PN-ABK-803

FAMINE MITIGATION

Proceedings of Workshops Held in

Tucson, Arizona
May 20-May 23, 1991

Berkeley Springs, West Virginia
July 31-August 2, 1991

Compiled by
The Office of Arid Lands Studies
The University of Arizona
Tucson, Arizona

Prepared for
The Famine Mitigation Activity Support Project
U.S. Agency for International Development
Office of U.S. Foreign Disaster Assistance
Washingtion, D.C.

Supported by
The Office of International Cooperation and Development
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Timothy R. Frankenberger
Charles F. Hutchinson
Richard M. Caldwell

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Famine Mitigation Activity

Introduction

The mission of the Office of U.S. Foreign Disaster Assistance of the Agency for International Development is to provide technical assistance, resources and services to foreign countries to alleviate human suffering and economic loss caused by natural and manmade disasters. It initiates and coordinates the U.S. Government's activities relating to disaster relief, rehabilitation, prevention, mitigation, and preparedness for disasters abroad. One element of the program includes the provision of logistical and non-food assistance to countries experiencing food security emergencies.

To date, the bulk of famine relief efforts mounted in Africa and elsewhere usually have focused on the provision of food aid to the most needy groups in affected areas. These efforts have undoubtedly saved lives by meeting the immediate food needs of the needy. However, because they are so narrowly focused, they have had limited to no impact on improving the long-term food security outlook in these regions.

At the other end of the spectrum are development activities which seek to improve household incomes in general through large, capital intensive projects (e.g road building, irrigation schemes, etc.). Over the long term, these efforts may decrease vulnerability to famine. However, these efforts may have little effect rapidly unfolding food security emergencies.

Between these two extremes we can define famine mitigation activities which seek to abate impact of the current emergency while reducing vulnerability to future emergencies. Thus defined, famine mitigation activities might involve food or cash for work projects that build water harvesting structures to enhance agricultural production in marginal areas, reclaim abandoned agricultural land, establish small-scale irrigation and drainage networks, reforest barren land, or other community-based projects. Mitigation activities are commonly initiated prior to the onset of large-scale migrations, with the goal of retaining productive assets (e.g. seed, animals, tools and land) in the hands of households. By keeping these resources in the hands of families, it would be possible: (1) to minimize the social and political disruptions that accompany large-scale migrations; (2) to reduce the amount of time needed for the area to recover; and, (3) to enhance the ability of the population to deal with future emergencies.

Although there have been a large number of successful relief and development interventions that could be termed mitigation as defined above, mitigation has not yet been employed as a regular and systematic part of emergency responses. As a specific relief strategy, it is largely untested.

Against this background, OFDA has undertaken the Famine Mitigation Activity. The intent of this activity is to identify, test under actual field conditions, and develop standard implementation models for a limited number of famine mitigation interventions. These interventions will be designed to 1) be rapidly implemented, 2) be adaptable to a broad range of situations, 3) have extensive application and high impact, and 4) have relatively low costs.

The Famine Mitigation Activity is organized along several sectoral lines (e.g. crops; water resources; livestock). In addition to these technical areas, several other activities are considered that cross-cut all others in 1) intervention planning and monitoring (e.g. early warning; rapid assessment), 2) selection of implementation options (i.e. food for work), and 3) operational constraints (i.e. conflict). Thus, the range of activities considered under the Famine Mitigation Activity is divided into the following component areas:

1. early warning;
2. rapid assessment;
3. extensive cropping systems (e.g. - cereals);
4. intensive cropping systems (e.g. - gardens);
5. livestock;
6. water resources;
7. food for work/cash for work;
8. modification of interventions under conflict situations.

Overall, the activity is envisioned to be conducted in six stages, including:

Stage 1: Review, analysis and synthesis of past and current mitigation efforts resulting in strategy papers for each component area outlining high priority intervention areas and methodologies to be employed in their development.
Stage 2: Conduct of target country profiles and assessments resulting in the development of implementation designs for activity testing in incipient or existing famine areas.
Stage 3: Field testing of promising activities.
Stage 4: Evaluation of promising interventions.
Stage 5: Development of intervention guidelines and training materials.
Stage 6: Design and presentation of summary workshops for famine response personnel.

To address the first stage of the Famine Mitigation Activity, issues papers were prepared for each of the nine component areas. Two workshops were convened in Tucson, Arizona, May 21-24, 1991, and Berkeley Springs, West Virginia, July 31 - August 2, 1991, to (1) review the issues papers, (2) arrive at a consensus on the direction, focus, and content of the subsequent strategy papers, and (3) begin planning pilot activities.

This volume documents the workshops and contains: (1) substantive papers presented before each workshop; (2) reports of working groups; (3) major findings; (4) supporting papers; and (5) summary matrices of the famine mitigation process.

Famine Mitigation Activity

Summary of Findings

The major objectives of the workshops held in Tucson, Arizona and Berkeley Springs, West Virginia were to: 1) review preliminary issues papers developed on each of the component areas envisioned as part of the famine mitigation activities to be undertaken by the Office of U.S. Foreign Disaster Assistance (OFDA); 2) determine the focus and content of strategy papers outlining intervention areas and methodologies to be employed in their development; and 3) plan future pilot activities. The major findings of each workshop are summarized below.

Tucson Famine Mitigation Workshop

The first day of the workshop began with opening remarks by Richard Record, Coordinator of the Famine Mitigation Activity, and Mary Little, OFDA Project Director. This was followed by an overview by Tim Frankenberger on the importance of household coping strategies to identify and design famine mitigation activities (see section on Conceptual Framework). The focus on indigenous coping strategies proved to be a theme that ran throughout the discussions. Papers were then presented on each of the component areas that comprise future famine mitigation efforts. Papers were presented on Early Warning Systems (C. Hutchinson), Rapid Food Security Assessment (T. Frankenberger), Seeds and Tools: Cereals/Staples (R. Caldwell), Seeds and Tools: Gardens (D. Soleri), Seeds and Tools: Seed Banks (D. Cleveland), Livestock (P. Warshall), Water Resources (J. Tabor), Cash-for-Work/Food-for-Work (D. Goldstein), and Conflict Modification (R. Hall). During the second day, the component teams broke up into small groups to discuss the various types of information that are needed to develop country profiles and what types of interventions can be developed for preventing famines or lessening their impact.

A number of issues arose in the course of these working group discussions. First, all the participants actively discussed whether famine mitigation itself is a viable activity. Is there actually a niche between short-term relief and long-term development that can be filled during times of emergency? Mitigation efforts should be directed toward minimizing the impacts of the immediate emergency and the time that would be required to recover from it. To achieve this, farmers and other rural inhabitants engaged in agricultural activities must be kept on the land and their productive assets should be retained so they are able to operate the next growing season. Because of this focus, development, mitigation, and relief activities clearly overlap, but they are also linked and should be mutually supportive. Unfortunately, functional and bureaucratic distinctions have yet to be worked out within and between major donor agencies.

Second, given the size of the famine problems in places like the Sudan and Ethiopia, many participants questioned whether the mitigation efforts proposed would have much effect on overall famine conditions. This called into question the scale at which any designed interventions should be carried out.

Third, because PVO/NGO groups would most likely be the major organizations to carry out mitigation efforts, there is some concern over whether such efforts would not compete for limited manpower and resources needed to carry out relief activities. Without additional resources, mitigation activities could possibly endanger relief efforts for certain segments of the population.

Fourth, many participants called into question the time restrictions placed on all OFDA-type interventions. It was felt that many of the interventions proposed would take more than 90 days to implement. Thus, it was argued that OFDA may be required to make some serious policy changes in order to carry out successful famine mitigation activities.

Fifth, famine mitigation involves both detecting vulnerable populations susceptible to famine and carrying out appropriate actions on interventions that lessen the severity of the food insecurity. The Early Warning group outlined a preliminary strategy for accomplishing the first task. This process involves: 1) deriving country vulnerability profiles generated from secondary sources that specify geographically and socioculturally vulnerable groups; 2) performing vulnerability assessments in historically troubled regions; 3) relying on early warning systems in place (e.g., FEWS) that can alert response agencies to impending crises; 4) conducting rapid assessments to determine the degree and impact of the emergency and determine appropriate mitigation strategies, and 5) monitoring mitigation activities to determine their impact. All other component groups identified the specific types of information to be collected in the country profiles and rapid assessments that would be essential to the various intervention areas.

Sixth, in addition to identifying an array of intervention options, the other component teams identified the essential factors that must be considered in the implementation of any interventions. These include identifying the appropriate conditions required to carry out the intervention, the necessary participants, required information, and resources (material, physical, and organizational). All groups stressed the importance of building upon existing practices, institutions, and experience, and emphasizing skill enhancement and local capacity building rather than inputs of external materials and expertise. Whenever possible, improved practices should be disseminated locally through such techniques as training of trainers and other culturally effective outreach strategies.

Seventh, the goal of any famine mitigation activity, particularly short-term and long-term interventions, should be to promote sustainable agricultural conditions and resource management while managing and enhancing local capacities to cope with famines. Interventions that promote yield increases without concern for carrying capacity or the resource base will lead to environmental degradation and increased vulnerability to future food shortages.

Eighth, the workshop in Tucson brought into focus the importance for OFDA to adequately define mitigation, and the requirements that will be necessary to carry out activities in this area. For example, interagency collaboration will be essential for any mitigation effort to be have significant, measurable impact given the nature of the task. In addition, limiting target countries to those engaged in on-going civil conflict situations needs to be carefully reconsidered in light of political, administrative, and logistical barriers that these situations present.

In summary, the Tucson workshop provided a forum for a wide-ranging group of development practitioners to come together to discuss the key issues surrounding famine mitigation. Given the nature of the topic, it is understandable why a diverse set of opinions were represented regarding famine mitigation efforts. This workshop contributed toward consensus building that will be necessary to carry out future mitigation activities under OFDA guidance.

Berkeley Springs Workshop

This workshop concentrated on famines that are the result of civil conflicts. Such conflicts can cause major disruptions in the migration routes, market systems, and distribution networks that normally provide an area with adequate food supplies. Recognizing the important relationships between conflict, famine, and food aid, the goal of this workshop was to identify alternative mitigation activities which could be implemented under conflict conditions.

The workshop began with a summary of the Tucson workshop followed by presentations on issues in Cash/Food-for-Work Activities (J. Bryson) and issues surrounding implementation of activities under conflict scenarios (J. Clark). Small group discussions centered on identifying the various types of scenarios that might be encountered by groups involved in the design and implementation of famine mitigation interventions. The intent was to provide a framework around which strategy papers on specific interventions might be structured.

A number of issues were discussed throughout the course of this workshop. First, similar to Tucson, opinions differed regarding the definition of mitigation, the amount of time necessary to carry out mitigation activities, and the purpose of the strategy papers. Some participants felt that the terminology established under the Famine Mitigation Activity should be in line with the current usage and understanding of response agencies. OFDA staff emphasized that the Famine Mitigation Activity was a staged approach that linked the provision of immediate assistance to desired long-term outcomes in a logical sequence of activities. This process entailed increasing local capacities and reducing vulnerabilities.

Second, the group identified a number of possible famine scenarios that could occur in countries engaged in conflict. These included: 1) drought-induced food shortages where access to vulnerable areas is not a constraint; 2) food shortages in rebel-held areas where access may or may not be a constraint; 3) food shortages in transition zones (areas between combatants) where access is constrained by both parties; 4) food shortages in non-conflict zones where access is not constrained, but where resources are diverted to support conflict; and 5) flood-induced food shortages where access is likely to be a constraint and markets and production areas may be affected.

Third, the group supported the notion that understanding and applying principles of military strategy may be applicable for identifying, designing, and implementing appropriate interventions. In addition, it will be necessary to evaluate mitigation activities in terms of how they will be viewed or used by military combatants.

Fourth, the group suggested, just as in Tucson, that OFDA better define both famine and mitigation (see Conceptual Framework). Additionally, given the wide range of possible market interventions, the group recommended that a paper be prepared on the types of market interventions that might be considered for mitigation.

Fifth, participants discussed the appropriateness of food or cash inputs in famine mitigation efforts. It was generally agreed that the type of input will be determined by the stage of famine development, access to affected locations, and logistical capabilities.

Sixth, the group proposed that interventions should be "catalytic", serving as a starting point and not as an end product in themselves. This would include training people how to carry out interventions themselves rather than having to rely on outside expertise to build structures or perform other tasks for them. Thus, the Famine Mitigation Activity is meant to be a catalyst for changing the way famine is responded to. It will challenge response agencies to explore ways of going beyond relief, breaking down conceptual barriers that define actions only in limited terms of relief or development, recognizing that such distinctions are artificial and overlapping. The Activity will stress the need for coordination, collaboration, and cooperation among all parties concerned in the hope of defining how short-term interventions can be designed to have long-term impact in enhancing and expanding indigenous mechanisms for coping with food and asset insecurity.

One of the major outcomes of this workshop was the development of a famine intervention matrix that identifies stages in a developing crisis, appropriate strategies for each stage, and potential intervention options. Other follow-up actions were identified to initiate famine mitigation efforts in Sudan, Ethiopia, and Angola.

1

Section I: The Tucson Meeting

Conceptual Framework

Tucson, Arizona
May 21-24, 1991

Part I: Famine and Mitigation

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Famine -- life-threatening food shortage -- has been with us always. Its causes can be linked variously to drought, flood, pest infestations, political upheaval, war, institutional instability, failure of regional economies, or some combination of these factors. Regardless of its origin, however, famine has been a persistent and powerful force in human history (Arnold 1988).

From an historical perspective, the relative absence of famine in Asia, Europe, and Latin America during the past two decades is something of an anomaly. While it might be argued that the disappearance of famines in the more developed part of the world has led to complacency, it appears, conversely, that the stark contrast between the security of the West and the recurrent famines of the Horn and Sahel regions of Africa has served to draw sharper and more sustained attention from donor countries.

The mission of the Office of U.S. Foreign Disaster Assistance of the Agency for International Development is to provide technical assistance, resources and services to foreign countries to alleviate human suffering and economic loss caused by natural and manmade disasters. It initiates and coordinates the U.S. Government's activities relating to disaster relief, rehabilitation, preparedness, prevention and mitigation for disasters abroad. One element of the program includes the provision of logistical and non-food assistance to countries experiencing food security emergencies. Through 1990, of the 400 disasters to which OFDA responded, the largest categories were drought/food shortage (109) and civil strife (63). The bulk of these have been in Africa.

In response to the rising number of emergencies -- particularly in Africa -- attention has been drawn increasingly to the types of institutional responses that have been applied in food security emergencies. As understanding of the causes, nature, and process of famine evolves, more innovative approaches to relief efforts become possible. While emergency food relief has been effective in saving lives, the constraints imposed by a shrinking budget brings OFDA to consider more effective and efficient alternatives to traditional approaches of minimizing the impact of current food security emergencies and preventing future ones.

Alternative Famine Responses

At a national or regional level, the causes of famine are usually diverse, often difficult to grasp, and virtually immune to abatement efforts -- especially over the short term (Arnold 1988). Because of this intractability, and because the impacts of famine are suffered ultimately at an individual level, it is prudent to examine the famine problem from a household perspective in seeking alternative solutions.

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Regardless of famine's origin, responses at the household level to almost any food security emergency are reasoned and knowable (see Frankenberger, *The Importance of Household Coping Strategies to Famine Mitigation*). These **coping strategies** progress through a series of stages, including: (1) adaptations in patterns of production, consumption, and investment; (2) liquidation of assets, including the sale of animals, farm implements and, ultimately, farm land; and, (3) general out-migration, typically to refugee camps (Watts 1983; Corbett 1988; see figure 1). In the Famine Mitigation Activity, the evidence of these coping strategies has specific importance. For example, the number of animals offered for sale and the terms of trade has significance for early warning (see Hutchinson, *ShortFEWS: Action-oriented Early Warning*), while sales of productive assets (e.g. draft animals, tools, and land) represent the point which mitigation efforts should be aimed to prevent (see Frankenberger).

In determining when an intervention is both most **critical** in terms of household integrity and **cost effective** in terms of long-term impact on household economies, the point at which productive assets (e.g. seed; animals; farm implements; farm land) are being liquidated is most significant. Once this threshold is passed, it is difficult -- if not impossible -- to return the household to its pre-emergency situation, thus broadening and deepening the emergency. Moreover, emergencies can create or exacerbate local economic and political inequalities as relatively wealthy households and groups are able to enhance their holdings at low cost. Thus, the maintenance of productive assets within the household is of long-term importance to both the economic and political security of any emergency area.

Traditional assistance to famine-prone regions has been divided between relief and development. **Relief** has concentrated on the alleviation of emergency conditions through the provision of food or cash aid to the most needy segments of the population. Most often, relief action is triggered by distress migrations within an affected area. However, even though it corresponds with the period of maximum vulnerability and need, distress migration occurs after all other strategies for coping with the emergency have been exhausted (see Figure 1). Moreover, relief's effective time frame is measured in weeks or months and, despite the lives that might be saved, there is little in the way of positive change that endures after the emergency has passed.

Development is not necessarily geared to address emergency situations. Generally, it focuses on long-term projects with time frames measured in years to decades. More often than not, these efforts have concentrated on relatively large, capital-intensive public works (e.g. road and dam construction), or institution building (e.g. strengthening agricultural research and extension capabilities). The long-term objectives of these projects has been to increase productivity, enhance general household income and thus reduce vulnerability to famine. In this, development has addressed conditions that affect essentially all economic levels of the population.

Between these two ends, another class of activities can be defined that targets the conservation of productive assets at the household level early in the famine process (see Figure 1). The objective is to abate the impacts of the current emergency, but also to shorten the period of recovery and, in the long term, reduce vulnerability to future food emergencies. The time frame may range from months to years and, commonly, the recipient group is in command of some productive assets (e.g. tools, animals, land). These activities can be called **mitigation**.

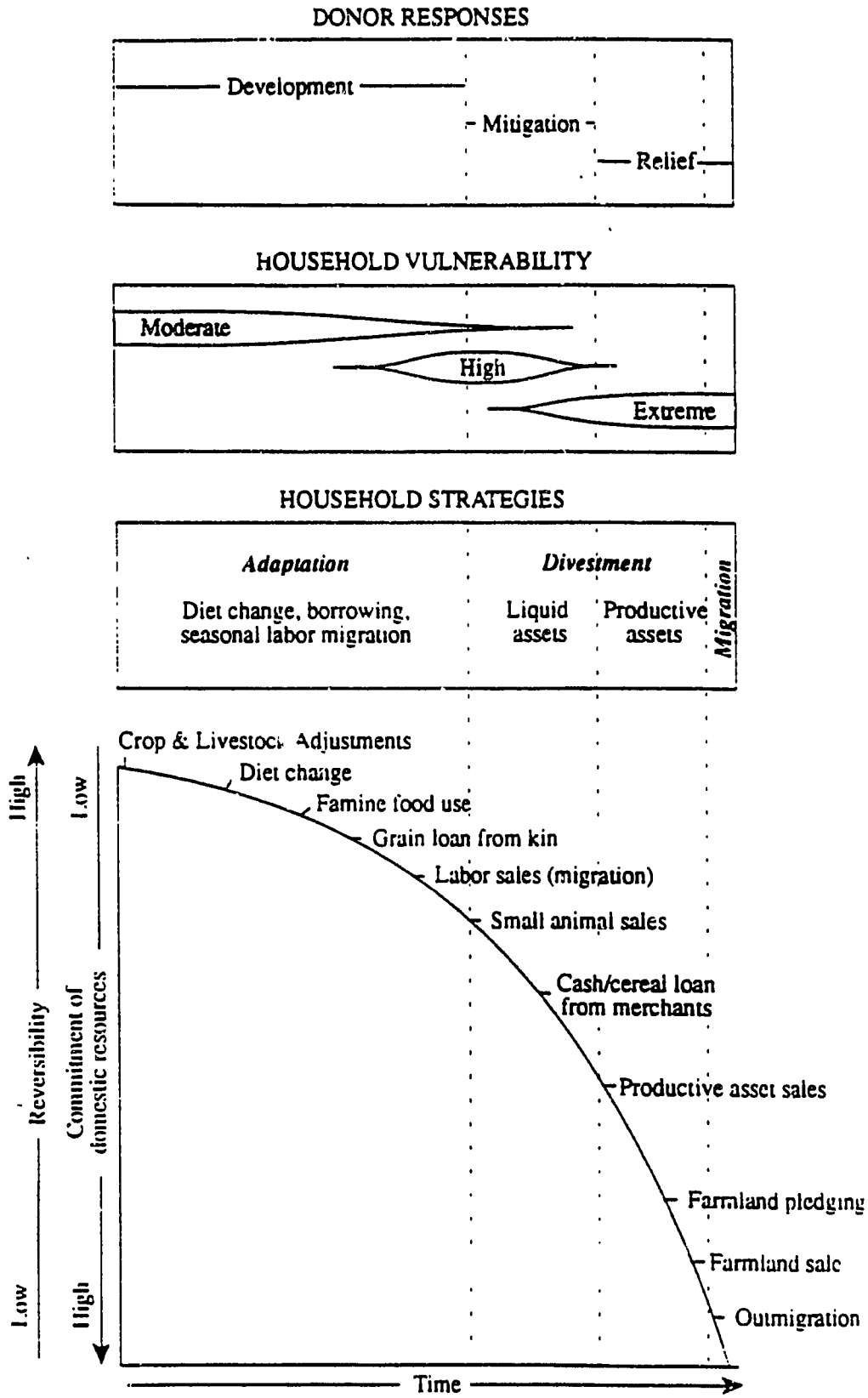

Figure 1. Responses to household food shortages (after Watts, 1983) Office of Arid Lands Studies, The University of Arizona.1991.

