-rainfall areas. On the other hand, farmers and herders will favor generous compensation in drought years, even though this approach may lead to excessive stocking rates and the further encroachment of barley planting into traditional grazing areas, neither of which is environmentally sustainable.

Policy Options

There are three possible sets of policy options for the future. The first is to continue with the present types of drought relief interventions but to find ways of making them less distorting. The second is to introduce some new policy instruments that are less costly and that do not distort incentives. The

third option is to withdraw all drought management interventions, allow agricultural markets to work in an unfettered way, and put in place general safety net programs for the poor that are not tied to farming practices or outcomes. These policy options are outlined here.

Current Policy Instruments

Investments and policies to reduce drought losses. There are a number of investments that can reduce farmers' exposure to drought losses. These options include investing in physical structures and wells to increase irrigation and water supplies, contouring land or planting vegetative bunds to improve water capture in soils, and planting drought-resistant shrubs in grazing areas. These actions need not all be financed by government. In some cases, simply strengthening property rights over cropland or providing long-term credit may provide sufficient incentive for farmers to make their own private or group investments. Public investments in agricultural research can also be targeted toward developing more drought-tolerant crop varieties and livestock breeds, thereby reducing yield losses in drought years. Improvements to rural roads can broaden the reach of local markets, helping to move livestock and feed over wider areas in the event of drought and buffering potential price fluctuations. Most of these investments are win-win strategies that improve average farm productivity while also reducing exposure to drought losses.

Feed subsidies. Feed subsidy programs provide supplementary feeds to safeguard livestock, with the predominant expenditure going for subsidies toward the costs and distribution of concentrates and other feeds, especially barley. These programs have been quite successful in protecting livestock numbers and production during droughts. They have also had negative impacts, including the following:

- They have probably accelerated rangeland degradation in the long term by undermining the traditional process of adjusting flock size to interannual climatic variations. Herd sizes have increased sharply in recent years, and grazing practices have changed so that many of the animals no longer leave the rangeland areas during the dry season but have their feed and water trucked in. This practice leads to overgrazing during the dry season, reduces the natural seeding of annual pasture species, disturbs the soil, and contributes to wind erosion, particularly in areas near water and feed supply points. User fees have been suggested as an economic signal of the scarcity and value of the rangelands, but whether this approach would be a viable option in these large and often remote areas remains to be tested.
- Government procurement prices for barley have encouraged the mechanized encroachment of barley cultivation onto rangeland areas where it cannot be sustained. An additional motive in some countries is that cultivation allows its perpetrators to claim user rights to the land.
- Feed subsidies have added to the fiscal burden on governments.
- Subsidies tend to become permanent, and they have proved difficult to target, with the lion's share of the subsidized concentrates going to large herders and to commercial farms.

Credit support. Systematic rescheduling of credit for farmers during drought years has also been an important policy approach to drought management in the MENA region. Although this approach provides some short-term relief to herders and small farmers, it has proved of greatest benefit to larger farms and contributed to the chronically poor debt collection performance of the region's agricultural development banks. Perhaps a better approach would be to provide consumption credit, not tied to agricultural loans, to smooth consumption across years.

New Possibilities for Improved Drought Management

Rainfall insurance. Agricultural insurance has often appealed to policy makers as an instrument of choice for helping farmers and agricultural banks manage climate risks like drought, and indeed many billions of dollars of public money are spent each year on agricultural insurance around the world. But the experience has generally not been favorable (Hazell et al. 1986). Publicly provided crop insurance has without exception depended on massive subsidies from government, and even then its performance has been plagued by the moral hazard

problems associated with many sources of yield loss, by high administration costs, by political interference (especially compensation payments in election years!), and by the difficulties of maintaining the managerial and financial integrity of the insurer when government underwrites all losses (Hazell 1992). Livestock insurance that compensates for loss of animals or reduced productivity because of drought has rarely been offered, and seemingly not at all for herders in traditional pastoral systems. There are good reasons for this: the incidence of drought losses is usually too high to make the insurance affordable, opportunities for fraud and moral hazard are too great, and there is little opportunity for on-farm inspection of management practices or loss assessments, particularly when the animals are on the move.

But given the frequent occurrence of drought and the widespread damage it causes, there clearly is a need for some form of insurance against drought losses. Indeed, if such insurance could be successfully designed, it might well displace the need for many existing drought management policies.

What is needed is a form of insurance that is affordable, accessible to all kinds of people, compensates for total income losses, is practical to implement given the limited kinds of data available, and can be provided by the private sector without the need for government subsidies.

Area-based rainfall insurance offers a promising new alternative that in principle can meet all these requirements listed above (Skees et al. 2000). In this approach, rainfall insurance contracts are written against specific rainfall outcomes, like drought at a local weather station. The rainfall events should be defined at catastrophic levels, and they should be highly correlated with the value of regional agricultural production or income. For example, an insured event might be that rainfall during the most critical month of the growing season falls 70 percent below normal. In years when the insured event occurs, all the people who purchased the insurance would receive the same payment per unit of insurance. In all other years, no payments would be made.

Insurance would be sold in standard units (for example, $10 or $100), with a standard contract for each unit purchased called a standard unit contract (SUC). Purchasers would decide how many SUCs to buy. The insurance would be sold on a full-cost basis, and the price of the SUC would be the premium. The insurance would need to be sold before season-specific information about the insured risk becomes available. Consequently a purchasing deadline would be established (such as a month before the normal arrival of the rainy season), after which new SUCs would not be sold.