Famine Mitigation

Household responses to emergencies at any one point in time vary largely as a function of the group considered (e.g. nomads; sedentary farmers; landless urban laborers), the type of emergency encountered (e.g. drought, flood, pests, economic collapse, civil strife), and the store of assets available to the household (e.g. individual family wealth; access and tenure to good farmland; ability to secure off-farm employment). By understanding the sequential coping strategies invoked by various groups we can learn, (1) the relative **level of emergency** at the household level, and (2) the types of **interventions** that would be both most appropriate and most acceptable. Thus, the coping strategies that are currently employed by various groups in a region are key in attempting to identify, design and implement effective mitigation efforts.

With its distinctive household orientation, the Famine Mitigation Activity is intended to be a bottom-up effort. From the preceding discussion, it is possible to lay out the operating **principles** around which it will evolve:

1. Famine is a process rather than a catastrophic event.
2. Famine may be widespread but does not affect equally all households, economic groups, or areas.
3. Households employ a reasoned and staged set of responses (coping strategies) to food security emergencies that seeks to conserve household assets.
4. The severity of the emergency in any household, group or area is reflected in the coping strategies currently being employed.

It is further possible to outline some **objectives** of mitigation efforts, or interventions, that are consistent with these principles:

1. Interventions will mitigate or abate the current emergency **while** reducing vulnerability to future emergencies.
2. Interventions will target and preserve productive assets at the household level.
3. Interventions will reinforce and build upon existing patterns of coping, and may, in fact, be derived from them.

Obstacles to Mitigation

While there have been successful interventions that might be termed mitigation according to the principles and objectives outlined here, mitigation as a routine response to famine is largely untested. Clearly, the objectives of relief, development and mitigation overlap to some degree. Equally important, however, these efforts overlap in terms of timing, personnel and institutions.

As noted above, the last, most severe stages of famine are characterized by large-scale migrations to relief camps. Here, relief efforts can be most effective because a large number of people are concentrated at one point. Efficiency in terms of the use of relief personnel and time are maximized. Unfortunately, by seeking to affect farmers prior to migration, mitigation efforts must be dispersed and may thus be comparatively inefficient in their use of time and personnel. Given the constraints of time and personnel during an emergency, it is unclear

what impact mitigation activities might have on parallel relief efforts unless alternatives are found that require relatively little direct assistance.

Finally, agencies and institutions have evolved to deal with both relief and development. Thus, for some of the reasons cited above, there is a tendency on the part of existing programs to view mitigation efforts as competitive rather than complementary. Although it may prove to be inconsequential, the logistical and institutional feasibility of mitigation also remains to be proven.

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Part II: The Importance of Household Coping Strategies to Famine Mitigation

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Effective famine mitigation activities must be based on the following three components:

1. Detection: Food insecurity must be detected early before it becomes a famine;

2. Preparedness: Timely responses must be prepared before households lose their productive assets and their ability to recover from the food deficit situation;

3. Interventions: Interventions must be sought that promote sustainable resource management and that reduce a household's vulnerability to future threats to its food security.

A thorough understanding of household coping strategies within a given region will have a direct bearing on the successful implementation of all three components. The following discussion provides a general overview of some of these strategies and their importance to famine mitigation.

Coping Strategies

Households do not respond arbitrarily to variability in food supply. People who live in conditions that put their main source of income at recurrent risk will develop self-insurance strategies to minimize risk to their food security and livelihood (Corbett 1988; Longhurst 1986). This careful forward planning that can be termed a coping strategy is fundamental to the survival of small farmers throughout Africa. Development practitioners concerned with helping small farm households to improve their food security must begin by understanding the strategies employed by these households in coping with the risk of hunger.

Examples of such responses include dispersed grazing, changes in cropping and planting practices, migration to towns in search of urban employment, increased petty commodity production, collection of wild foods, use of inter-household transfers and loans, use of credit from merchants and money lenders, migration to other rural areas for employment, rationing of current food consumption, sale of possessions (e.g., jewelry), sale of firewood and charcoal, consumption of food distributed through relief programs, sale of productive assets, breakup of the household, and distress migration (Corbett 1988). Evidence from Africa and Asia has demonstrated that common patterns in coping strategies can be identified (Cutler 1986; Downing 1988; Longhurst 1986; Malambo 1987).

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In analyzing varieties of coping strategies, it is important to distinguish between the two types of assets that farmers have at their disposal. Assets that represent stores of value for liquidation are acquired during non-crisis years as a form of savings and self-insurance; these may include small livestock or personal possessions such as jewelry. A second set of assets are those that play a key role in generating income, such as land and draught animals. These are less liquid as stores of value, and are much more costly to the farm household in their disposal. Households first will dispose of assets held as stores of value before disposing of productive assets (Corbett 1988).

Most initial responses to actual or potential food shortages are extensions of practices conducted in some measure during normal years to adapt to rainfall variability (Longhurst 1986; Watts 1988). Traditional methods of handling risk can be divided into routine risk-minimizing practices and loss-management mechanisms (Walker and Jodha 1986). Risk-minimizing practices are adjustments to production and resource use before and during a production season. This involves such practices as diversification of resources and enterprises, and adjustments within cropping systems. Crop-centered diversification can include choice of crops with varying maturation periods, different sensitivities to environmental fluctuations, and flexible end-use of products (Walker and Jodha 1986). Farmers will also reduce production risks by exploiting vertical, horizontal, and temporal dimensions of the natural resource base. Vertical adjustments involve planting at different elevations in a topographic sequence. Spatial risk adjustment includes planting in different microenvironments or intercropping. Temporal risk adjustments involve staggering planting times (Walker and Jodha 1986). Adjustments may also include extension of farming to marginal areas or overuse of a particular plot, practices that can have a destructive effect on the natural environment.

Loss-management mechanisms include farmers' responses to lower-than-expected crop production caused by natural hazards (Walker and Jodha 1986). Reductions in crop production can be compensated for through non-farm income, the sale of produce durables (livestock), the management of stocks and reserves, seasonal migration, and reciprocal obligations among households. Over-exploitation of certain natural resources (forest reserves, for example) for market sale may also be part of a loss-management strategy.

In communities marked by landholding and income inequalities, household responses are not the same (Longhurst 1986; Tobert 1985). Indeed, identical climatic conditions can affect households of varied economic levels to different degrees. Seasonal shortages for some families produce famine conditions for others. Poorer households, having smaller holdings and a weaker resource base, are more vulnerable to stress than are wealthier households, and begin to suffer earlier when food shortages hit. The poor resort to early sale of livestock, pledge farms, incur debt, sell labor, and borrow grain at higher interest rates (Watts 1988). In essence, crop failures reveal rather than cause the fragile nature of food security among vulnerable rural families. At the same time, prosperous households buy stock at deflated prices in conditions of oversupply, sell or lend grain to needy farmers, purchase wage labor at depressed rates, and purchase land (Watts 1988). Thus, during a food crisis, a cycle of accumulation and decapitalization can occur simultaneously within a single community.

Watts (1988) has observed that patterns of coping strategies can be diagramed to show the sequence of responses farm households typically employ when faced with a food crisis (Figure 1). In the earliest stages of a crisis, farmers employ the types of risk-minimizing and loss-management strategies discussed above. These typically involve a low commitment of domestic resources, enabling speedy recovery once the crisis has eased. As the crisis persists, farmers are increasingly forced into a greater commitment of resources just to meet subsistence needs, a strategy that becomes less reversible the longer the crisis persists. In Watts' model, the final failure to cope with a food crisis is marked by permanent out-migration from the region.

As Figure 1 illustrates, the types of coping strategies employed by households not only indicate the household's vulnerability, but also correspond to different types of donor responses. Household coping strategies that do not involve divestment normally indicate moderate vulnerability and donor response is more appropriately oriented towards development efforts (see Hutchinson, *Famine and Mitigation*). Once divestment begins to occur, household vulnerability to food shortages becomes high and mitigation should be considered the more appropriate response. Productive asset sales and permanent outmigration indicate extreme vulnerability to famine calling for relief efforts on the part of donors.

Recent studies have found that the range of coping strategies pursued by farm families in drought-prone areas may be changing over time (Downing 1988; Thomas et al. 1989). Three major trends appear to be developing. First, risk-minimizing agricultural strategies appear to be narrowing in some locations (e.g., in Kenya), as repeated sale and reacquisition have depleted domestic and productive asset levels. In these areas, agricultural coping strategies are being replaced by strategies that diversify income sources through off-farm employment and nonagricultural production (Mead 1988; Swinton 1988). These nonfarm strategies often include practices that are known to be environmentally damaging, but that provide a last resort in crisis conditions. Second, strategies that relied on social support and reciprocity for overcoming food deficits are eroding due to the integration of individual households into the cash economy (Thomas et al. 1989). Third, a shift has been observed in the responsibility for coping with drought from the individual household and local community toward the national government through famine relief programs (Frankenberger 1990). This trend is due in large part to the reduction in response flexibility of small farm households (Frankenberger and Goldstein 1990).

Awareness of local coping strategies and ongoing monitoring of local conditions and of trends in strategies being employed (e.g., exhaustion of assets, depletion of stores, increased migration) can alert development agents to areas where immediate interventions may be needed. These areas can be targeted for mitigation efforts that enable farm families to prolong the effectiveness of non-degrading coping strategies (Frankenberger and Goldstein 1990).

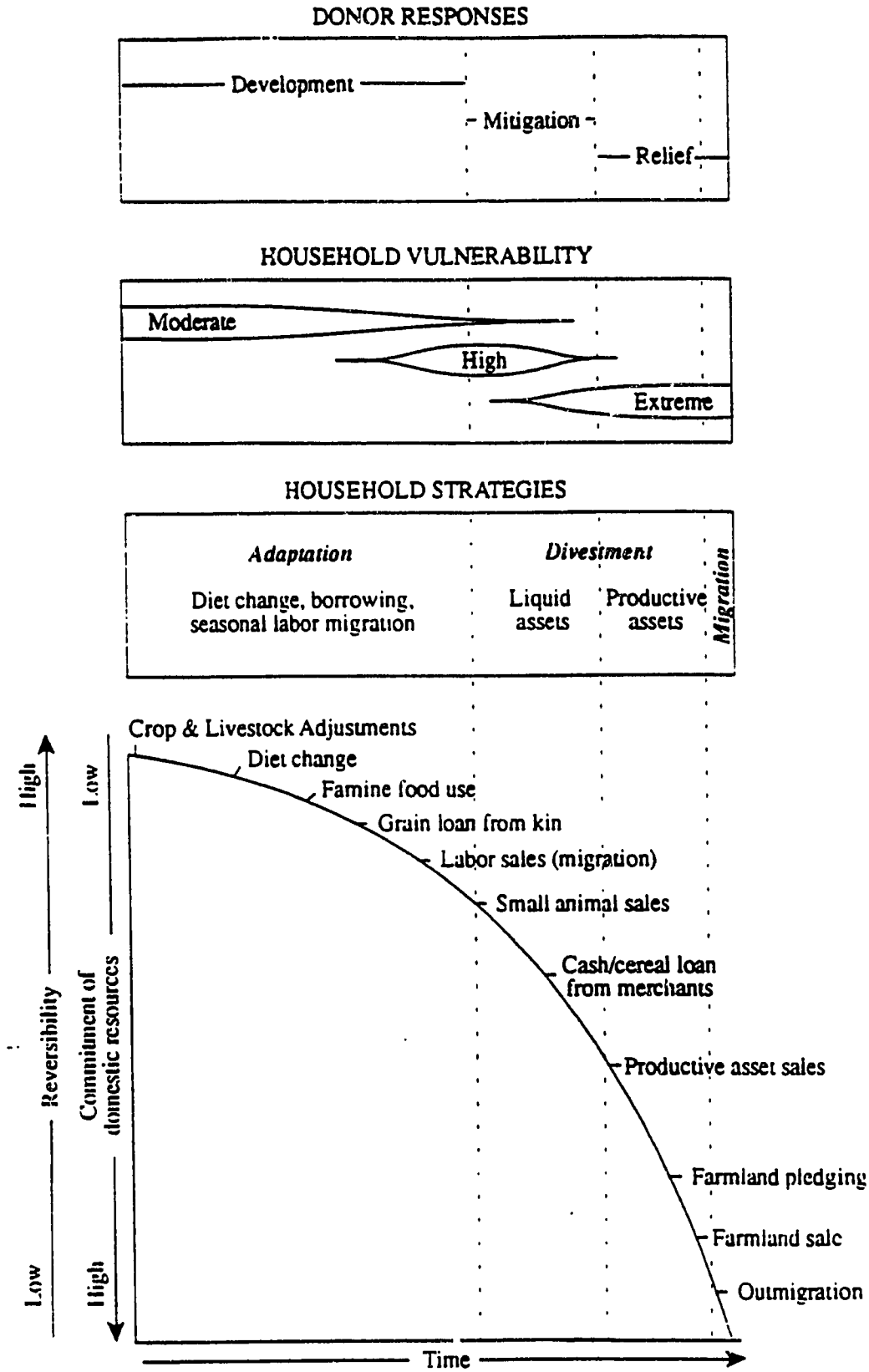

Figure 1. Responses to household food shortages (after Watts, 1983)
Office of Arid Lands Studies, The University of Arizona, 1991.

Establishing a Decentralized Food Security Monitoring System

The generalized patterns of coping strategies discussed above find practical application as tools for food security monitoring. Rather than focusing strictly on the outcome of farmer responses to production constraints and food crises, development practitioners can develop methodologies that monitor the processes by which households cope with food insecurity. Monitoring these processes will improve famine early warning systems as well as guide the determination of appropriate interventions for increasing farm productivity.

Building upon the work of the World Food Program (WFP), there are three types of indicators that can be monitored for changing coping responses, thus suggesting worsening conditions and heightened food insecurity. Leading indicators (WFP refers to these as Early Indicators) are changes in conditions and responses prior to the onset of decreased food access. Examples of such indicators include: 1) crop failures (due to inadequate rainfall, poor access to seed and other inputs, pest damage, etc.); 2) sudden deterioration of rangeland conditions or condition of livestock (e.g., unusual migration movements, unusual number of animal deaths, large number of young female animals being offered for sale); 3) significant deterioration in local economic conditions (e.g., increases in price of grain, unseasonable disappearance of essential food stuffs, increases in unemployment among laborers and artisans, unusual low levels of household foodstocks; and 4) significant accumulation of livestock by some households (due to depressed prices caused by oversupply). Leading indicators can provide signs of an impending problem and may call for a detailed situational analysis to determine the extent of the problem, causes, and need for monitoring.

Concurrent indicators (WFP calls these Stress Indicators) occur simultaneously with decreased access to food. Examples of such indicators are: 1) larger than normal migrations of able-bodied family members in search for food or work; 2) appearances in the market of unusual amounts of personal and capital goods, such as jewelry, farm implements, livestock (draft animals); 3) unusual increases in land sales or mortgages; 4) increases in the amount of people seeking credit; 5) increased dependence on wild foods; 6) reduction in the number of meals; and 7) increased reliance on interhousehold exchanges. Concurrent indicators can be assessed while carrying out situational analysis using rapid rural appraisals. Once the nature and extent of the problems have been confirmed, interventions can be introduced that focus on the causes or mitigate the effects.

Trailing indicators (WFP calls these Late Outcome Indicators) occur after food access has declined. They reflect the extent to which the well being of particular households and communities have been affected. In addition to signs of malnutrition and high rates of morbidity and mortality, trailing indicators include increased land degradation, land sales, consumption of seed stocks and permanent outmigration. All of these indicators are signs that the household has failed to cope with the food crisis.

Focusing on coping strategies reveals the actual behaviors of farm households that adverse climatic or market conditions have provoked. Such an orientation allows for an ongoing monitoring of the processes by which people adjust to changing circumstances.

Complementarity to Early Warning Systems

To effectively monitor the food situation for a given region, systems must be established that can effectively identify those areas that may be experiencing an emergency (early warning), and that can gauge the magnitude of the potential emergency (assessment). Early warning systems such as the Famine Early Warning System (FEWS) and the Global Information and Early Warning System (GIEWS) operated by the Food and Agriculture Organization (FAO) trigger emergency food aid responses, but lag times in delivery often relegate these to solely relief measures without high mitigative impact. So while these systems have been very effective in accomplishing early warning, through use of satellite remote sensing, but have not been as successful accomplishing effective assessment. The proposed food security monitoring system complements these national early warning systems by providing more fine tuning of assessments on a localized level.

Recognizing that households pass through different stages in coping strategies will help planners identify key indicators for early warning of impending food crises and trigger more immediate responses (see Swift's (1989) discussion on the Turkana system). A thorough understanding of these coping strategies will enable development agencies to more accurately interpret consumption indicators such as asset sales, price movements and levels of undernutrition (Campbell and Trechter 1982; Corbett 1988). Famine warning systems need to be localized because few indices are universal indicators of impending famine (Corbett 1988; Campbell and Trechter 1982).

Timely Famine Mitigation Interventions

Effective food security monitoring should be geared to warning of the erosion of the subsistence base of households (Walker 1990) and should also be tied to triggering local-level responses. A crisis situation arises when households shift from using reversible non-asset stripping strategies to non-reversible ones which limit their options. Relief programs geared towards food handouts will do little to re-establish the long-term viability of local communities. Although relief focuses on preserving lives, mitigation activities focus on preserving livelihoods. The timing of mitigation interventions should be aimed at safeguarding people's capital and assets as well as existing social structures that buffer vulnerable households to periodic stress.

Timely response is more likely to occur when interventions are designed to enhance existing coping mechanisms and closely linked to a food security monitoring system based on household coping strategies (see Figure 2). For example, food for work/cash for work interventions would occur in the dry season after a poor harvest to prevent people from selling off their productive assets. Seeds and tools may be distributed during the next cropping season if poor production in the current year has forced many households to eat their seed stocks and sell their tools. In addition, livestock interventions would be implemented to preserve these assets through the dry season.

Figure 2
Proposed Famine Mitigation Framework

HOUSEHOLD COPING STRATEGIES

Risk-Minimizing Strategies

- crop-centered diversification (vertical, horizontal, temporal)
- water management
- livestock-centered diversification

Risk-Minimizing Strategies

- changes in crop-centered practices
- changes in livestock-centered practices
- water management changes

Loss-Management Strategies

- borrowing food
- use of wild foods
- sale of labor
- use of credit
- reduction of meals
- sale of liquid assets (livestock, jewelry)
- seasonal migration
- petty trading and borrowing
- sale of wild products
- charcoal production
- artisan work
- private or government employment
- sale of domestic assets

Loss-Management Strategies

- increased reliance on wild foods
- increased reduction of meals
- sale of labor
- sale of agricultural tools and livestock
- sale or mortgage of land
- sale of other productive assets
- seasonal or permanent migration

Cropping Season 1 — Hungry Season — Harvest — Cropping Season 2 — Hungry Season — Harvest — Cropping Season 3

MONITORING ACTIVITIES

Monitoring — Early Warning/Assessment

Leading Indicators

- rainfall
- vegetation cover
- prices
- crop conditions
- range and livestock conditions
- economic conditions

Concurrent Indicators (nutritional analysis)

- mass migration
- capital goods in market
- land sales/mortgages
- large number of people seeking credit
- reduction in quantity and quality of meals
- breakdown of interhousehold exchanges
- livestock sales.

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- livestock sales.

Cropping Season 1 — Hungry Season — Harvest — Cropping Season 2 — Hungry Season — Harvest — Cropping Season 3

MITIGATION INTERVENTIONS

Livestock Interventions

- maintenance
- destocking

Livestock Interventions

- maintenance
- destocking

Gathering seeds for seedbanks

Seeds and Tools Interventions

- distribution of seeds and other inputs
- early maturing varieties
- garden vegetables

Gathering seeds for seed banks

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- early maturing varieties
- garden vegetables

Food/Cash-for-Work

- water resource improvements
- garden interventions
- reforestation

Food/Cash-for-Work

- water resource improvements
- garden interventions
- reforestation

Time-effective response involves being prepared to respond when the need arises. Response capability can be improved within a country or region through a country-wide vulnerability assessment (see Hutchinson, *ShortFEWS: Action-oriented Early Warning*). Such an assessment will employ an analysis of disaster history to identify vulnerable areas and/or population groups that are chronically prone to food shortages and production shortfalls. This vulnerability can result from recurrent droughts, political instability, and conflict, or some combination of these factors. Such assessments can identify infrastructure needs that will improve response capability.

NGO Involvement

To effectively establish food security monitoring systems in food deficit areas and to implement appropriate interventions, Non-Governmental Organization (NGO) involvement is essential. A number of NGOs have been very active in creating localized monitoring systems for the past several years (Bryson et al. 1991; Swift 1989). This work often began as part of emergency relief assistance but has evolved into development assistance with a capability for early response to food shortages.

Experience from Ethiopia has made it apparent that maintaining a NGO presence in disaster prone areas is critical for adequate response to food shortages. CARE, CRS, WVRD, and SAVE all have large commitments in disaster prone countries. Such a presence provides a basis for mobilization and expansion of food assistance. Almost all of these groups maintain food stocks, trucks, warehouses, experienced staff, and good interactive relationships with local communities. This logistical support is vital to timely interventions.

NGOs also have considerable experience in promoting natural resource management improvements. This experience will provide valuable input into programs aimed at soil conservation, water harvesting, and reestablishment of forest reserves. For example, WVRD has been actively involved in promoting such efforts through food-for-work in Mali (Bryson et al. 1991). NGOs have also made an impact in training local populations in extension practices. CARE personnel are involved with training people from local communities in Ethiopia in extension activities related to soil conservation. NGOs could provide training for local community members in monitoring consumption indicators with the objective of enhancing local capabilities for preparedness.

Summary

To help farm families meet their food security needs, timely interventions must be implemented that allow farm families to retain their productive assets and enable them to pursue nondegrading coping strategies. The timeliness of interventions will depend upon the effectiveness of decentralized food security monitoring and decision making for detecting food deficit areas early enough, and the preparedness of the local government and other development organizations to respond. Interventions that are implemented should help promote sustainable resource management and reduce a household's vulnerability to future threats to its food security.

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Section I: The Tucson Meeting

Issues Papers

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ShortFEWS: An Action-Oriented Famine Early Warning System

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1. Introduction

Although famine has persisted in Asia until quite recently, its memory in Europe and North America gradually faded in the wake of the industrial revolution of the 19th century and the economic growth of the 20th (Arnold 1988). However, beginning in 1972, a series of droughts in the Sahel region of Africa returned famine to a place of prominence in Western consciousness. In response, the donor countries of the West sought accurate and timely warning of impending food emergencies to facilitate the provision of assistance. But donor countries were once more caught off-guard in the severe famines of 1983-84 in the same region. Afterward, a "bumper crop" of early warning systems (EWSs) sprang to life across Africa that were intended to avert future disasters (Walker 1989).

The purpose of this paper is to briefly describe the nature of EWSs, some of the issues that surround them, and to consider variations on or additions to current EWSs which might be adopted to meet the needs of the US Office of Foreign Disaster Assistance (OFDA) in famine mitigation.

1.1 Operating Assumptions

In the design and operation of EWSs, four operational assumptions are made which underpin their methodologies:

1. Famine is a process rather than a catastrophic event.
2. Famine has observable precursors, or indicators.
3. Some indicators will appear early enough to permit mitigative action to be planned and taken.
4. There is a general progression of indicators that reflects the severity of the emergency as it unfolds.

1.2 Causes of Famine

It might be argued that the existence of indicators suggests that the process of famine is well-ordered, understood, and predictable. Excluding war-related famine, this does not appear to be generally true. Since Malthus, many explanations of famine have been tied to imbalances between agricultural production and demand. In a few rare cases this may be true, but promoting Malthusian explanations is, at best, misleading and does injustice to the complexity of famine.

Almost always, other factors such as political, economic or institutional weaknesses work to render some places more vulnerable to risk than others (e.g. Garcia 1981; Sen 1981; Watts 1983; Glantz 1987). Under vulnerable conditions, an external shock -- such as a drought -- may provide the final straw that triggers famine (Mayer 1981). Thus, in the case of the Sahel, for example, despite the fact that rainfall remains the single largest controlling factor in determining crop variability (LeComte et al. 1988), the failure of rains alone is not solely responsible for famines.

1.3 Indicators of Famine

Because of the diverse nature of its causes and expressions, a host of different indicators are commonly considered in famine early warning. These can be divided into four general types. The first are physical indicators, or data which describe phenomena that can be measured. These include standard meteorological data (i.e. rainfall), satellite-derived estimates of vegetation "greenness" (normalized difference vegetation index [NDVI]), and rainfall. Often, several types of physical data may be used in models to derive secondary indicators, such as soil moisture, that predict crop success or failure (Henricksen and Durkin 1986).

The third type of indicator is also "objective," and is also derived, in part, from physical data. These encompass agricultural projections and estimates, including production, scheduled imports, stocks, and demand, usually distributed by host countries. For early warning, these data are combined in a food balance sheet that weighs food project availability against demand. The food balance sheet is the heart of the system employed by the Global Information and Early Warning System (GIEWS) of the Food and Agriculture Organization of the United Nations (FAO).

The final type -- socioeconomic indicators -- is more transitory and describes the response of the population to current conditions, both quantitatively and qualitatively. These include grain prices, labor prices, the number of animals offered for sale and terms of trade, migration, and measures of health and nutrition, among others. Anecdotal reports of local situations are also considered here.

1.4 Technical Approach

None of these indicators works well alone in signalling an impending food emergency. Objective data may provide a reasonably accurate picture of the current growing season but cannot portray the perceived risk to which a population responds. Socioeconomic data seem to accurately reflect the degree of emergency that is currently being experienced, but are exceedingly difficult to interpret accurately, especially without objective data and ground observations (Cutler 1984). Health, nutrition, and morbidity data may be the ultimate measures of famine severity but have virtually no predictive value (Mason et al. 1987).

Because the causes of famine are varied and the performance of all indicators differs in terms of the kinds of information they contain and the time they are available, a convergence of evidence approach has been generally adopted that is similar to that used in traditional air-photo interpretation (Estes et al. 1983). Using this approach, the convergence of several

independent indicators is used to identify potential emergencies. The Famine Early Warning System (FEWS) operated by the U.S. Agency for International Development (USAID), has been built along these lines and, among EWSs, FEWS routinely evaluates the widest array of data. However, because of the scope of their mission, virtually all data considered by FEWS comes from secondary sources. There is no independent primary data generated within the project.

1.5 Methodological Trends

Because they are easily acquired, often synoptic, and generally understood, many EWSs have focused on the collection and interpretation of "objective" data, such as rainfall measurements, satellite NDVI and estimates of rainfall, and components of the food balance sheet. In particular, the development of tools for managing and interpreting satellite and precipitation data have been widely debated (NRC 1987) but have progressed to the point where standards are being informally discussed.

As already noted, current physical conditions can be ascertained reasonably well, but say little about the impact these conditions might have and how local populations are responding to them. Moreover, there are many conditions that make some areas more vulnerable to famine than others. If vulnerability can be known and mapped, it would be possible to identify areas in which famine was most likely to occur long before other factors precipitate an emergency.

1.5.1 Market Data

Market data have been widely regarded as potentially the most sensitive indicator of stress. In particular, the prices, volume, and terms of trade in grain, labor, animals and other capital assets should accurately portray the population's response to stress as they invoke various coping strategies to deal with production losses (e.g. purchase of grain in response to failed harvest; labor migration; distressed sale of capital and productive assets).

Unfortunately, the use of market indicators has had only mixed success (cf. Sen 1981; Cutler 1984; McCorkle 1987; Reardon et al. 1988). In some cases, their fundamental value has been severely questioned, even though the sources of confusion could be explained (de Waal 1988).

The experience of FEWS has been somewhat different. Increasingly, price data are being incorporated as a critical element in FEWS analyses. In the convergence of evidence approach used by FEWS, they appear to complement objective data as a current indicator of risk or vulnerability. Thus, it would seem that mixed successes in the use of market data are probably due more to a failure to employ a convergence of evidence approach rather than the inherent value of the indicators considered.

1.5.2 Vulnerability Assessment

A fundamental problem in early warning has been the difficulty of establishing "initial" summary conditions and placing subsequent indicator changes into some type of historical or situational context. The value of understanding initial conditions of vulnerability would be

two-fold. First, it could provide an indication of the locations where increased attention is warranted. Second, it would permit a more timely, accurate and reasonable interpretation to be made of current data as it comes available.

As already suggested, a whole set of economic, institutional, social, and climatic events -- both current and historical -- render some populations more vulnerable to famine than others. For our purposes, we will consider vulnerable populations to be (1) more susceptible to food insecurity, and (2) less able to deal, or cope, with its consequences (Chambers 1989). To translate this concept into application, a regional baseline vulnerability assessment performed at the beginning of the growing season has become a central feature of the FEWS methodology. It considers a number of factors including rainfall, food balance, previous growing season for crops and rangelands (from satellite data), and average rainfall (probability of drought), among other factors (see FEWS 1990; Borton and Shoham 1991). Subsequent assessment of vulnerability is stratified and reported both by geographic region and socioeconomic group. As the growing season proceeds, the baseline is continuously updated to produce a current vulnerability assessment (Downing 1991).

Considerable effort is now being devoted to refining the vulnerability assessment methodology, particularly in the use of geographic information systems (GIS) and development of weighting criteria for each vulnerability criterion (Borton and Shoham, 1991).

2. Issues

2.1 Objectives

To date, a good deal of debate about early warning has centered on indicators and the ways in which data are managed and interpreted. Ultimately, part of the discussion revolves around the trade-off that is struck between accuracy and timeliness. Much of this debate appears to be conducted without considering the difference among systems in terms of their objectives.

Although the overall objective of all early warning systems are essentially the same (to identify populations that might be at food security risk, and to estimate the magnitude of that risk), they differ significantly in the ways they perceive and go about their task.

Early warning is sometimes seen as an extension or adjunct of crop forecasting. Clearly, the two efforts share a good deal in terms of data and technique, but they differ in their objectives and, as a consequence, in the accuracy/timeliness tradeoff. In crop forecasting, timeliness is important but the needs of national program planning dictate that accuracy have priority. In contrast, EWSs -- particularly FEWS and GIEWS -- have an overriding need for timely information with perhaps less accuracy. However, in both cases, the objective is the production and distribution of information rather than action.

Because the early warning activity being considered by OFDA focuses on mitigation after a potential emergency has been identified, it differs in two fundamental ways from other systems. First, it is not an on-going project and must be selectively invoked when need arises. Thus, it must be fast and flexible, but because it is country- and usually site-specific,

it must also be accurate. Second, because the ultimate product is action, the activity must also produce a range of suggested site-specific mitigative actions that might be taken.

This activity is called ShortFEWS here because it accurately reflects both its heritage and mission. ShortFEWS is derived from the FEWS methodology and is dependent on FEWS, or other EWSs, for initial alerts in those countries in which it operates. Conversely, the detailed data -- such as vulnerability assessments -- produced by ShortFEWS supplements the data considered by FEWS. Thus, the two activities are highly complementary. Finally, and most appropriately, the name ShortFEWS suggests the need for quick and decisive action in response to life-threatening situations.

2.2 Data

By necessity, virtually all regional or global EWSs are based on secondary data produced by host countries, regional or international agencies, or satellite-borne sensors. The special missions to problem areas mounted by GIEWS are notable exceptions.

A more-or-less standard data set has emerged for both FEWS and GIEWS, consisting of physical data, models, food balance (production, imports, stocks and demand), and socioeconomic data (see 1.3). Most significantly, these data have been assembled in comprehensive country-specific archives that may span time periods greater than 10 years.

As interest in a number of countries has grown during the past year (e.g. Sudan and Ethiopia) a "minimum" data set has been increasingly used by FEWS. In addition to base maps and population data, this set contains rainfall observations, satellite NDVI, and cereal prices. Where available, this minimum data set would be a reasonable beginning for many ShortFEWS efforts in Africa. However, it is unlikely that comparable data would be available for areas outside Africa or the Middle East. Moreover, while these data describe current conditions, they cannot adequately describe vulnerability (see 2.3.2).

The need for (1) a vulnerability assessment, and (2) suggestions for possible mitigation strategies (see 2.1) make it necessary to gather primary data in a ShortFEWS effort. This, combined with the need for timeliness, suggest the use of rapid rural appraisals (RRAs) conducted in the field (see Frankenberger, this volume). The approach for generating these data would be similar to that described by Maxwell (1989), the results of which have been used for vulnerability assessments (Borton and Shoham, 1991). By focusing a major component of the RRA on the identification of coping strategies, it will also be possible to identify possible avenues of mitigation (see 2.3).

Without primary data, it is unlikely that a system like ShortFEWS could operate successfully. Moreover, in those countries where FEWS operates, data generated by ShortFEWS's RRAs would provide a description of field conditions that is currently unavailable.

2.3 Technique

One of the primary tasks of the conventional EWS -- identification of areas and populations at food security risk -- will fall largely outside ShortFEWS' scope. Rather than maintain its own monitoring effort, with preliminary vulnerability assessments, ShortFEWS could rely on other groups, such as FEWS, GIEWS, or JAWF (Joint Agricultural Weather Facility operated by NOAA and USDA; Motha and Heddinghaus 1986) for initial warning and the identification of target areas for ShortFEWS activities.

Without the maintenance of a relatively large database, analytical options are also limited. Currently, almost all data in EWSs are analyzed in one of two ways: simple time series analysis, or historical comparison (departures from norms). As already noted, there has been considerable debate about the methods used and the reliability of their results (NRC 1987; Hutchinson 1991). Because it must operate in a reactive mode, the construction of long-term archives for ShortFEWS will not be possible and, outside those areas covered by FEWS, these data and methods of analysis will not be available.

Thus, the approach to be adopted is relatively simple and will consist of four components: project database compilation, vulnerability assessment, field data acquisition, and mitigation monitoring.

2.3.1 Database Compilation

At the outset of a ShortFEWS mission, it will be necessary to assemble all pertinent information available for the target area. The intent would be to extract as much background information on potential vulnerability as possible. To facilitate archiving, analysis, exchange, and subsequent transfer of the database to the host country mission, all data -- including RRA results -- should be entered in a low-cost, generally-available GIS, and a common database management system (DBMS) or spread sheet package (e.g. Lotus). All data formats and software packages should be compatible with FEWS.

Part of this activity (e.g. satellite data acquisition and analysis) must take place in the U.S.; however, a good part of the data collection must be conducted in the host country.

2.3.2 Vulnerability Assessment

The primary use of the database will be for vulnerability assessment. The purpose of the assessment will be to identify areas and groups in the country of interest that are most vulnerable to famine. Vulnerability will be considered as a composite indicator of (1) the inherent susceptibility of a population to risk (famine in this case), (2) their current ability to cope with "shocks," such as drought, and (3) the proven resilience of the population to recover from shocks.

Assessment will begin with an analysis of generally-available secondary data including rainfall, pest attack, areas of conflict and insecurity, average food production per capita during preceding years, food crop prices, distress migration, access to productive soils, access to off-farm employment, etc. (Borton and Shoham 1991). This preliminary

vulnerability assessment will be finalized during the initial stages of the RRA through interviews with local experts (i.e. staffs from USAID, other donors, host-country ministries, and NGOs) to attempt to arrive at a consensus regarding (1) generally-recognized vulnerable areas and groups, (2) the criteria, or indicators, by which they are identified, and (3) the relative importance of each indicator of vulnerability.

The mapping done during the vulnerability assessment will be used in the selection of villages to be visited during the secondary phases of the RRA. However, because it is developed by consensus, the vulnerability assessment will have enduring importance in guiding early warning and mitigative actions by providing reliable and accepted baseline information.

2.3.3 Rapid rural appraisal

The RRA activity is described elsewhere (see Frankenberger, this volume). However, it is worth noting the special significance of the RRA for the ShortFEWS methodology.

Without considerable historical data and ground observation, a comprehensive vulnerability assessment is not possible (see 1.5.2 and 2.2). To further refine the preliminary vulnerability assessment (2.3.2), major components of the RRA will concentrate on (1) identification of vulnerable areas and groups, and ranking the criteria by which they are recognized, and (2) characterization of coping strategies being employed by different segments of the population in different target geographic areas.

As outlined within the operating assumptions (see 1.1), there is a progression of indicators that reflect the severity of the emergency. At the household level, a series of coping strategies are invoked as the emergency progresses. The more obvious of these include diet changes, reduction in caloric intake, borrowing food, labor migration by males, sale of capital items (e.g. livestock, jewelry), sale of productive assets (farm tools, etc.), sale of land, and permanent family out-migration.

Understanding the coping strategies being employed has value in two ways. First, it gives a fairly reliable indication of vulnerability: the more desperate the situation, the more desperate the means of coping with it. Second, it suggests the type of mitigation strategy that might be adopted. For example, if male labor migration appears to be the dominant or preferred coping strategy in the target population, a program of food or cash for work might be adopted that complements this existing method of dealing with emergency.

2.3.4 Mitigation monitoring

A frequently overlooked task is the monitoring of mitigative actions to ensure, (1) that they have been performed, and (2) that they are having the desired effect. For ShortFEWS activities, a second limited-scope RRA is desirable to evaluate interventions within the targeted areas. The second RRA would revisit the area in which mitigative action was taken and monitor those indicators designated as most significant and reliable (see 2.3.2).

A reasonable period must be allowed to pass after the intervention is implemented, but the follow-up RRA should probably be undertaken in no less than three months.

3. Recommendations

3.1 Objectives

For this part of the Famine Mitigation efforts of OFDA we suggest that the design, demonstration, and ultimate deployment of ShortFEWS be undertaken. In large part, this should build on and complement the existing capability of FEWS.

In contrast to FEWS, however, the objectives of OFDA/ShortFEWS should be:

1. to assess identified populations that might be at food security risk and to estimate the magnitude of that risk;

2. to suggest appropriate mitigative actions based on that assessment.

3.2 Approach

Assuming that an OFDA/ShortFEWS assessment will be performed in each of the five countries that have been tentatively selected, an iterative, rolling design approach should be adopted in which the general methodology outlined above (see 2.3) is refined in each successive application.

3.3 Products

In each country, an OFDA/ShortFEWS database and vulnerability assessment will be assembled and installed at the USAID mission, and their personnel will be trained in its use and maintenance.

At the end of the project, a final report will be prepared describing our findings. In addition, a handbook will be prepared which documents the ShortFEWS methodology. The handbook will be suitable for use in training.

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Rapid Food Security Assessment

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1. Introduction

Once an early warning system has identified an area where food shortages are likely to occur, it is essential to determine the causes, dimensions and characteristics of the food insecurity situation in a timely manner to identify and implement appropriate mitigation activities. Time-effective survey techniques such as rapid rural appraisals are effective means of acquiring this information (see Annex 1 of this paper).