Area-based rainfall insurance has a number of attractive features:

- It avoids the moral hazard and adverse selection problems that plague crop insurance programs.
- It could be very inexpensive to administer.
- It uses only rainfall data, which are available in most MENA countries for long periods of time.
- The insurance can be sold to anyone at risk when there is a drought, including agricultural traders and processors, farm input suppliers, banks, shopkeepers, and agricultural workers. There is no need to be a farmer or to keep livestock.
- It would be easy for the private sector to run.
- As long as the insurance is voluntary and unsubsidized, it will be purchased only when it is a less expensive or more effective alternative to existing risk management strategies.
- A secondary market for insurance certificates could emerge that would enable people to cash in the tradable value of a SUC at any time.
- By providing a way of insuring borrowing groups against covariate risks, it could help broaden the reach of microfinance programs to include more agricultural lending.

Any scheme for area-based rainfall insurance must overcome a number of difficulties:

- The insurer faces high risk because of the covariate nature of the insured risk. When a payment is due, then all those who have purchased insurance against the same weather station must be paid at the same

time. Moreover, if the insured risks at different rainfall stations are highly correlated, then the insurer faces the possibility of having to make huge payments in the same year. To hedge against this risk, the insurer can either diversify regionally by selecting weather stations and risks that are not highly positively correlated or seek reinsurance in international financial markets.

- Rainfall stations must be protected to prevent possible tampering of rainfall measurements. Possible approaches include (1) more secure, tamper-proof stations and instruments, (2) triangulation of readings from neighboring weather stations, and (3) verification of low soil moisture by remote satellite sensing.
- The volume of insurance sold could be too small to be profitable. The insurance will only appeal to people whose economic losses are highly correlated with the insured rainfall event. If the basis risk (the uninsured part of a person's risk) is high, then the insurance will not sell. Also, if the probability of the insured risk is high, then the cost of the insurance could be prohibitive. To overcome these problems, the insurance should be limited to truly catastrophic droughts that significantly affect agricultural production in a region.
- Global climate change and weather cycles (such as the Pacific El Niño Southern Oscillation [ENSO] weather patterns) can change the probability of the insured events, and insurers will be challenged to find cost-effective ways of adjusting the premium rates they charge to reflect changes in the underlying risk of loss.

The private sector has been slow to take the initiative in developing rainfall insurance in developing countries, and several setup problems might require government intervention to jump-start activity. These interventions could include paying the research costs of identifying key catastrophic rainfall events that correlate strongly with agricultural production and income; educating rural people about the value of rainfall insurance; ensuring secure rainfall stations; establishing an appropriate legal and regulatory framework for rainfall insurance; and underwriting the insurance in some way (perhaps through contingent loans) until a sufficient volume of business has been established so that international reinsurers or banks are willing to come in and assume the underwriting role. These interventions need not be costly and could prove crucial in launching rainfall insurance. But it is also important not to launch the insurance on a subsidized basis so as not to distort incentives for private insurers or farmers and herders. Drought insurance of the kind proposed here is being piloted in a number of developing countries with the active interest of international insurers (World Bank 2005).

Early warning drought forecasts. In principle, the ability to provide early warning drought forecasts could be a powerful tool for avoiding many of the economic costs associated with the misallocation of resources that arise because farmers, herders, and other decision makers must commit resources each year before key rainfall outcomes are known. For example, decisions about planting crops (such as date of planting, seeding rate, and initial fertilizer treatment) often have to be made at the beginning of the rainy season before knowledge about rainfall outcomes is available. The economic value of season-specific forecasts depends on the degree to which farmers can adjust their plans as the season's rainfall unfolds. Of course, the reliability of the forecasts and the ability of the farmers to adjust their initial decisions in response to this information are also critical. If decisions about planting and cultivation practices and the feeding, culling, and seasonal movement of livestock can be sequenced, with key decisions being postponed until essential rainfall data are available, then forecast information will be less valuable. But if most decisions must be made up front each season, then the scope for mistakes will be much larger and the potential economic gains from reliable forecast information will be greater. Stewart (1991) examines how the date of onset of the rainy season can provide a fairly reliable forecast of the ensuing seasonal rainfall pattern for Niamey, Niger, and shows how this information could be used to more optimally adjust planting and input decisions for the season (this is his "response" farming approach). Barbier and Hazell (2000) use a stochastic programming model to show how many of the decisions in a typical agropastoral community in Niger can be optimally adjusted to rainfall outcomes.

Reliable drought forecasts could also enable governments and relief agencies to position themselves each year for more efficient and cost-effective drought interventions. This possibility has already been realized, and several early warning drought systems now in place in Africa have proved successful in giving advance notice of emerging drought situations. But these programs are really monitoring systems that track emerging rainfall patterns within a season rather than true weather forecasting systems that predict rainfall outcomes before they even begin.

Reliable multiyear rainfall forecasts are not yet possible, but seasonal forecasts (from three to six months out) have become more reliable, particularly where an important part of the year-to-year variation in seasonal rainfall can be attributed to the Pacific ENSO weather patterns. As the ability to model these phenomena at the global and regional level improves, it seems plausible to expect that more reliable seasonal forecasts will be available at local levels. Private weather forecasting services may expand and become more available to developing countries. But this is also an area where government could play a catalytic role, and even subsidize many of the development costs, without having to worry that this involvement would distort resource management incentives at the farm level.

Nonagricultural Safety Nets

A very different policy approach is for governments to withdraw from providing any direct support to agriculture in drought years and to focus instead on providing efficient and well-targeted safety net programs that ensure that all needy people have adequate access to food and other essentials, including in drought years. This approach would be consistent with recent market liberalization programs in some MENA countries and their greater openness to food imports from abroad. It would, however, probably lead to a shift toward more extensive farming systems in the low-rainfall areas, with a reduced capacity to support the existing rural population in agriculture.

Assignment

Your assignment is to propose an appropriate mix of drought management policies for the MENA region, giving careful thought to the kinds of additional information needed to inform these choices.

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