Rapid Rural Appraisal (RRA) is a set of data collection techniques adapted from social science interview and survey methods used in farming systems research and extension for providing comprehensive socio-cultural, economic and ecological assessments of a project area for project planning and implementation (Molnar 1991). The major distinguishing features of such approaches include the following (taken from Franzel 1984):

1. Interviews are conducted by researchers themselves, not by enumerators as in formal surveys.

2. Interviews are essentially unstructured and semi-directed with emphasis on dialogue and probing for information. Questionnaires are never used; however, some researchers use topical guidelines to ensure that they cover all relevant topics on a given subject.

3. Informal random and purposive sampling procedures are used instead of formal random sampling from a sample frame.

4. The data collection process is dynamic and iterative, that is, researchers evaluate the data collected and reformulate data needs on a daily basis.

5. RRAs are generally conducted over a period of one week to two months.

6. To deal with the accuracy/timeliness trade-off, a process of triangulation is used whereby diverse methods and information sources are used to improve accuracy (similar to early warning systems).

7. RRAs rely on multi-disciplinary teams to carry-out surveys.

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Rapid Rural Appraisals are used at various stages throughout the project cycle (Scoones and McCracken 1989). They can provide exploratory information (i.e. Agroecosystem Analysis), be used to focus on one specific topic (Topical RRA), involve local people in research and planning (Participatory RRA), monitor and evaluate a research or development activity, or deal with conflicting differences between different groups. RRAs are especially effective in obtaining access to local socio-cultural idiom, perceived problems and general patterns of variation.

2. Limitations of RRAs

Despite the multiple advantages derived from utilizing RRAs, it is important to recognize the limitations of such approaches. First, researchers cannot be certain that households interviewed in the survey are representative of most households in the region. Time constraints do not allow for systematic sampling procedures to be followed. Thus, RRA techniques should be viewed as complementary to other research methodologies such as formal surveys and anthropological studies. RRAs can be combined with the formal interview process to correct biases. For example, random sampling procedures could be introduced half way through field visits once hypotheses have been identified that need to be tested (Molnar 1991).

Second, RRA techniques may not be cross-culturally transferable. Therefore flexibility in the approach is critical so that the survey can be adapted to local situations.

Third, such surveys may not be sufficiently focused to determine the relative importance of factors limiting production opportunities for farmers. Therefore other diagnostic procedures may be required to verify and fine-tune hypotheses generated by informal surveys (Frankenberger and Lichte 1985).

Fourth, given time constraints, RRAs may have trouble targeting the least visible target groups such as the landless, rural poor, women and isolated ethnic groups. To compensate for this, RRA teams can focus on degraded resource areas, and smaller marginal farms while interviewing households (Molnar 1991). In addition, spending the night in villages may allow researchers to see a wider range of the community.

3. Rapid Food Security Assessments

Coupled with early warning systems, RRAs are especially useful techniques for quickly assessing household food security within a targeted geographic area. Following the lead of Maxwell (1989), food security is defined here not only as access by all people at all times to enough food for an active and healthy life, but also involves the notion that poor peoples' livelihoods are secure and sustainable. Thus, the information that must be gathered includes food access as well as a characterization of the coping strategies being employed by different households in the community. A thorough understanding of the coping strategies will help in the identification of indicators for food security monitoring.

4. Methodology

The approach for carrying out a Rapid Food Security Assessment (RFSA) is similar to those used for carrying out RRAs for farming systems research activities and will not be outlined in detail here (see Frankenberger and Lichte 1985; Maxwell 1989). The targeting and timing of RRAs will be triggered by early warning systems identifying specific geographical regions susceptible to food shortages. RFSAs will be used to determine the causes and magnitude of the food insecurity situation. In addition, RFSAs will help determine the appropriate mitigation activities which should be pursued to help alleviate the food deficit problem. Through this process, communities will actively participate in helping to identify intervention alternatives. Finally, RFSAs will monitor targeted communities to assess the household food security impact of mitigation efforts.

5. Data Needs

Recent studies in Mali and Burkina Faso have demonstrated that commonly used indicators of food security at the national and regional levels are often poor predictors of household or individual food security (Staatz et al. 1990). For this reason, location specific data on dietary patterns and strategies for acquiring food will help development agencies more accurately interpret consumption indicators such as asset sales, price movements, and levels of under-nutrition (Campbell and Trechter 1982; Corbett 1988).

Building upon the work of the World Food Program (WFP), there are three types of indicators that can be monitored for changing coping responses, thus suggesting worsening conditions and heightened food insecurity. Leading Indicators (WFP refers to these as Early Indicators) are changes in conditions and responses prior to the onset of decreased food access. Examples of such indicators include: 1) crop failures (due to inadequate rainfall, poor access to seed and other inputs, pest damage, etc.); 2) sudden deterioration of rangeland conditions or condition of livestock (i.e. unusual migration movements, unusual number of animal deaths, large numbers of young female animals being offered for sale); 3) significant deterioration in local economic conditions (i.e. increases in price of grain, unseasonable disappearance of essential food stuffs, increases in unemployment among laborers and artisans, unusual low levels of household foodstocks); and, 4) significant accumulation of livestock by some households (due to depressed prices caused by oversupply). Leading indicators can provide signs of an impending problem and may call for a detailed situational analysis to determine the extent of the problem, causes, and need for monitoring.

Concurrent Indicators (WFP calls these Stress Indicators) occur simultaneously with decreased access to food. Examples of such indicators are: 1) larger than normal migrations of able-bodied family members in search of food or work; 2) appearances in the market of unusual amounts of capital goods - jewelry, farm implements, livestock (draught animals); 3) unusual increases in land sales or mortgages; 4) increases in the amount of people seeking credit; 5) increased dependance on wild foods; 6) reduction in the number of meals; and, 7) increased reliance on interhousehold exchanges. Concurrent indicators can be assessed while carrying out situational analyses using rapid rural appraisals. Once the nature and extent of the problems have been confirmed, interventions can be introduced that focus on the causes and mitigate the effects.

Trailing Indicators (WFP calls these Late Outcome Indicators) occur after food access has declined. They reflect the extent to which the well being of particular households and communities has been affected. In addition to signs of malnutrition and high rates of morbidity and mortality, trailing indicators include increased land degradation, land sales, consumption of seed stocks, and permanent outmigration. All of these indicators are signs that the household has failed to cope with the food crisis.

Focusing on coping strategies reveals the actual behaviors of farm households that adverse climatic or market conditions have provoked. Such an orientation allows for an ongoing monitoring of the processes by which people adjust to changing circumstances.

In addition to information on coping strategies, the RFSA will provide baseline information on food usage and food preferences, condition of livestock, seasonal availability of food and fodder, market access and cash reserves, use of wild foods, health related food uses (such as weaning practices), specialty foods for child bearing women, prevalent health problems, women's involvement in agriculture and other consumption constraints (see Annex 2 of this paper).

In food insecure regions plagued by conflict, other types of data will be collected. Such information will include the geographical delineation of conflict zones, level of violence and kind (i.e. targeted or passive), freedom of movement, condition of access to conflict zones, existence and organizational capabilities of local non-governmental institutions, existence and activities of partisan (i.e governmental and rebel) organizations involved in humanitarian relief and rehabilitation, physical resources and availability for farmer mitigation actions (i.e. logistical resources, supply and storage facilities, operational facilities[1]), planned interventions by national governments, international private and voluntary organizations, and coordination structure to be used (e.g. who will coordinate which activities by who for whom). (For additional data categories, see Food Insecurity Checklist, Annex 3).

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[1] This information will also be collected in non-conflict zones.

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Annex 1

Rapid Rural Appraisal[2]

Why use RRA?

To avoid the problems of long and costly formal surveys, including:

- too much data collected;
- irrelevant data collected;
- late and inappropriate results produced;
- too little/no participation by the local people.

To avoid the risks of quick and unstructured development tourism surveys, including:

- obtaining only a snapshot picture of the area or topic;
- relying heavily on previous assumptions:
- working without a framework to guide the collection and analysis of information.

To help overcome the biases of:

- meeting only the more accessible and well-to-do individuals and groups;
- looking for only the quantitative, apparent data, and missing the more qualitative, in--depth information and insights;
- dealing with the local population in a 'top-down' manner.

To encourage participation of local people in the process of development by:

- investigating local insights resulting in more effective research information being collected;
- involving local people in research and design to increase commitment and empowerment.

What are the principles behind RRA?

- We can involve local people and increase participation and empowerment;

- We can learn from the local people, use local classifications and terminologies;

- We can limit the amount of information we collect (optimal ignorance);

- We can explore the range of circumstances, rather than get a statistical sample;

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2 Produced by the Sustainable Agriculture Programme, International Institute for Environment and Development, London.

- We can investigate each issue in different ways and from different angles (triangulation);
- We can adopt an informal approach, and change it is we go (iterative);
- We can learn better in teams, with people from different backgrounds and with different areas of expertise (interdisciplinary);
- We can do much of the work in-the-field.

What are the techniques of RRA?

The RRA approach provides a basket of choices of different techniques. Any RRA exercises will make use of a particular combination of these techniques, depending on the available resources and the desired output. The choices include:

- Secondary data review: learning from existing official records, census reports, survey documents, maps, photographs, etc.
- Direct observation: looking first-hand at the conditions, the agricultural practices, the people, the relationships, the problems, etc.
- Semi-structured interviewing: informal discussions, based on a flexible checklist of topics. Respondents could be individual villagers or key informants (people with specialist knowledge, for example, the schoolteacher, village leaders, health officer). Interviewing can be done with the individuals or in groups. Taking casual notes during the interviews. A learning experience for the interviewer.
- Group interviewing may be in focus groups (for investigation of interest groups or specialists' attitudes) or open group workshops (for general discussion or feedback).
- Diagramming: producing diagrams, often in the field, to help communication and learning. For example, maps, transects, seasonal calendars, flow diagrams, cartoons. Roughly drawn on paper or scratched in the ground.
- Ranking: Investigating decision-making preferences and why people make choices can be done in ranking games. Preference ranking: ranks items through pairwise comparisons. Direct matrix ranking ranks decision criteria. Wealth ranking is a tool for investigating local perceptions of wealth and is a rapid way of stratifying the population.
- Games and role playing: playing learning games, such as adaptations of traditional board games (e.g. the Ayo to investigate attitudes, strategies and preferences), futures possible (to find people's ideas for opportunities), and the Why? game (to find people's perceptions of the root causes of problems). Informal dramas by the RRA team, or the local people, or both, for communicating and learning, and stimulating discussion.

- Stories and portraits: as part of the RRA report, recording interesting stories told during interviews, and describing portraits of households with interesting or unusual situations.

- Workshopping: brainstorming, analysis and presentation session in the field or in the meeting room.

Who uses RRA?

- Anyone involved in development and research can; it is best carried out by local people.

Where has RRA been used?

- Mostly in less developed countries (but also in developed).

- Mostly in rural situations but also in urban).

- Mostly in the agricultural field (but also in others, for example, economics, health, nutrition, forestry, energy).

- Mostly at the village level (but also as larger scale exercise).

When is RRA used?

The RRA approach can be used throughout the project cycle:

- When exploring an area to learn of the key problems and opportunities to help plan research or development projects (Exploratory RRA, for example Agroecosystem Analysis);

- When investigating one specific topic, question or problem (Topical RRA);

- When involving local people in research and planning (Participatory RRA):

- When monitoring and evaluating a research or development activity (Monitoring and Evaluation RRA);

- When dealing with conflicting differences between different groups (Conflict Resolution RRA).

Limitations of RRA

- RRA techniques are complementary to other research methodologies (statistical surveys, long-term anthropological study, etc).

- RRA techniques may be rapid, but the process of development is not.

- Participatory approaches to research may raise local expectations; follow-up is necessary.

- RRA techniques may not be cross-culturally transferable; they need to be adapted to local situations.
- Appropriate use of RRA techniques requires the training of facilitators and participants.
- RRA produces questions, hypotheses or "best bets" for development - not final answers.

Annex 2

Rapid Rural Appraisal Techniques: The "Basket of Choices"[3]

There are a variety of categories for the RRA techniques, methods or tools. These are as follows:

Secondary Data Review - secondary data and information are published or unpublished data acquired by other people at an earlier time that are relevant to the topic or system under study.

Direct Observation - this encompasses any direct observation of field objects, events, processes, relationships or people that are recorded by the team in note or diagrammatic form.

Map - bold and schematic to obtain an overview of the resources of all types in the PA.

Transect - a representation of spatial differences that includes the major distinguishing features, including soils, crops, trees, livestock, wildlife, tenure and institutional issues.

Seasonal Calendar - a single diagram containing between-season changes in related components of the system under study, including climate, crop sequences, pests and diseases, perennial and wild harvest, labor demand, prices, human diseases, social events, income/expenditure, consumption of food, etc.

Historical Profile - major events recalled by informants and obtained from the secondary data.

Venn Diagrams - in which key institutions and individuals responsible for decisions are represented by circles with differing degrees of overlap in order to investigate local perceptions of institutional control and decision-making.

Other Diagrams - other diagrammatic representations of flows or decisions can be useful for demonstrating hypotheses or summarizing interview information.

Preference Rankings - pairwise comparisons to investigate decision-making criteria between various items, e.g., trees, crop varieties, fruits, vegetables.

Direct Matrix Rankings - in which the items under investigation are ranked by informants according to favorable and unfavorable characteristics.

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3 Produced by the Sustainable Agriculture Programme, International Institute for Environment and Development, London.

Wealth Rankings - in which the perceptions of informants are used to rank households within a village or portion of a village according to overall wealth.

Key Informant Interviews - in which informants with special knowledge or who hold a position of interest are identified and interviewed on these topics.

Focus Group Discussions - different groups in the community are gathered for open-ended discussion on key issues.

Community Workshops - open discussion sessions where research issues can be explored or results fed back to the community. Either managed with one group or with break-up into smaller discussion groups with plenary feedback.

Analytical Workshops - these are a means of bringing people together, including the field team and outsiders introduced for their skills and experience, to participate actively in reviewing, analyzing and evaluating the information gathered. Workshops are typically fairly intensive, switching between plenary and group work, and aim to arrive at a consensus of opinion over priorities for action.

Any Rapid Rural Appraisal exercise uses a selection of these techniques to generate and crosscheck information. The choice of techniques is dependent on the objectives of the exercise. RRAs combine short, intensive periods of field work interspersed with analytical workshop sessions.

Annex 3

Food Insecurity

Information Checklist[4]

Introductory Note:

The purpose of this checklist is to help you gather the information you need to write up short case studies of individuals or families thought to be food insecure. It is not a questionnaire. This means it is not necessary to present questions in the order asked, nor use the exact phrasing in the checklist. However, you should try to cover all points listed in the checklist and present your report in the order of the questions.

The questions on the checklist fall into four main sections:

a. Information on the community
b. Background information on the family
c. Current sources of livelihood; and
d. Food issues.

A. The Community

(NB: These questions can often be answered by community leaders at the beginning of the visit)

1. History of settlement
2. Size and composition of population (ethnic, family structure, occupations)
3. Social/political leadership
4. Government and voluntary agency programs
5. Community problems and needs.

B. Background Information

1. Location
2. Name of respondent
3. Family composition (adults, including children over fifteen; children; other dependents)
4. Length of time in present location
5. Place of origin, date of leaving, reason for leaving
6. Occupation in place of origin
7. Future plans to stay or move

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[4] Taken from: Maxwell, S. 1989. *Rapid Food Security Assessment: A Pilot Exercise in the Sudan RRA Notes.* International Institute for Environment and Development - Sustainable Agriculture Program.

C. Current Livelihood

1. Resources available to the family (land, land improvements - including trees), labor, animals, machinery, equipment, household goods, cash, gifts/zakat
2. Security of tenure
3. Description of housing (materials, size, cooking facilities)
4. Activities undertaken (amount and description, including seasonality, location and who in the family does what): agriculture, herding, employment, self-employment, trading, etc.
5. Estimate of income earned, per period, by person
6. Level of risk and coping strategies in times of hardship; illness, theft, physical security, natural disasters; changes to normal pattern of activity
7. Access to services (health, education, transport)

D. Food Issues

1. Level of nutrition of family members
2. Composition of diet, by family member and time of year
3. Sources of food: production, purchase, exchange, free distribution
4. Problems of availability of food in the market (especially bread, sugar, sorghum)
5. Ownership/validity of ration card
6. Prices paid for food in most recent purchase, especially sugar, bread, sorghum, beans, etc.
7. Source and price of water; quantity consumed; storage
8. Source and price of fuel for cooking
9. Views on food security issues.

Seeds of Change: The Role of Crop and Cropping System Interventions in Famine Mitigation

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1. Introduction

This discussion paper identifies issues and themes related to intervention strategies for mitigating declines in cereals-based cropping systems during times of drought, famine, or other natural disaster. Agrarian systems fail or significantly decline for a number of reasons: adverse climate changes (for example, prolonged drought); insect or plant disease infestations; degradation of the resource base such as declining soil fertility; and other extraneous elements such as local market failure and mis-directed government policies which act as disincentives to production. They also fail, or become totally abandoned, when impacted by civil conflict. Lands are mined, labor is displaced, mobility is restricted, and food is confiscated or destroyed (Cliffe 1989). Often the impacts of these factors lead to famine.

Farmers respond to declines in crop productivity in various ways. When yields decline due to a reduction in soil fertility, for example, farmers simply look for new land to expand cropping activities on. This option is becoming increasingly difficult as population growth makes available land for cropping increasingly scarce. Seasonal variability in rainfall, another cause of declining productivity, may be mitigated by replanting or switching to more drought-tolerant varieties.

When households lose their ability to produce or purchase adequate food stocks famine conditions develop and other strategies are employed. These conditions are anticipated by the household well in advance and strategies are adopted which avert or dampen the impacts of the stress (Corbett 1988, Walker 1988). De Waal (1990) and others have referred to these responses as coping strategies. Households adjust their behavior in order to fill the food gap (e.g. - search for famine foods), ensure economic survival at the household level (e.g. - look for off-farm employment, obtain a post-famine harvest), and address the root causes of the famine (ecological degradation or political/military oppression). In extreme cases, the coping strategies which households employ during famine situations can ultimately lead to a long-term breakdown in local production systems and economies. Supporting crop production during periods of food shortage can help avert a famine crisis before such a destructive phase is reached.

In order to implement appropriate mitigation measures an understanding of how local production systems operate under 'normal' conditions is necessary. The goal of famine mitigation activities which target cropping systems should be to provide inputs which allow cropping systems to remain viable when stressed by drought or other crises. Mitigation

should prevent a breakdown in production systems which would 1) necessitate long-term recovery, 2) leave the system in a high state of vulnerability, or 3) cause secondary damage such as adverse environmental degradation. After this has been accomplished then development-oriented activities can focus on activities aimed at long-term system sustainability.

Food relief assistance, in the form of donated grains, has reached an unprecedented scale during recent famine outbreaks in Africa. It is risky to assume that relief levels experienced in the 1980s can be sustained, much less increased, to cover escalating food deficits and famine relief needs in the 1990s. Already in 1991 we are witnessing 'donor fatigue' whereby relief efforts are being hampered by a shortage of resources, a growing sphere of assistance (primarily to East Europe and the Middle East), and a public becoming increasingly numb to repeated appeals for help. Rehabilitation of existing agricultural systems in Africa is needed in order to stabilize smallholder production systems and decrease their vulnerability to drought and other forms of agroecological stress.

To illustrate the magnitude of the food grain crisis, we need look no further than Ethiopia. Current per capita food consumption is estimated at only 1,570 kcals per day. Per capita cereal production has declined steadily since the 1960s at an average rate of 4.1 kgs per year (Webb and von Braun 1990) and it is estimated that in the 1990s only 70 percent of national food requirements would be met **even during an average rainfall year** (Belshaw 1990). These statistics reflect both the level of vulnerability to food shortages faced by Ethiopians and the urgent need to reinforce some level of stability in production systems of areas susceptible to food shortages.

Every opportunity to reduce smallholder production risks in disaster-prone areas needs to be explored. A first-order objective to reduce risk would be to stabilize grain yields over variable rainfall years. This would insure that low-resource farmers in rainfed agricultural zones could avoid chronic food shortages by producing some crop each year. Famine mitigation activities which allocate some resources to strategically designed crop and cropping systems interventions may represent an important window of opportunity in this area. It should be stressed, however, that crop production is only one of the many activities that people engage in and, as a result, is only one component of food security needs. Interventions in cropping systems should be designed and implemented with this in mind and with full consideration of other activities, such as livestock rearing or wage-labor employment, that are part of smallholder production systems.

2. Crop and Cropping Systems Interventions

Cropping systems in famine-prone areas have developed over long time periods and production alternatives for surviving periods of food shortages are incorporated into existing cropping practices. Nevertheless, factors such as increased population density, declining land availability, increased degradation of land resources, civil conflict, and prolonged drought have exceeded the buffer capacity of many crop production systems. Famine mitigation activities which target crops and cropping systems should be designed so that they enhance local production systems in order to keep them viable through periods of

stress. They should be based on indigenous practices and capitalize on local production practices, traditional crops, and the incredible will and strength of farmers.

Mitigating crops and cropping systems under pre-famine, famine, and post-famine conditions will require several stages and classes of intervention. The stages can broadly be defined as analysis, intervention, and evaluation. The analysis stage depends on reliable information from early warning monitoring systems such as FEWS, from a pre-intervention information base developed by agencies and individuals involved in famine mitigation, and by a careful analysis of the populations at risk, their agricultural systems, and the range of options available to implement as activities. The intervention stage starts with programming of resources necessary to carry out activities. In some cases, as with seedbanking, this may require large lead times with activities beginning before the onset of any particular famine situation. Finally, the evaluation stage would monitor activities and analyze the impact that intervention is having on the population at risk.

2.1 Analysis Stage

The analysis stage begins by careful monitoring of drought-prone areas and areas where others factors may lead to famine conditions. Early warning systems which are already in place or which could be developed as part of famine mitigation activities would provide the means for identifying areas to implement mitigative measures. Some means of appraisal would be required to identify appropriate interventions and to fully design each activity. Systems for seed production, storage, and distribution will have to be developed at the appropriate level: household, local, regional, or national. Efficient mobilization of resources using in-country organizations will be essential for mitigation activities based on preserving local agricultural systems.

2.2 Intervention Stage

Crop and cropping systems interventions should be designed with a sensitivity toward preserving local crop varieties and systems of production. At the same time, however, opportunities should be explored and implemented which reduce the probability of repeated crop loss and future famine conditions. Radical changes in crop selection or cropping practices, at a time when the system as a whole is vulnerable, would not be appropriate. However, introducing or re-introducing drought-resistant varieties, or instituting small changes in inputs and management may be appropriate in certain cases. Design of interventions should carefully consider the range of options which would be appropriate for a given area. Each case will be different and in some cases a broader range of response options will be possible.

For many famine situations, interventions would be limited to simple activities which bolster current practices, improve the probability of harvesting a crop, and ensure that farm households do not lose their material means of production. Mitigation activities which could support local production systems include seedbanking programs, distribution of tools and agricultural inputs, provision of information and advice to farmers, pest management activities, seed/grain storage projects, and local market support.

2.3 Evaluation Stage

Famine mitigation, in that it represents a new approach to disaster relief, is a relatively young "science." Experience gained by early interventions will serve as valuable input and feedback into the planning process. The evaluation stage should critically examine factors which led to production systems failures. It should also serve as a means of forecasting future vulnerability, including the outlook for the subsequent cropping season. An assessment of the mitigation impact should allow planners to design follow-up activities and apply knowledge gained to other mitigation efforts.

As unfortunate as the need for mitigation is, it can become a powerful tool in defining and prioritizing programs which will ultimately decrease the vulnerability of areas to future famine situations. Mitigation really fails if it does not minimize recovery time of a disaster and provide a framework for reducing risk of future disasters.

3. Issues in Crop and Cropping Systems Interventions

The following discussion assumes that normal cropping activities have been disrupted due to a prolonged drought. The issues discussed reflect some operational and practical implications of introducing changes to the cropping system.

Issue 1 Balancing short- and long-term objectives.

Cropping interventions targeted to provide short-term disaster relief should focus on restoring and sustaining production activities. Examples of this type of relief would be supplying seeds and tools appropriate to the farming system. For example, civil war often displaces large numbers of people away from their homelands. Once the conflict is over, most return to resume normal farming activities. Restoring the cropping systems of these areas would involve replacing lost tools and supplying farmers with seed - ideally seed of the same cultivars in use prior to displacement or a mix of local and improved varieties. The implications for this type of mitigation are relatively straightforward and are based on adequate assessment, procurement, and disbursement of inputs and on effective monitoring.

By supplying necessary inputs to stimulate crop production, activities could help in 1) reducing the number of people (usually men) leaving to seek work in other areas (usually irrigated perimeters), 2) increasing household food security and preventing the sell-off of productive assets, and 3) restoring a sense of normalcy among the population.

Farmers are unlikely to be positioned to make radical cropping system changes during initial mitigation phases. There will be a natural nurturing period where 1) basic distribution problems are resolved, 2) farmers gain trust in personnel involved in intervention, 3) farmers are engaged in planning for cropping system changes, and 4) proper cropping strategies can be formulated.

Long-term relief implies introducing fundamental changes in the mix or management of production inputs which would improve cropping systems and leave them less vulnerable to future crises. Drought is a frequent phenomenon in all of the countries this activity targets. If

famine mitigation activities are to venture beyond the realm of food aid, I would argue that, with respect to cropping systems, the ultimate goal should be to introduce limited crop inputs which would reduce risk and increase the probability of producing a crop each season. This strategy stresses the central importance of reviving and building upon the production capabilities of smallholder family units.

In the long run, populations vulnerable to famine should not be dependent on food relief for basic survival. Relief of this nature makes these same populations vulnerable to the politics and logistical constraints of food relief. A major lesson from the 1985 famine in the Gedaref area of Sudan was that emergency food assistance of the magnitude required could not be delivered and distributed. Despite good intentions and efforts, the local population was left to depend largely on its own production resources in the near and long terms (Holcombe 1987). Interventions at the cropping systems level could allow areas like this to rely more on their own means of production, thus empowering people to solve such problems through their own labors and with their own land.

Cropping system interventions, if properly planned and implemented complementary to other famine mitigation activities, would form a critical bridge between relief and development given 1) the opportunity that mitigation activities provide for reaching farmers, 2) the desire to decrease the probability of future drought or other disaster impacts in the same region, and 3) the dilemma facing farmers when trying to cope with such threats to their livelihoods.

Issue 2 Appropriate time frames for crop and cropping system interventions.

Cropping systems interventions should be phased into famine relief efforts. Only rarely would they be a first-order response. Other mitigation interventions, such as Food or Cash for Work or direct food aid, would normally be implemented first since they 1) provide a more immediate response to food shortages, 2) can be implemented independent of the cropping season, and 3) stabilize the crisis and allow other interventions a chance to become established.

It may be reasonable to assume that crop interventions could not be implemented until the first full growing season <u>after</u> famine mitigation activities are initiated. If this were the case, appropriate lead time would be available for adequate information to be gathered and incorporated into a sensible mitigation plan.

Issue 3 Information needs and planning, programming, and implementing crop interventions.

Technical constraints and options represent only part of the difficulty in implementing crop interventions. Perhaps more difficult to solve are issues related to the planning and implementation of such activities. For example, careful consideration should be given to the host government role in planning and the use of local resources (manpower, private sector, etc.). Another important consideration is the use of seedpaks or other technological groupings. Seedpaks have already been used successfully by NGOs and others in several countries and have been found to eliminate some of the transfer problems of various technologies.

Several key questions should be asked regarding what types of information and data are necessary prior to and during famine mitigation activities.

1. What type of information and data is most useful in planning and implementing famine mitigation activities involving cereals-based cropping systems?

2. What level of information is needed in order to plan and implement mitigation activities? What type of sample is needed in order to adequately represent what the real needs are for farmers in a given area.

3. Who should be responsible for collecting, maintaining, and interpreting data?

4. Is annually updating a reliable data base for cropping system interventions more useful than conducting ad hoc rapid surveys at the onset of each disaster?

Famine mitigation activities which propose to alleviate food shortages and help restore cropping systems should begin with accessing and synthesizing relevant data and information that will help determine what the appropriate nature of the intervention should be. Data needs will in part be fulfilled by earlier mitigation information efforts, such as through ShortFEWS, but there are several areas of information specific to crops and cropping systems which need to be gathered and analyzed in order to properly plan interventions, such as:

1. **Climate Data** - Reliable climate data may enable 1) anticipation of drought or famine, 2) more accurate prediction of appropriate replacement varieties or crops, and 3) programming of when and where to mitigate for losses. Climate data such as daily rainfall for a particular area can be extremely useful in identifying appropriate varieties and understanding local production constraints.

2. **Crop Variety and Performance Data** - Every country has had at least some crop variety improvement work, although the quality and degree varies considerably. Knowledge of what varieties have been tested, their appropriate agroecological zone, and their current status would be useful for planning purposes.

3. **Seed Stocks** - Even if appropriate varieties can be selected, there is usually a larger problem of obtaining adequate seed supply. Seed stock data should be collected annually in order to enable quick response. There are several sources to consider:

   a. In-country - What seed stocks do farmers normally retain, what seed quantities are retained by the agricultural research station, what other sources are available for obtaining seed (private sector, government storage, etc.)?
   b. Regional - Do neighboring countries or IARC's have stocks of appropriate seed?
   c. International - Often large quantities can be found from commercial sources. This may not be appropriate for many areas.

4. **Cropping Systems and Production Data** - Data on average crop yields over agroecological zones could be useful in determining appropriate substitutes. Knowledge of cropping systems is necessary to understand what options would be feasible. The same is true for determining other characteristics of the cropping system, such as what tools are traditionally used.

Issue 4 Selection of inputs for crop interventions

Many of the technical means for reducing crop risk to drought and other forms of disaster are well known. The real problem lies in mobilizing adequate resources, both human, financial, and physical, to reach an adequate number of farmers.

Seeds of drought-tolerant cultivars and varieties will be the main non-labor input in many crop intervention strategies. Information on crop and cultivar performance under different agroecological zones is mostly available. Many national programs have tested a large number of crops and crop cultivars as part of their national agricultural research station. In addition, international agricultural research centers operating in country or nearby have performed similar tests. There are many cultivars that outperform the traditional varieties under stress conditions. Others are available with significantly shorter growing seasons. For a number of reasons, these seeds have never been multiplied and disseminated in a release program. Consideration should also be given to collecting and distributing seeds of wild foods consumed during periods of food shortages. There may even be potential in these species later becoming cultivars or used in future breeding programs targeted for the region.

Although considerable research and breeding have been done in developing countries and crop genetic material is available, there is usually little systematic cataloging of performance data of these materials. Often a researcher has very good knowledge of the specific crops she or he has worked on, but since few annual reports or other means of recording experiences exist, it is often difficult to know what is in-country.

Another problem exists in how to secure enough seed of a particular cultivar. Seed multiplication programs are usually inadequate to produce even seeds of commonly used cultivars, much less keep adequate supplies of a wide range of seeds for mitigation programs. Here there may be a role for the private sector, including contract farmers or merchants, to become engaged in seed multiplication, storage, and dissemination.

Sources of seed and other inputs should be determined well in advance of any crop interventions. In countries where drought and other disasters are common there should be some mechanism developed for identifying, multiplying, and maintaining sufficient seed stocks for relief programs. If there is adequate private sector capability in this area it should be exploited. Whether national governments keep a nuclear stock of seed available for responding to drought and other disasters should also be considered.

Annex A provides an summary of some of the crop and cropping system options which could ultimately lead to more sustainable production systems which are less vulnerable to factors which promote food shortages and famine conditions.

4. Considerations

The issues discussed above cover only a part of the considerations that need to be addressed in formulating concepts and methods for crop interventions in famine mitigation activities. A number of other general considerations are worth mentioning.

4.1 **Markets** - Market or socio-economic factors may inhibit the introduction of certain interventions. Replacing tools or seed may disrupt normal local channels for distribution. If the private sector has been active in such areas, the impact on their sector should be evaluated prior to implementing activities. To the extent possible, the local markets should be utilized for services. Information on agricultural markets can influence the selection of crops used in intervention strategies. In areas that normally have a solid market for crops, the status of this market may discourage farmers from planting specific crops. Where markets are vulnerable, crop selection should avoid non-food cash crops and opt for crops that can serve both as food or cash crops.

4.2 **Scaling** - The physical size and the diversity of agroecological zones within the targeted area of intervention will have a large impact on what types of activities are possible. Small scale efforts should ideally be targeted for early implementation phases in order to flush out new issues and resolve logistical constraints.

4.3 **Extension** - Most cropping system interventions will require some type of extension to introduce new varieties or crop management measures. The capacity of national extension services to perform these functions may be a major constraint on project activities and alternate means of technology transfer should be considered.

4.4 **PVO's/NGO's** - There is ample opportunity to engage local and international PVO's and NGO's in crop intervention activities. Many already have experience in seed and input distribution, have established contacts at the local and governmental level, and have personnel trained in famine intervention activities.

4.5 **Conflict** - Civil strife may be the largest barrier to implementing activities. This may be especially true if government institutions are relied upon to react to disaster situations.

4.6 **Livestock** - Rarely will interventions target groups of farmers who do not also engage in raising livestock and using draught animals in their farming systems. Planning for crop interventions should not be carried out apart from that for livestock and ensuring adequate replacement of animal traction.

4.7 **Emigration** - Successful intervention may actually trigger people from adjacent areas to migrate to the project area in order to benefit from activities. This could fuel land disputes and disrupt existing systems.

4.8 **Non-rainfed Systems** - This discussion has focused primarily on rainfed cropping systems since they are the most prevalent in the targeted countries. Other systems, such as irrigated perimeters or flood recessional, will also be impacted by drought and other disasters and will likely require different intervention strategies.

4.9 **Popular Participation** - The involvement of local peoples and government should be viewed as essential. However, because they normally lack appropriate resources they should be adequately backstopped with national expertise, if available, or other technical assistance.

4.10 **Agroforestry** - There is an important role for agroforestry or tree crops to play in reviving and increasing the production of smallholder agriculture. While it is beyond the scope of this paper, ways to incorporate trees into cropping intervention programs should be given serious consideration.

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Annex A

Technical factors which limit crop production in arid and semi-arid Africa are reasonably well-known. Substantial emphasis has been placed on developing new varieties for agro-ecological zones. Research continues in developing agronomic practices which reduce stress and stabilize production. Only recently has emphasis been placed on other factors of production - such as lack of credit, insufficient cereal markets, and social constraints at the farm level. While research in all of these areas continues (albeit at a declining rate), it is evident that there are a number of known technological interventions that, if appropriately applied, could improve and stabilize cereal production in high-risk agricultural zones.

Interventions can be focused at the crop, input, or cropping system level. Below is a menu of options available. Rarely would these be considered in isolation. An appropriate mix of options, however, would need to be formulated in response to varying circumstances. This may even be true for responding to different needs within the same general physical area of assistance, as different ethnic, climatic, and environmental conditions can all change the characteristics of the cropping system.

A.1 Crop Options

a. Provide drought tolerant genetic material - Genetic improvement related to drought tolerance has been made in every major cereal crop. Most genotypes bred for these conditions show moderate yield improvement under both stress and non-stress conditions. An alternative is to switch to a more drought-tolerant cultivar within the same crop or change species (e.g. maize to sorghum, sorghum to pearl millet or fonio, groundnuts to cowpeas or bambarra groundnut, etc.).

b. Provide early maturing cultivars - The risk of total crop failure due to intermittent or prolonged drought can be reduced by using cultivars with shorter growing seasons. This reduces the amount of time a crop is exposed to the vagaries of climate and disease. Early maturing varieties can often provide the first food for consumption. They can also be used for late planting in the event rains begin late or if intermittent drought disrupts early plantings. If rains start late and then proceed normally, or if late season rains coincide with flowering and heading times, these short-duration varieties are often plagued with mold problems.

c. Increase area planted - This is basically a production maximizing strategy. Many development efforts in the 1960s and 1970s included this option as a means for increasing cereal production in developing countries. In most cases, however, opportunities for expanding land under cultivation are limited. Factors such as labor availability and access to arable land are constraints which severely limit the use of this option.

d. Increase crop diversity - There are numerous staple crops which are grown in arid and semi-arid regions, although the number grown in any one area is often limited by food preferences and traditional cropping preferences. Increasing crop

diversity through the introduction of new varieties or through new strains of existing crops can serve to spread risk and increase the probability that at least one crop will make it through the season.

A.2 Input Options

a. Fertilizers and Soil Amendments - Manures, plant residues, and chemical fertilizers are all known to have some useful effects on soil physical properties, plant growth, and yield when applied in proper amounts. Chemical fertilizers, if used, should be applied at moderate levels. Specific recommendations, however, will depend on crop, time during crop growth that interventions are employed, soil moisture levels, and availability.

b. Tools - Farmers may have lost access to tools (sold in order to buy food, lost in civil strife, not carried when displaced, etc.). Appropriate varieties may be useless unless farmers have implements for planting, weeding, and harvesting. Tools, such as plows, hoes, and fertilizer applicators should be stocked and supplied when necessary. We must have knowledge of appropriate tools for target farmers.

c. Pest and Disease Control - Pests and/or diseases may be a cause of crop failure. Drought and other stresses can increase the susceptibility of crops to pests and diseases. Supplying new cultivars or varieties may result in more or fewer problems (difficult to predict). Relevant control measures should be included in mitigation activities to minimize risk of these problems.

d. Animal Traction - Cropping may be limited by lack of animal traction for planting and weeding. Surveys in Eritrea on factors limiting crop production in 1986-1987 revealed that a shortage of oxen was the primary constraint to production in 1986 (Ethiopian military action was ranked second) and the second-ranked constraint in 1987 (lack of rain ranked first) (Cliffe 1989).

A.3 Cropping Systems Options

While the genetic component of crop options has received considerable attention (and rightfully so), it is changes in crop management that can often have considerable impact, especially in stressful environments. For example, traditional land-race varieties of pearl millet have yielded, with improved management, 2,000-3,000 kg/ha in areas where average yields are only 500-700 kg/ha (Andrews 1990).

a. Intercropping - Intercropping can be used to spread seasonal moisture demand, increase soil fertility, and stagger production and food availability. Although intercropping generally decreases the yield potential of individual crops, it acts to decrease some risk and assure some level of production. Its viability should be questioned in areas where intercropping is not historically used.

b. Staggered Planting - During drought years, staggered planting may decrease the risk of total crop failure. This is a potentially important mitigation option since it is

easy to apply and may not involve introduction of new cultivars or radically different cropping methods.

c. Planting Density - Altering plant density can be useful if rainfall is expected to be less than average but approximately normal in duration. Competition for water and soil nutrients is decreased, thus giving plants more chance for survival.

d. Spaced Planting and Maximum Safe Crop Biomass - If available moisture can be predicted, production potential can be increased by appropriately spaced planting and crop biomass.

Household Gardens as a Famine Mitigation Strategy

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1. Overview

Although India is often cited as an example of a country that has successfully overcome famine caused by drought, some researchers are still concerned (Jodha 1990). While acknowledging that "drought prone areas in India are less vulnerable to drought induced crises today than in the past," Jodha points out that this is not because those areas are better able to cope with drought, but because that country can "spare and mobilize surpluses to help them." Jodha suggests that to be effective in the long run, drought management should be a development policy, not simply a distribution network, and it must start by enhancing farmers' own strategies for coping with drought and famine.

Whether or not you believe it is valid as a long term goal, it seems obvious that a famine mitigation strategy based on transportation, storage, and relief infrastructures will not work in areas torn by civil strife and poverty. Instead, strategies must first be found that work at the household and community levels. While most of the fundamental causes of and solutions to famine are beyond the control of individual households, households must none-the-less find their own strategies for coping with famine.

In this paper we discuss 1) the contributions that household gardens can make, and in many areas do make, to household strategies for coping with drought, 2) the obstacles to achieving those contributions, and 3) a number of practical steps which can be taken to overcome those obstacles and support sustainable gardens. We will start our discussion by defining a few terms.

1.1 Sustainability

Sustainability is a popular word these days in development circles, so popular in fact that it has already achieved the status of required lip-service. Even so, environmentally and socially sustainable development is a critical concept for drought disaster mitigation in that it implies a long term perspective to improving people's ability to cope with the risks of famine and drought. Gardens promoted for famine mitigation should be environmentally sustainable by managing soil, water, and biological resources so that all future generations can also use them, and socially sustainable by improving nutrition and income in ways that are cost effective and promote local self-reliance and control, and a just distribution of resources (Cleveland and Soleri 1991:3). Key elements in achieving sustainable development which reduces risk are diversity and stability in food production systems.

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1.2 Household Gardens

Household gardens have been defined in many different ways. For example, some definitions are based on garden location, while others use the type of crops as the key criterion. In our work at the CPFE we use a functional definition of household gardens (Cleveland and Soleri 1987, 1991:2). A household garden is a supplemental food production system under the management and control of the household. It is secondary to both the primary source of household food and of household income. A household garden can be consumption or market oriented, but at least some of the produce will be consumed by the household. While vegetables and fruits are common in gardens, they can contain any crop, as well as nondomesticated species which are managed or protected.

Indigenous gardens have often been neglected by researchers focusing on large- scale field production of staple crops. However, the ubiquity of gardens and their persistence even under difficult or changing conditions shows that households value these supplementary production systems and consider them to be worthwhile investments of time and resources. For example, relief workers in northern Pakistan told us that gardens appeared spontaneously in Afghan refugee camps in Baluchistan and North West Frontier Province of that country. Both male and female refugees grew a variety of vegetables and culinary and medicinal herbs in small patches in the camps. While most of the produce was consumed by the gardeners, trade and sales of garden vegetables was also occurring.

2. Potential Benefits of Gardens

Gardens can contribute to household or individual well-being by adding stability to the food system through their high production, as sources of improved nutrition and income, and by reinforcing cultural identity.

2.1 Stability and Risk Reduction

The genetic and ecological diversity of indigenous gardens as part of household food systems (many local varieties and mixture of crops with different life spans and productive cycles) means that their production is stable. Stability can be seen as the ability of a system to resist perturbation through preparedness and mitigation. An example is the ability to maintain production of some sort of vitamin A-rich foods in the face of increasing drought stress. Second, stability is a measure of the resiliency of the system, that is the speed with which it returns to stable production, through preparedness, mitigation, and rehabilitation. An example of resiliency is the rapid return of households to gardening activities after drought and famine, either in their own communities or in refugee camps.

2.2 Production

Small, intensively managed gardens have high yields. A study in Eastern Nigeria showed that dry weight harvested per unit area from "compound" gardens are twice as large as those from more extensively cultivated outer fields (Lagemann 1977). A study of two household gardens in an urban desert environment in Arizona, USA, showed yields between 1.2 and 6.5 kg/m^2 (Cleveland et al. 1985). These results can be compared with commercial vegetable

production in the U.S. which yielded on average 1.7 kg/m_2 in 1974. Norman's (1972) study of farmers in northern Nigeria, who grow 25 crops in 200 combinations, was one of the first major studies in Africa to show that mixed cropping gives higher yields than monocropping.

Unlike intensification of field crop production, intensive garden production may not mean lower labor productivity. In traditional mixed gardens returns to labor may actually increase because of greater biological diversity, continuous harvesting, and the large proportion of perennials. Continual harvesting may raise annual yields and encourage fine tuning of management strategies. The mixed compound gardens in eastern Nigeria mentioned above yield returns to labor which are four to eight times greater than those in outer fields. So in terms of yields for investment, gardens compare favorably with field production.

Accumulating resources for production, including time, energy, water, and land, is difficult for the poor households most vulnerable to drought and famine. However, the small amount of resources available to these households can be productively used in gardens, which can be one small plot or a few containers in the house or compound area. For example, in Wollo Province, Ethiopia, poverty resulting from drought and famine makes purchase of commercial fertilizers impossible. However, limited quantities of manure are available from domestic livestock, some of which is applied to home gardens, the rest being used as a fuel (ERCS and IIED 1989). Garden labor requirements can be met with small amounts of the spare time of men, women, children, the disabled and the elderly, and can easily be combined with child care and domestic tasks.

2.3 Nutrition

The nutritional impact of garden projects has seldom been measured, partly because it is so difficult to do. The influence of gardens on the nutritional status of household members is affected by many factors including quantity and quality of garden nutrient production, availability of nutrients in garden produce, storage and processing, food distribution and diet. However, three of the most important dryland nutritional problems - vitamin-A deficiency, anemia resulting from lack of iron and vitamin-C, and protein/energy under-nutrition of infants and children (Latham 1984), can potentially be solved by gardens.

Gardens can provide these benefits in several ways. First, they can provide specific nutrients, especially vitamins and minerals, which would otherwise be lacking in the diet. Foods containing these nutrients may not be otherwise available in the area, or they may be too expensive for many households to purchase. For example, dark green leafy vegetables and red and yellow fruits are rich sources of provitamin A. Recent research shows that vitamin A plays a role in the body's immune system and that deficiency of this vitamin appears to increase mortality from infectious diseases such as measles, dysentery, gastrointestinal infections, cholera, and tuberculosis (Soleri et al. 1991). These are diseases common among children in drought and famine-stressed areas. Just 100-200 g (3-7 oz) of vitamin A-rich food such as cooked amaranth leaves, provides the US RDA (Recommended Dietary Allowance) for infants and young children. The FAO RDAs are even lower.

Second, the nutrients in many garden foods compliment those in staple crops, for example by supplying the amino acid lysine which is low in cereals, thereby increasing the quality of protein in the diet. Gardens can provide food when staples are running low or are

depleted, thus helping to smooth out seasonal fluctuations in the diet and overcome the periods of greatest vulnerability to hunger and malnutrition. Dryland diets are commonly punctuated by a preharvest hungry season, which increases in severity with drought. This hungry season occurs is when dryland populations are most nutritionally at risk due to a combination of low or depleted food stocks, high food prices in the market, hard agricultural work, and an increase in diseases such as malaria and gastrointestinal infections. In many areas garden production at this time (rainy season gardens) provides an important supplement between the consumption of last season's food stocks and the upcoming harvest.

Third, gardens can also supply important amounts of protein and energy (Cleveland and Soleri 1991:19-20). For example, the dark green leaves of jute (*Corchorus olitorius*), cowpea (*Vigna unguiculata*), and pumpkin (*Curcurbita pepo*), widely eaten in Third World drylands, are only 4% or more protein by weight when fresh, but are 20% to 35% protein when dried. While the energy density of most fresh fruits and vegetables is only about one-sixth or less than that of grain, this increases several fold when they are dried. The energy content of some vegetables grown in household gardens such as tiger nut, dried sweet potato, yam, and cassava, along with many dried fruits, approaches or exceeds that of grains, which is about 350 kcal/100 gm. While dryland gardens will not be the main source of energy and protein, they may supply important nutrients in convenient forms and at times of the year or during periods of stress when major sources are unavailable. This is especially important for weaning children, the most nutritionally vulnerable group in the population. Other nutrient-rich garden foods appropriate for weaning foods include nut or seed crops, pulses, and cucurbits.

There is little research on nutrient production in indigenous African gardens, but other data are available. Research on two urban desert gardens in Arizona, USA, (77.4 and 58.3 m^2) recorded a year-round harvest that provided the gardeners with over 50% of the RDA for vitamins A and C for more than half the months of the year, while only 2 to 3 hours per week were spent gardening (Cleveland 1982). Perhaps the most ambitious study to date was carried out in experimental gardens in the humid tropics by the Asian Vegetable Research and Development Center in Taiwan. Results from the third year of the study (1983-84) showed yearly production of RDAs for a family of five determined quarterly on samples from the 4.0 x 4.5 m gardens as follows: 13-18% protein, 33-42% calcium, 56-82% iron, 82-125% vitamin A, and 336-374% vitamin C (Gershon et al. 1985).

Finally, sale of garden products can provide income which may be used to improve nutrition or purchase foods when needs are greatest. The sale of garden products as well as direct consumption of garden foods improved child nutrition in southern India where presence of home gardens was found to be a strong predictor of weaning-age children's nutritional status. This was especially true in the slack season for off-farm employment when garden produce, or the income it brought, provided a "buffer against reductions in child nutrition" (Kumar 1978). However, nutrition education may be important in order for gardens to improve household nutrition. For example, after 20 years, a garden project in Senegal showed no significant difference in nutrient intake, because few of the vegetables produced were consumed by the family, and income from the sale of vegetables was almost never used to purchase food (Brun et al. 1989). However, these gardens may improve nutrition indirectly by improving womens' social status.

2.4 Economics

Gardens can make economic contributions to the household both as income and savings. Cash incomes in the Third World are so low that even small amounts of savings or income from the sale of garden produce can be important. Poor gardeners often cite economic reasons for having gardens. For example, in one project in Botswana 29 of 33 household gardens adjacent to a dam belonged to women from the poorest segment of the community, and 21 of the 33 gardeners cited the gardens as their sole or major source of cash income (Duggan 1985).

Low income was the primary reason given for cultivation of gardens for home consumption in a sample of 50 homeowners in Lusaka, Zambia, where 57% of all households in low cost housing areas have gardens (Sanyal 1986). Many of these people described their gardens as a money saving response to the high cost of vegetables.

The contribution of household gardens is important for women, who are often the principal gardeners as well as being responsible for providing weaning foods, condiments, relishes, and sauces. Household gardens, along with other home-based activities, can provide women with a means of earning income while adhering to cultural or religious requirements for female seclusion. Or gardens may be important because they are production systems which do not require large investments of time, land, water, and other resources compared with field production. For this same reason gardens can be valuable to other vulnerable groups such as the rural and urban poor.

The very success of women's market gardens may, however, lead to problems. If the gardens become economically successful, men may use their stronger social positions to usurp women's control (Cleveland and Soleri 1991:40). This was found to be the case in several drought mitigating projects in Niger and Mali where women were excluded from access to garden sites near new dams (Monimart 1989). This is a serious problem since biases in agricultural development have tended to exclude women from the control over resources which they once enjoyed, and gardens may be one of their last sources of independent income.

2.5 Cultural Identity

Gardens as sources of traditional foods and activities can contribute to feelings of well-being and strengthen cultural identity (Soleri 1986), especially important for vulnerable or displaced households. Some garden foods are particularly valuable because they are cultural requirements for maintaining social relations and status within the group or community.

If gardens have the potential to provide the benefits we've just described, why is it that they do not always do so? In the following six sections we will outline some common problems in garden projects, and how they can be overcome to ensure that gardens achieve their mitigative benefits, especially in drought-prone areas.

3. Models in Development

Garden projects, like all development activities, are based on assumptions. Unexamined assumptions give rise to garden models which are often out of step with local needs and realities, and reflect a top-down ideology renowned for its failure (Browrigg 1985:100-112; Cleveland and Soleri 1991:7-9).

Garden projects have been dominated by a development model based on Western, temperate, industrial row gardens. These gardens are characterized by a limited repertoire of European crops, planting in rows, and the use of purchased inputs. The track record of garden projects based on this model has been poor due to pest and disease problems, cost and/or unavailability of required inputs, and lack of interest among local people. While people will often agree to participate in such a project in order to receive free seeds, tools, or access to water, these gardens frequently disappear shortly after the end of the project because they are not cost effective in the local context.

Another model for gardens in development is what we call the alternative industrial model. Popular in the 70's and 80's, this model was based on raised bed, bio-intensive gardening as practiced in Europe and North America. Both of these models have been built on assumptions about household food production which are not appropriate for Third World conditions, especially in drought-prone areas. In fact, these models are not even appropriate for dryland areas of the industrialized world.

We suggest instead an approach based on indigenous gardens which are grounded in the local context and use local resources including people's knowledge and skills.

Indigenous gardens are a part of food systems all over the world including much of the Third World but are seldom studied, in part because of their genetic, agronomic, and social complexity. Key features are the use of local knowledge and resources, locally adapted, genetically diverse crops, crop rotation, mixed cropping using many varieties, and the exploitation of different microenvironments, such as pockets of soil which hold water longer. Cultivated areas often resemble natural ecosystems, containing dozens or even over one hundred domesticated and non-domesticated species. These features minimize pest, disease, and weed problems. When they occur, these problems are managed by system adjustments rather than purchased chemicals.

Using inappropriate development models based on invalid assumptions has negative consequences for long-term development. The consequences for famine preparedness and mitigation are even more serious because inappropriate models reduce stability by undermining two essential risk-spreading features of indigenous gardens: diversity at many levels, and a foundation of local resources and control.

While indigenous gardens are the best foundation for sustainable dryland gardens, they are frequently in need of recognition, support, and improvement. Projects have much to offer gardeners and potential gardeners by supporting local knowledge and resource use. Western science can also provide insights into basic principles of soil, water, and plant science which can then be used to seek solutions to unique, local problems. This kind of collaboration, in

which the local people are in control of defining priorities and developing strategies, is essential if the goal is sustainable, effective change which will make a long-lasting difference in the lives of those who are most at risk.

General regional training materials could be developed to serve as the basis for versions tailored to specific local areas using local examples of plants and techniques. Extension support would include training of field workers and community representatives, production of simple, illustrated extension materials, and production of short audio materials for broadcast on local radio.

4. Water Management

Although water management should be integrated with other extension support, it deserves special attention in drought-prone environments. Here small-scale water projects such as digging shallow wells, establishing small dams for holding seasonal rainfall, and improved management of soil water, make dry season gardening possible. This is the case in the drought-prone Dogon plateau in Mali, where some communities have developed water supplies for market gardens. In dry years the gardens are a critical source of food and income and prevent the massive out migration experienced by communities without market gardens (Kassogue et al. 1990).

Garden projects should collaborate with water resources projects to ensure that gardens are recognized as an important use of water. In Africa, projects have successfully supported gardens by planning for gardening space around newly established wells. Techniques which conserve available water resources are critical for successful garden projects in drought areas. All other aspects of gardening, including soil management, crop selection, planting strategy, and garden location should be oriented to maximize water-use efficiency, that is the amount of garden harvest per unit of water used. Simple techniques such as small scale water harvesting, bed design, shading, and mulching can improve water use efficiency significantly.

For example, a project was started in Burkina Faso to replicate a technique observed in the Negev of building rainwater microcatchments for growing trees for erosion control (Pacey and Cullis 1986:165-173). Local work teams were organized to build the stone berms to catch the rainwater. The local people, whose immediate concern was drought-inflicted food shortages, planted seeds for cereal crops in the catchment basins as well as the tree seedlings provided by the project. The vigor and productivity of those plants and peoples' strong interest in food production eventually led to a change in project design to include using microcatchments for field crops as well as for fruit trees. Starting with a few small berms and defining contours with a simple tube level, farmers were able to use their experience from season to season to expand the microcatchments without the need for hydrological calculations.

5. Diversity

Gardens contribute to the diversity and stability of household food systems. At the same time the internal diversity of gardens makes them stable food production systems under stress.

Gardens can contain genetic diversity within a heterogeneous, open-pollinated traditional variety, between different varieties of the same crop, and between the many different crop species and nondomesticated plants grown in the garden. This frequently includes mixing plants of different sizes, growth habits, and longevity.

The diversity of garden produce can smooth out the fluctuations in diet and income which are especially devastating to the most vulnerable households. Gardens can improve the household diet and/or income at critical times because they contain different crops and often have different cycles than field agriculture, or because they can exploit diverse microclimates providing food which supplements or extends other subsistence sources. In addition, these foods enhance both palatability and nutritional value of the staple food. Gardens are the source of relish or sauce ingredients which are used to compliment the local cereal or starchy staple in many African drylands.

Another source of diversity in supplementary food "production" is nondomesticated plants, many of which grow in and around gardens. Under increasing stress from drought, these plants are more and more important as a buffer from famine when all other food production fails. Garden projects can lead to neglect and perhaps eventual loss of these traditionally protected plant resources. However, in areas where environmental stress such as deforestation and erosion have wiped out the wild species, gardens may serve to replace the depleted wild source.

Indigenous gardens using small amounts of local inputs are not dependent on outside inputs whose supply can easily be interrupted when transport and marketing infrastructures are disrupted by civil strife, national politics, or the global economy. Creating gardens that will improve the stability of food production for drought and famine mitigation means that local people must be in charge of their own gardens and the resources used must be locally available and affordable. The diversity of local sources of inputs provides more stability during famine than dependence on centralized, large-scale infrastructure.

Overall, losing diversity means losing the ability of the garden and the household to resist disturbances such as drought and civil unrest.

6. Seed Saving and Seed Banking

Education and support for existing household level seed saving and community seed banking should be included in any drought/famine mitigation garden project (Soleri, Cleveland, and Smith 1991). Community or regional seed banking efforts should be supported so that seeds of garden crops are also conserved. The quantity of seeds required to provide households with replacement stocks of garden seeds is small compared with the quantity required for field production.

For example, the Plant Genetics Research Centre (PGRC) in Ethiopia has a program focusing on famine foods, both domesticated and nondomesticated, and garden crops, including many species and varieties of Brassicas (Worede 1991). Seed stocks of these folk varieties are being returned to households whose seeds have been lost due to war and

famine. In addition, the PGRC is working with farmers and gardeners, many of them women, to select improved lines from within these traditional populations.

Deciding which kinds of crops should be emphasized in gardens for famine and drought mitigation will depend on a number of factors including what people grow and want to eat, and any special needs such as for vitamin A. Long-term gardening efforts should include perennials because of their ability to make use of resources like nutrients and water held below the root zone of annual crops.

Gardens focusing on more immediate problems should give special attention to local dark green leafy vegetables because these are good sources of vitamin A and because leaf production occurs more quickly, and continues longer than fruit, seed, or tuber production in many annual species. In addition, vegetative growth is rarely limited by photoperiod sensitivity, nor is it as vulnerable to water or temperature stress as is reproductive growth.

7. Non-Domesticated (Famine) Foods

During drought and famine, wild and weedy plants are important foods. Traditionally in many areas these plants are encouraged, protected, or even nurtured by the community, or by specific households or individuals designated as caretakers. Frequently these plants are hardy native perennials which are able to survive far more severe stress than domesticated field or garden crops. Local famine foods should be identified and described. This is a major project of the Ethiopian PGRC (Worede 1991) and of the FAO traditional foods program in East Africa (FAO 1983, 1988).

In Kenya the NGO KENGO has a large program devoted to identifying, describing, and conserving indigenous, domesticated and non-domesticated plants, emphasizing perennials. The program includes in situ and ex situ conservation and propagation, and an extensive educational campaign about these species.

8. Nutrition

Although gardens can improve nutritional status, they do not necessarily do so. Problems may be quantity or quality of food produced, the effect of food processing, food distribution within the household, and the use of economic benefits from gardens.

Nutrition education can play an important role in garden projects. It should focus on the value of local garden foods, their contribution to health, and their ability to protect against infectious diseases and PEM. Emphasis should be given to garden foods rich in vitamins A and C, and iron, and those which can be used to make nutrient-rich weaning foods. Simple extension and training materials can be developed emphasizing local plants and processing techniques which preserve important nutrients. For example, encouraging shade- instead of sun-drying of garden foods can improve the retention of provitamin A substantially. Sweet potato leaves, a common potherb in Africa, retain 34% of total carotenoids (the vitamin A substances in plants) if shaded, but only 10% if sun dried (Maeda and Salunkhe 1981).

Nutrition education is also important in countering the negative effects of modernization which often reduces the value of indigenous foods and replaces them with "modern" foods which are often less nutritious (Cleveland and Soleri 1991:29).

9. How Can Famine Mitigation Projects Support Sustainable Dryland Gardens?

Support for sustainable dryland gardens can come from both policy makers and project fieldworkers. It may require changes in assumptions about what gardens are, and recognition and respect for indigenous gardens. That technical approaches have implications for local participation and long term sustainability should be recognized in the design and execution of projects.

1. Projects should start with an assessment of existing gardening activity including both indigenous and introduced gardens, cultivated and non-domesticated plants, and annuals and perennials.

2. People's reasons for gardening or not gardening should be identified and explored. The impact, or lack of it, of gardens on households should then be investigated.

3. Problems preventing gardening from providing its potential benefits, and solutions to those problems, should be identified by gardeners and non-gardeners in collaboration with project workers.

4. Locally adapted extension materials and programs can be developed based on easily available resources and indigenous knowledge, and incorporating some appropriate new ideas and techniques judiciously.

5. An emphasis on diversity, stability, and local self-sufficiency and control to achieve environmental and social sustainability is the best way for projects to prevent, mitigate, and provide relief from famine.

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Local farmers and gardeners are the experts on local FVs and their knowledge of FVs and the diversity which they contain should serve as one basis for sampling. Sampling should also be based on whatever genetic information is available for the local crops, specifically, whether crops are cross- or self-pollinated, the cropping systems, selection methods and criteria used locally, and the history of crop introduction. Efficient, standardized sampling strategies that do not depend on sophisticated genetic analyses (Marshall and Brown 1975), and yet capture a majority of the diversity present already exist and could be easily adapted for rapid construction of local seed banks. At the PGRC a combination of random sampling techniques and "biased" sampling based on farmer observations and selection criteria are used to ensure that FV collections are broadly representative (Worede 1991).

5.2 Collection Size

Size of the collection for each species depends on practical considerations including the risk of loss of planting stocks due to drought and other causes, resources and expertise available, whether the crop is cross- or self-pollinated, and the purpose of the seed bank.

Collections which are too large may lead to loss of genetic diversity because seeds cannot be maintained properly. Collections which are too small may not reflect the full range of genetic diversity among FVs necessary to maintain stable production during and after drought.

6. Maintenance of Collection

Before any collection of seeds or other germplasm is done, plans for maintenance of the collection should be well thought out.

6.1 Replenishment of Seed Stock

For critical crops and areas enough seed stock should be maintained so that farmers can receive seeds for planting to recover from total drought-induced loss. This is one of the main goals of the Seeds of Survival program in Africa sponsored by the Unitarian Service Committee of Canada (USC/C). In Ethiopia, in collaboration with the Plant Genetic Resources Committee (PGRC/E), Seeds of Survival is helping farmers replenish local seed stocks. Eventually these FVs and other locally adapted seed will be backed up by local ex situ conservation in the form of community seed banks whose main function would be to store replacement seed stocks for replanting (Worede 1991).

6.2 Maintenance of Genetic Diversity

Brown (1989) has championed the concept of core collections for large seed banks to make them easier to use and maintain by drastically reducing seed samples actively used in research to develop new varieties. The core collection idea may also be relevant for large community and small regional seedbanks as well. However, determination of a representative core collection depends on fairly extensive knowledge of the distribution of genetic diversity in the area sampled, and its

representation in the collection (Smith et al. 1991). One major advantage of local seed banks, and in situ conservation approaches in general, is that their unique local focus may make numerous small community seed banks the only practical way to maintain nearly all the genetic diversity found within the crops in their community. This is because the number of different FVs considered is relatively small. Constructing core collections is useful only when small samples from a large seed bank are likely to contain a large number of different FVs.

7. Storage: Facilities and Management

Seed banks which are not established and managed properly may lead to the loss of seedstocks (Fowler and Mooney 1990; Plucknett et al. 1987).

7.1 Facilities

Simple storage, for example an underground chamber to moderate temperature and humidity, is most appropriate for limited resource communities. Sand, ashes, and various dried and ground plant materials can be used to protect seeds from insect damage (Cleveland and Soleri 1991:301-304). Toasted cereal seeds can be mixed with saved seed to reduce humidity, and glass jars or locally made glazed ceramic containers can be used to exclude both humidity and insects. A simple vacuum packer based on a US $8.00 bicycle pump has recently been developed and used to package seeds for storage (African Diversity 1990a).

7.2 Management

Standard, simple data management procedures should be created with the local community to insure that the information they need about seed bank accessions is included. In plant genetic resources lingo this is called passport data. It might include local names, person who donated, person who collected, appearance, and when, where, and how grown and used. Information should be compatible with that required by any national or international seed bank with which the local seed bank might be cooperating (Hawkes 1983).

The frequency with which seed samples in the seed bank will need to be grown out to maintain viability will depend on the crop, the storage conditions, and the climate (Chang et al. 1989). For example, melons, squash, and chilis require more frequent grow out than small grains and pulses. If enough seeds are available, simple germination tests can be done to check viability.

Conserving planting material for vegetatively reproduced crops such as cassava, ensete, sweet potatoes, and yams requires much more room than seed crops. These materials keep for a shorter period of time than seeds, unless expensive and technically complicated techniques such as tissue culture are used. The other alternative is the creation of field gene banks where living accessions of these crops can be maintained, although this is also a costly method of conservation. Therefore, support for in situ conservation of vegetatively reproduced crops is even more important than for crops grown from seed.

Community Seed Banking as a Famine Mitigation Strategy

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1. Introduction

From 1976-78, one of us (DAC) lived in a small savanna village in northeast Ghana near the Togo-Burkina border. Rainfall was low and erratic those years, harvests were poor, and the people considered it a famine which they called Ayayua, one of six named famines in the last 100 years in this area. The head of the household David lived with, Azal (a pseudonym), had a cousin with several small children living close by. You could hear the youngest boy sometimes crying in the night. When asked what was wrong, Azal said that the child was simply hungry and there was no food. A few nights later, after hearing the cries before falling asleep, David was awakened again by the sound of someone pushing aside the logs that closed the entrance to Azal's house compound and going out to the granary. David learned the next morning that Azal had gone into his granary and taken a bowl of his planting seed to give to his cousin so that his wife could grind it and make porridge for the boy.

When dozens, hundreds, or hundreds of thousands of farmers under the stress of hunger caused by drought or civil strife go into their seed banks to find food for their children and their families then the genetic resources that provide resilience in the face of future famines are in danger of being lost. Almost all farmers and gardeners in Africa maintain their own seed banks, a store of seeds which they draw on for planting and replenish at harvest with seed saved from their own crops. Some seeds obtained from relatives, neighbors, and the market may also be in the seed banks.

Drought, famine, and social disruption can eliminate an individual farmer's seed bank, or the seed banks of farmers in an entire community or a region. When this happens, reestablishing food production is very difficult.

Therefore, while local, in situ conservation of seeds (that is by farmers in their fields, and in their individual seed banks in granaries and other containers) is the best solution, local ex situ conservation in community and/or regional seed banks has great potential as a strategy to combat famine. This is because they can maintain farmers' access to seed stocks which would otherwise be interrupted by minor environmental and social disturbances. When a major problem such as prolonged drought occurs, they can provide the base on which farmers can rebuild their farms, perhaps even replenishing planting stocks of some varieties. This level of seed banking is an innovation in Africa.

In this paper we will be discussing ex situ conservation in the form of community and regional seed banks, and their connections to farmers' individual seed banks. We assume that the major goal for these seed banks is to conserve as broad a range of genetic diversity as possible. Especially valuable in this regard are locally adapted folk varieties (FVs) that are the primary candidates for conservation in community seed banks because of their adaptation to distinctive, local environments. In this context, "adaptation" is defined as above average yield in representative environments with low variability among environments (Hall et al. 1979). Conservation of modern varieties (MVs), which are typically produced through organized plant breeding and have broader adaptation, should not be a major concern in community or regional seed banks.

The rich genetic diversity of local FVs and the self-sufficient and diverse agricultural systems they are part of, provide relatively stable yields, and therefore decrease risk to farm households and communities. The performance of MVs in local farming systems in Africa is often unknown and difficult to predict, and they are therefore more risky for the farmer.

1.1 Definitions

Folk varieties are also known as traditional varieties (TVs) or landraces and are often selected in low-input or marginal environments. They are locally adapted crop varieties that have been selected by local farmers and gardeners to serve their needs, including adaptation to local pests, pathogens, soils, water regimes, and climates; taste, processing and storage requirements; and yield. Modern varieties have been selected by plant breeders in both public and private institutions primarily with the goal of attaining maximum yields in optimal environments. Moreover, individual MVs are usually developed to have acceptable productivity (adaptation) throughout entire regions, rather than to unique local growing conditions (Cleveland 1991; Cleveland and Soleri 1989).

We use the term "optimal environments" to mean high-input environments, environments which are optimal for plant yield. These are usually high-production environments based on edaphic, climatic, and biotic factors, and are also highly managed, e.g. with irrigation water and high levels of pest and disease control. These are the environments where MVs do the best. "Marginal" or "low-input" environments are those which lack sufficient water, have highly variable rainfall, poor soils, heavy pest and disease pressure, or high or low temperatures, or a combination of these characteristics, and where inputs to alleviate these limitations are often scarce or absent.

We use the term risk as a measure of the probability of an unacceptable outcome of decision making. For example, the probability of an inadequate yield from a millet variety a farmer chooses to plant in a drought year. Stability, diversity, and local control are defined in Soleri and Cleveland (1991).

We will now briefly review the potential benefits which seed banks can provide, especially in drought- and famine-prone areas.

2. Potential Benefits of Seed Banks

Seed banks containing locally adapted folk varieties support two important risk-avoiding features of dryland, low-input farming systems: diversity and local self-sufficiency.

2.1 Diversity and Risk

It is well known to plant breeders that there is a tradeoff between yield and stability in response to environmental stress (Rosielle and Hamblin 1981; Blum 1988). High-yielding MVs have high yield in optimal environments, but generally lower yield in marginal environments. FVs have relatively low yield in optimal environments compared with MVs, but higher mean yields in marginal environments to which they are specifically adapted (Laing and Fischer 1979; Weltzien and Fischbeck 1990). Mean yield of FVs is affected relatively less by genotype x environment interactions, i.e. within their area of adaptation yields of FVs have less variability, are more stable from season to season than those of MVs. Plant breeders usually attribute these differences to the greater genetic diversity in heterogeneous FVs compared with homogeneous MVs (Borojevic 1990:332-334). This greater genetic diversity exists not only at the level of the crop variety, but at the species level where there are many more FVs of a crop planted than of MVs, and at the field level where many more species and varieties are planted together in indigenous compared with industrial agriculture. Genetic heterogeneity also exists between local and regional areas, as with barley in Ethiopia (Bekele 1983).

FVs are selected for performance in indigenous gardens and fields with relatively complex agroecosystems, whereas MVs are selected primarily for yield in relatively simple agroecosystems. Diversity at the garden, field, and regional levels also confers stability and lowers risk, and is reflected in the number of heterogeneous varieties found in the crop repertoires of indigenous farmers in Africa. African farmers are not unaware of this relationship, and in fact stability is an important criterion in their varietal selection. Women farmers in Malawi, for example, told Anne Ferguson that a major reason for maintaining so many varieties of common bean (*Phaseolus vulgaris*) was because of the yield stability that such a mixture conferred (Ferguson and Sprecher 1987). Even self-pollinated African folk varieties are often very heterogeneous, as with *Phaseolus vulgaris* in Malawi (Martin and Adams 1987a,b) and farmers typically grow many varieties of major crops, as do Mende farmers in Sierra Leone who in one area grow 70 varieties of rice (Richards 1986). This variation is typical of farming in other areas also (Dennis 1987; Soleri and Cleveland 1989).

2.2 Local Self-Sufficiency and Risk

Modern varieties are dependent on purchased inputs and a capital intensive infrastructure to deliver these inputs in order to produce high yields. Although their maximum yields may be lower, FVs are not dependent on such inputs or infrastructure, and therefore support local self-sufficiency. This means that farmers' yields drop less when there is a breakdown in infrastructure (e.g. lack of irrigation water, lack of fuel for vehicles delivering agrochemicals) due to drought, conflict, or other factors. In addition, covariation in yields between regions and nations both within and between years tend to be lower with FVs than with MVs, because with the latter there is homogeneity of plants, cropping practices, and input supply sources over large geographical areas which increases overall instability of yield by increasing covariation (Anderson and Hazell 1989; Barker et al. 1981).

In the next seven sections we discuss obstacles to achieving the benefits of seed banks, and practical ways to overcome them.

3. Choice of Seeds

Seed banking should concentrate on FVs, because MVs are available from other sources, whereas local FVs may only be found in the area where they were selected. In addition, production characteristics (e.g. optimum planting dates and rates, susceptibility to stresses) of FVs are known to local farmers and gardeners, while getting to know such production attributes for MVs will require too much time and risk for households suffering the consequences of drought. While some MVs may be more drought-adapted, they should not take up valuable space in local or regional seed banks. If MVs are available through a project, they should be tested first by farmers in small experimental plots in their fields, as is done indigenously (Richards 19..), and as is now being promoted by some development projects (Gubbells 1988).

4. Level of Focus

The level of focus, whether community or regional seed banks, must be appropriate to the existing sociocultural groups, ecological zones, and ability to manage seedbanks, including existing seed saving practices and level of community cooperation. In some communities it may be difficult to encourage sharing of seeds if this contradicts existing social patterns or cultural values. The level of focus will also depend on the money and other resources available.

In Africa, several countries are working out seed banking collaborations between community and national levels (see section 8).

5. Collection and Sampling

Providing households with food aid in exchange for seed stocks which are then put into local seed banks safeguards these resources in time of famine.

5.1 Sampling Strategy

Collection of FVs for seed banking requires a sampling strategy which assures a representative sample of the genetic diversity in the area served. Lack of representation means that the seed bank will fail to conserve the genetic diversity of FVs, and therefore will provide inadequate protection if farmers' crops are wiped out.

Local farmers and gardeners are the experts on local FVs and their knowledge of FVs and the diversity which they contain should serve as one basis for sampling. Sampling should also be based on whatever genetic information is available for the local crops, specifically, whether crops are cross- or self-pollinated, the cropping systems, selection methods and criteria used locally, and the history of crop introduction. Efficient, standardized sampling strategies that do not depend on sophisticated genetic analyses (Marshall and Brown 1975), and yet capture a majority of the diversity present already exist and could be easily adapted for rapid construction of local seed banks. At the PGRC a combination of

random sampling techniques and "biased" sampling based on farmer observations and selection criteria are used to ensure that FV collections are broadly representative (Worede 1991).

5.2 Collection Size

Size of the collection for each species depends on practical considerations including the risk of loss of planting stocks due to drought and other causes, resources and expertise available, whether the crop is cross- or self-pollinated, and the purpose of the seed bank.

Collections which are too large may lead to loss of genetic diversity because seeds cannot be maintained properly. Collections which are too small may not reflect the full range of genetic diversity among FVs necessary to maintain stable production during and after drought.

6. Maintenance of Collection

Before any collection of seeds or other germplasm is done, plans for maintenance of the collection should be well thought out.

6.1 Replenishment of Seed Stock

For critical crops and areas enough seed stock should be maintained so that farmers can receive seeds for planting to recover from total drought-induced loss. This is one of the main goals of the Seeds of Survival program in Africa sponsored by the Unitarian Service Committee of Canada (USC/C). In Ethiopia, in collaboration with the Plant Genetic Resources Committee (PGRC/E), Seeds of Survival is helping farmers replenish local seed stocks. Eventually these FVs and other locally adapted seed will be backed up by local ex situ conservation in the form of community seed banks whose main function would be to store replacement seed stocks for replanting (Worede 1991).

6.2 Maintenance of Genetic Diversity

Brown (1989) has championed the concept of core collections for large seed banks to make them easier to use and maintain by drastically reducing seed samples actively used in research to develop new varieties. The core collection idea may also be relevant for large community and small regional seedbanks as well. However, determination of a representative core collection depends on fairly extensive knowledge of the distribution of genetic diversity in the area sampled, and its representation in the collection (Smith et al. 1991). One major advantage of local seed banks, and in situ conservation approaches in general, is that their unique local focus may make numerous small community seed banks the only practical way to maintain nearly all the genetic diversity found within the crops in their community. This is because the number of different FVs considered is relatively small. Constructing core collections is useful only when small samples from a large seed bank are likely to contain a large number of different FVs.

7. Storage: Facilities and Management

Seed banks which are not established and managed properly may lead to the loss of seedstocks (Fowler and Mooney 1990; Plucknett et al. 1987).

7.1 Facilities

Simple storage, for example an underground chamber to moderate temperature and humidity, is most appropriate for limited resource communities. Sand, ashes, and various dried and ground plant materials can be used to protect seeds from insect damage (Cleveland and Soleri 1991:301-304). Toasted cereal seeds can be mixed with saved seed to reduce humidity, and glass jars or locally made glazed ceramic containers can be used to exclude both humidity and insects. A simple vacuum packer based on a US $8.00 bicycle pump has recently been developed and used to package seeds for storage (African Diversity 1990a).

7.2 Management

Standard, simple data management procedures should be created with the local community to insure that the information they need about seed bank accessions is included. In plant genetic resources lingo this is called passport data. It might include local names, person who donated, person who collected, appearance, and when, where, and how grown and used. Information should be compatible with that required by any national or international seed bank with which the local seed bank might be cooperating (Hawkes 1983).

The frequency with which seed samples in the seed bank will need to be grown out to maintain viability will depend on the crop, the storage conditions, and the climate (Chang et al. 1989). For example, melons, squash, and chilis require more frequent grow out than small grains and pulses. If enough seeds are available, simple germination tests can be done to check viability.

Conserving planting material for vegetatively reproduced crops such as cassava, ensete, sweet potatoes, and yams requires much more room than seed crops. These materials keep for a shorter period of time than seeds, unless expensive and technically complicated techniques such as tissue culture are used. The other alternative is the creation of field gene banks where living accessions of these crops can be maintained, although this is also a costly method of conservation. Therefore, support for in situ conservation of vegetatively reproduced crops is even more important than for crops grown from seed.

Local farmers can conduct growouts cooperatively given the proper community management structure. In the Seeds of Survival program in Ethiopia some growout by farmers is subsidized (Worede 1991). Individual farmers, farmer associations, or the local community donate the land. The seeds supplied for growout and testing are sometimes supplied by the national seed bank, and sometimes by the farmers. Mass selection to improve these varieties is then carried out through collaboration between farmers (primarily women) and scientists from the PGRC in the Seeds of Survival On-Farm Landrace Conservation and Enhancement Project (Worede n.d.:12-16).

Most varieties in the seed bank could probably be replenished every few years by the gardeners and farmers to ensure viability without a formal growout program. However, varieties which may not be grown every year or which completely fail, may have to be grown out through a more formal system.

7.3 Back-up for Local Seed Banks

The purpose of community or regional seed banks is to provide a back-up for farmers' own in situ conservation of their crops. What makes these small-scale seed banks both valuable and viable is their focus on the local farming system and their ability to meet local needs and remain accessible to the farming households in the area. The extent of diversity typically present in indigenous, low-input farmers' crop repertoires and the value of this diversity for coping with risk is well known (Bekele 1983; Brush 1991; Dennis 1987; Richards 1986; Soleri and Cleveland 1989). Although backing-up these back-up systems in national or international storage facilities may seem a sensible further precaution, we do not feel that this should be a priority, and that it may have some deleterious effects. 1) Back-up at a national level could not accommodate the broad genetic diversity present in the field and would necessarily lead to the loss of rare alleles. 2) If integrated into a national gene bank hierarchy there could be a significant risk of loosing local control over local seed banks and seeds. 3) The presence of replicate accessions in the national storage facility may be seen as a rationale for eliminating support for local seed banks. As we have discussed through out this paper, a national storage facility cannot replace community or regional seed banks and the critical local benefits they provide.

8. Establishment and Control of Seed Banks

Control over crop genetic resources is an increasingly critical international issue. Lack of adequate protection could jeopardize the control of the local communities over the FVs which they have created. In fact, this is the reason for using the term "folk variety." The World Intellectual Property Organization (WIPO) of the UN has worked out international agreements that protect indigenous rights in folk property such as myths, music, textiles, painting, and by referring to indigenous crop varieties as "folk varieties", some hope to emphasize the point that they too should have protection under these agreements. Thus, in the very terms we use in talking about seeds are embedded the elements of the political struggle over rights to crop genetic resources. These resources are valuable to the international plant breeding community and commercial seed industry because they are a major source of the genetic diversity needed to create or improve MVs.

Seed banks should be organized on the community level (or multiple communities in the case of regional seed banks) to maintain community access and control (see section 4). Outsiders should serve as facilitators, liaisons with the larger structure, and as expert consultants on limited topics.

To date a number of indigenous African organizations are planning or initiating community seed banks. As already mentioned, the PGRC in Ethiopia and Seeds of Survival are already active in the conservation of local genetic resources based on local participation. In addition, the PGRC is developing a policy on which to base agreements between the national seed bank, the national seed corporation, and local communities regarding their FVs

(Worede 1991). KENGO, a Kenyan NGO, has been promoting protection and use of indigenous plants and plans to establish community seed banks (African Diversity 1990b).

9. Use of Seed Banks to Improve Indigenous Sustainability

While seed banks can help to preserve the famine mitigating FVs which farmers continue to select to meet their changing needs, they can also help to decrease vulnerability to famine by enhancing existing agricultural systems. It is important to understand that a return to traditional or indigenous systems is not the goal of seed banks. The reason is that indigenous systems are often not adapted to present or future conditions because: 1) they have been changed, disrupted by many decades of interaction with and incorporation into the world system, and 2) their social, biological and physical environment has also been changed radically, by colonialism, international markets, population growth, environmental degradation, migration to new areas, and international conflict.

In addition to resupplying local FVs, community, regional, or national seed banks may also choose to cooperate with national or international institutions on various projects, as long as their sovereignty is ensured and this collaboration does not detract from their local work.

The PGRC/E has been using the national collection as a source of FVs to resupply local farmers whose seed stocks have been obliterated by drought, famine and conflict. It has also promoted field testing by farmers of FVs from other areas, and has brought plant breeders to work with farmers on crossing and selection in their own fields (Worede 1991). Seed banks could also be used to disseminate a few new varieties, including "improved" varieties from plant breeding programs. The World Neighbors program in West Africa has been building on indigenous farmer experimentation to introduce short-season varieties desired by farmers (Gubbels 1988).

The PGRC/E has held workshops for extensionists, and has held joint workshops with Asian colleagues focusing on community seedbanks and FV selection. Modeled on these workshops, the African Committee on Plant Genetic Resources (ACPGR) has held regional training workshops in Ethiopia for African plant breeders and geneticists on conservation, evaluation, and use of the genetic resources of FVs of agricultural importance in Africa.

The interest, knowledge, and ability of African farmers in the areas of seed selection, preservation, and experimental plant breeding cannot be overemphasized. Farmers spend much time thinking about their crop varieties and how to improve them or add new varieties to their repertoires. Their knowledge and skills should be the foundation for seed banking for famine mitigation.

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Cash Cows and Camels: the Fate of Livestock in African Disasters

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1. Overview

In Africa, livestock provide crucial goods and services to at least 40 to 70% of the population in any one nation. This includes meat, milk, manure, traction, transport, fuel, skins, hides, and other products. Milk is an important food source. Competition for milk between humans and calves or kids can be severe during hard times. Meat is rarely an important product in non-commercialized societies with indirect markets to the city slaughter houses. But, combined with skin sales, meat can be crucial for supplemental income (e.g., among the Baggara and Topoza) and essential purchases of vaccines, payment of taxes, and school fees (e.g., Dinka, Nuer, Shilluk). Manure is used on farmer's own fields and has been shown to increase crop yields as much as 300%. Or, it is deposited on someone else's fields in exchange for allowing livestock to feed on crop residues.

Livestock are, in most areas, the major form of savings, asset accumulation, old-age and health insurance and intergenerational equity (inheritance). Cattle are sold to obtain medicines for ill kin and for vaccinations and drugs to prevent and to reduce livestock disease. Even with droughts, the interest rate on cattle investment may be higher than investing in what few banks exist. Livestock may be necessary for marriage dowries and religious celebrations, requiring non-seasonal offtake. Young men establish their herds by gifts and exchange entitlements for work as herders. Livestock serve as a major "currency" of exchange, sales and barter. In this sense, the value of livestock cannot be isolated from the value of monetary currencies, regional and national inflation and debt, and international market prices. In food shortage situations, the price structure of the market may mean the difference between chronic malnourishment and death by starvation. For instance, Cutler (1986) found that in one area of Sudan the price of sorghum, the principle food grain, escalated 600% compared to prefamine prices. On the other hand, the value of goats, the main livestock sold to purchase grains, dropped to a quarter their prefamine price. The effective food price rise for pastoralists was 2,400%!

In short, livestock are intimately involved in kinship and clan focused subsistence, investment, and sales. These three goals are intertwined. At any moment in the animal's life, the livestock owner must decide whether the same animal is for dairy, traction, meat, transport or manure production, for family or clan consumption or investment, or should be exchanged for some other good or service.

2. Animal Management Overview

There are two basic approaches to livestock: managing the animals or managing the ecolcgy (water, salts, vegetation). This paper will emphasize certain aspects of animal management because, in crisis situations, the management of ecology is difficult, if not impossible. But, it should be remembered that African livestock depend on both trees and shrubs for up to 30% of forage intake and as an even more important source of protein, mineral and vitamins. Certain species (e.g., *Pterocarpus lucens*) play special roles in that they provide nutritious food when pregnant cows need it most. This tree is lopped for sale in markets and competes as a fuelwood (Warshall 1988). In special situations, planting and protecting trees and shrubs could be included in mitigation measures (see below).

2.1 Forms of Animal Husbandry

The diverse end-uses of livestock are compounded by the equally diverse forms of animal husbandry. In Africa, one must distinguish between true nomadism where the whole household moves with the herd of flock, transhumant pastoralism where only the herder moves with the stock, semi-pastoralism where cultivation (usually of cereals) constitutes a significant segment of activity, and sedentary agropastoralism or agro-silvo-pastoralism in which tne major segment of activity is cultivation, but a segment of tne family is in charge of grazing the oxen or family stock. There are, of course, many shades of these categories, especially cases when the whole family may move with the herd or part of the herd for shorter or longer periods.

Pastoral and nomadic societies usually indicate that more than 50% of total income and more than 20% of total food energy derive from livestock and their products. Pastoralists are more vulnerable to disasters (disease, locusts, war, drought) that impact livestock and experience more difficult marketing problems, especially when livestock prices collapse and grain prices sky-rocket. Agropastoral families and clans have between 10% and 50% of their total assets based in livestock. In Ethiopia, a single ox may typically increase grain production by 69% by deep ploughing and increased cultivated land. Among agropastoralists, livestock for household cash income is usually easier than for pastoralists because of access to markets and abattoirs. Since the household location is fixed, beast of burden transport of household goods such as firewood and water are also more important to the agropastoralist. Agropastoralists who are dependent on traction animals can become very vulnerable to food shortages. When pasture becomes scarce, as during periods of prolonged drought, agropastoralists have limited opportunity to move their livestock. If they cannot supply adequate crop residues or pasture near their village then they often lose their animals.

Finally, there are a few small completely commercialized or state run dairy and cattle operations modelled after industrialized nations. Little is known of these operations in the countries of concern at this time and their relation to food shortages will not be discussed. Nevertheless, they could play a crucial role in livestock offtake and improvement of rangeland management.

2.2 Periodic and Aperiodic Livestock Movements

From the famine preparedness point of view, it is also crucial to distinguish between periodic versus aperiodic livestock movements. Periodic movements are based on more predictable seasonality, while aperiodic pastoralism follows random climatic vagaries in both time and space. A good communications system can warn periodic herdsmen of a pasture failure before they waste the energy and undergo the risks of herd movement. In addition, a good indicator of increasing famine vulnerability is a sharp change in periodic livestock movement. When herd separation (i.e., the fragmentation of normally larger herd into smaller groups) begins and normal grazing patterns become impossible, vulnerability to livestock die-off and drastic drops in exchange value can be expected.

Even under normal conditions aperiodic livestock movements are difficult to discover, let alone support. Aperiodic livestock movements increase enormously when climate and war combine. Herdsmen set off to relatively unknown pastures in a last ditch effort to save the stock. Relief efforts for random herd movement have always been discouraging.

2.3 Secure Access and Use of Resources

Crucial to famine preparedness is an understanding of the ownership of pastures and watering holes, and the distances and the ownership of the trekking lands between them. Access, use, and security of access and use can mean the difference between livestock survival vs. death, between herdsmen's income and food security vs. complete destitution. For instance, the Kabbabish of Sudan move over very long distances (1000 to 2000 km), while many of the Somali groups in the Ogaden of Ethiopia may move only a few hundred kilometers. But, many of the Ogadeni groups must traditionally cross the Ethiopia/Somali border to complete their nomadic cycle. In times of war, these routes may be closed. Since a major source of oxen for plowing in the Ethiopian highlands comes from the Ogaden herdsmen, the loss of movement and grazing pastures has implications for the replenishment of draught animals and food supplies for both the pastoralists and the agropastoralists. In the 1980s, the Ogaden refugee camps appear to be much more permanent than the 1960s and 1970s. There are herders' children who have never gone on nomadic treks. They do not know anything about the serious military and political obstacles to the return of refugees to former grazing lands. In Ethiopia and Somalia, access, use and security questions override all others. How to rehabilitate returnees from the camps is a major socio-political as well as technical and educational issue.

In "worse case" situations, herders move toward "drought sanctuaries" -- the best pastures --causing conflicts between livestock owners and cultivators over land and water rights, and resulting in extravagant overgrazing and overbrowsing. Knowledge of these drought sanctuaries (and, in the case of armed conflict, livestock refuges in nearby nations) can greatly help distribution of relief, especially vaccination programs to prevent livestock diseases that are common in these difficult and crowded pastures.

2.4 Alternative Labor

From the vulnerability point of view, it is crucial to know what other forms of income generation are available to pastoralists and agropastoralists. If necessary, can the men

become fishermen, farmers, craftsmen, construction workers, traders, caravaners, livestock thieves, contraband agents, hunters, soldiers, foreign assistance employees or shareowning shepherds for expatriate or urban livestock owners? Can the women return to gathering food and crafts products, providing value-added products to the family income? The "pastoralist" is widely known for his/her flexible and inventive abilities to squeeze through economic hardship. Knowing local economic or income-generating possibilities and helping pastoralists and agropastoralists to quickly pursue these alternatives can be a crucial strategy in preventing food and income shortages, inhibiting mass migration, and maintaining the family and clan unit intact.

The agropastoralist, whose major asset is family land, is less likely to be this flexible and, without the knowledge accumulated by pastoralist's movement, is less likely to know alternative income possibilities. In addition, agropastoralists, especially peasant farmers with traction animals and a few small livestock, are much more deeply imbedded in the political system and subject to social controls that pastoralists can sometimes avoid. For instance, in Ethiopia, various pastoral groups became contraband caravaners of coffee beans because the government controlled price is so low that selling at higher illegal prices in Djibouti is worth the risk to both cultivator and pastoralist. On the other hand, many agropastoralists found their trade in grain blocked and confiscated by government armies.

2.5 Mixed Species Stocking

To add to these locally-adapted herding and labor patterns, there is a remarkable diversity of animal management throughout Africa (Table 1). Single species herds are the exception, not the rule. Mixed species stocking is an ancient practice which smooths the human food supply curve and shields the family or clan from the impacts of fluctuations in available grazing lands and browse (Wilson 1986). Specialized cattle, one humped camels, hair sheep, wool sheep, goats, donkeys, and horses can all be part of a single family's stock (Table 2). The varying longevity and different durations of gestation and lactation dampen the supply of booms and busts of animal protein, especially milk (Figure 1), and marketable livestock (Figure 2). As droughts proceed, small ruminants (sheep and particularly goats) that reproduce in shorter periods and do not depend as heavily on seasonal rainfall may become predominant in order to maintain year-round milk, meat, assets, and overall herd size. Their shorter gestation also allows accelerated recovery after the triggers that set off herd collapse are back on safety.

On a longer-term basis, species mix allows adaptation to drought because each species has different watering and forage requirements (Table 4). In longer-term droughts, camels may completely replace cattle, even though their inter-birth intervals average about 8 months longer. Depending on the local ecology, a herdsman may switch to predominant browsers such as goats and burros and sell his predominant grazers such as cattle and horses. In times of war and drought, species with contraband value such as Ogadeni camels that can be sold illegally to Saudi Arabia become more valuable than oxen because peasants can no longer afford to purchase new stock. Knowing the "species mix" game is an essential part of famine prevention for all types of pastoralists. This same knowledge can increase the effectiveness of aid, especially rehabilitation programs and prevention programs. Too often, aid has kept the wrong species alive and restocked the wrong species too soon after famine.

2.6 Large Herds

Much has been written on the need to maintain large herds. Old texts talked about prestige. But newer insights show that the herd is a form of savings ("walking banks" of stored value), insurance and intergenerational equity, the result of complex loans and shared ownership so that a herdsman has little choice but to maintain the herd size. A major cultural shift to monetary investments and medical, inheritance, and old age insurance will be necessary to control herd size in most parts of Africa. Unfortunately, most multilateral banks and trade agreements are working in the opposite direction (see below).

2.7 Age and Sex Classes

Livestock owners manipulate the age and sex classes of their stock (Table 2). In order to achieve reliable weight gain (vs. maximal weight gain), reproduction and milk production, livestock owners maintain a predominance of females. Only in special cases do males receive equal demographic status. For instance, male camels may be equally important as females for transport or for meat, bullocks are needed in the oxen trade, and wool can be equally sheared from male sheep. When bullocks are part of the trade and sales strategy, greater numbers of small ruminants may be part of the herd. The fattened rams required for the various religious festivals can encourage a herdsmen to keep a "dysfunctional" flock from a "western" or "commercial" off-take point of view. The herd may appear overstocked and the range overgrazed from a conservation point of view. Since many of the dates for festivals in which a ram is sacrificed change annually, it is important to know these dates in order to understand the economic strategy of sheep herders, especially in Sudan, Somalia, and Ethiopia. Restocking live rams right before Ramadan will please local herders who may simply sell the rams immediately rather than rebuild their herds. In order to benefit food security and reliable production goals donors must understand the complex nutritional, ecological, and cultural reasons behind sex and age mix in each herders and agropastoralist strategy.

In summary, the diverse forms of seasonal grazing patterns; herd separation and herd size; mixes of species, age classes and sexes; access, use and security of pastures and watering holes; as well as alternative forms of income-generating activities, all influence the resilience of livestock owners to food shortages and their vulnerability to famine. The goals of African animal husbandry are not maximal production. Interventions that promote only increased animal production are bound to cause increased social conflicts and project failure. The goal is reliable production in the face of the many triggers that can increase livestock mortality and push livestock owners towards hunger and starvation.

3. The Process Leading to Livestock Disasters

In the last thirty years, over 1 billion US dollars have been spent by donors on range management and range-related livestock production and health care in Africa. These funds have been largely wasted. Livestock products are the worst performing economic sector in Africa and, according to the World Bank (1990), the worst agricultural sector in the world with a -2% economic return. Africa has become an importer rather than an exporter of beef. Between 1985 and 1987, all the nations of concern in this conference required dried milk donations ranging from 4,107 metric tons in Angola to 20,775 metric tons in Ethiopia.

3.1 Vulnerability

Livestock production in arid and semi-arid areas is always risky. Somalia, Ethiopia, Sudan, and certain parts of coastal Angola and Mozambique are arid lands subject to rainfall shortages and/or too much or too little flooding of riverine pastures. But, rain shortfalls or floods do not necessarily lead to livestock losses nor food shortages. Single year droughts have little impact on most livestock holders. In the sudd of Sudan, the local flooding results from rains far upstream and water shortages (vs. forage shortages) have been ingeniously dealt with by shallow wells, hafirs, water-yards, and boreholes. Nevertheless, two or more years of soil moisture shortages can become a precondition for livestock losses and food shortages, especially drops milk production. In the Sahelian region, there were sixteen years of subnormal soil moisture that caused livestock losses from 40% to 90% of Sahelian herds (LeHouerou 1989). In Sudan, with 90% losses, the mass migrations began (Walker 1988).

Natural disasters repeatedly occur. The most devastating have been range pests and livestock epidemics. Both locust plagues and rinderpest and bovine pleuropneumonia have been controlled to a remarkable extent. There are still occasional outbreaks of other diseases and chronic depression of production from parasites. But, livestock holders are now educated about vaccination programs and try to retain enough extra stock to exchange for vaccines and other drugs. One of the compounding effects of food and income shortages is the forced abandonment of health care as livestock sales must focus on obtaining grain.

Where locust monitoring is difficult, locusts may breed unnoticed. This occurred in the civil war area of northern Ethiopia. The locusts made it through 'hopper' stage before they were noticed and eradication with pesticides was tardy and dangerous. Much of the local rangeland was ruined (Ashall 1987).

Civil wars in Sudan, Ethiopia, Mozambique, armed conflict within Angola and between Ethiopia and Somalia as well as pastoralists fleeing from Chad into Sudan and back-and-forth between Ethiopia and Sudan have greatly complicated the ability of herders to raise livestock. The wars have stopped or diverted funds from livestock and rangeland projects in Ethiopia, Sudan, and Somalia. They have disrupted markets, trade routes, and pastoral trekking. Livestock have been murdered outrightly in scorch-the-earth pillaging in southern Sudan. Herders and agropastoralists have been forced into refugee camps and have had to abandon their livelihoods in the process.

Vulnerability has increased due to an amazing assortment of change in land use practices and socio-political and economic decisions. These include:

-- pressures from increasing population pressure such as the loss of the best pasture lands (the drought sanctuaries) to agriculture; the shortened fallow periods of stubble fields with reduced nutritional grasses; the loss of drought fallback protein, especially hunted game; and the slow deterioration of grazing lands from overstocking and over-burning.

-- the rapidly changing and ill-defined socio-politics, economics, and authority structure in much of Africa such as the confusing land and water tenure rules that have resulted from the nationalization of natural resources (e.g., the Dinka/Reizaqat controversy of 1974); the partial centralization, subsidizing, and commercialization of the cattle industry for export with further marginalization of the poorer livestock herdsmen; the inability to control inflation in grain prices (the debt crisis); the inability to establish alternative forms of financial investment for the African middle-class; the skewed price controls on grains and livestock products that favor urban dwellers vs rural producers; skin and hide monopolies that work against livestock sellers; and the continual disruption of pastoralism by wars.

-- single, isolated donor interventions without understanding their social and economic consequences such as the introduction of high cellulose green revolution grasses as stubble forages; the spectacular increase in livestock from vaccination programs with no controls on the resulting herd build-ups; and poorly designed aid projects such as stratified marketing without proper training and institution building.

In fact, it is remarkable that nomads and pastoralists hold on and that the supply of traction animals and small livestock among agropastoralists has not been worse.

3.2 Coping Strategies

Livestock holder coping strategies are similar to other sectors. The ultimate goal is to ensure enough grain when animal protein fails and maintain breeding stock. As times worsen, they reallocate milk (to human children and pregnant mothers); liquidate less important assets (investment livestock and mature sterile males vs. breeding stock); increase grain purchases; call in debts (including breeding livestock and traction animals on-loan) and go into debt (especially from other kin); lend livestock and kin to other herders to keep them alive; break up the herds and family into more viable economic units (sending smaller herds to more distant pastures); fragment the family by sending young men off to find other sources of income or work; diversify diet (including increased hunting, fishing and gathering); reduce the number of meals; migrate to urban areas or refugee camps; and migrate with herds to areas in which access and use are not assured but where they may have better water and pasture or safer conditions. As the situation worsens, they may resort to contraband, thievery and tricks. They sell younger and younger male livestock, then young females and eventually reproductive stock. In colonial times, livestock raiding was common.

The onset and distribution of these coping strategies varies enormously and their sequence may be extremely local. Like all famine victims, the market becomes increasingly the only source of nourishment. Unless the government or donors intervene, the prices are beyond the victim's control. For instance, in the Korem market, in October 1982, the sale of one oxen provide enough cash to buy 4.3 quintals of sorghum. By May 1985, the same oxen could purchase only 0.9 of a quintal (Baulch 1987). The problem of pricing is compounded because disaster stresses also reduce the quality of livestock and lower quality brings lower prices. In Sudan, after 90% herd destruction, pastoralists generated most of their income from wage labor and food aid (Walker 1988).

4. Key Issues

For the purposes of this paper, famine can be considered a socio-economic process which causes the accelerated destitution of the most vulnerable, marginal, and least powerful groups in a community, to a point they can no longer, as a group, maintain their livelihood and may, ultimately, cause individuals to be unable to obtain enough food to sustain life (Walker 1988b). The issues involved with livestock are extremely complex because of the diversity and the site-specific nature of the social organization of pastoralism and agropastoralism. As stated, ecological management of the rangeland is a long term issue that cannot be handled in short-term projects and interventions. Here, we pose a few of the salient pastoralist issues that confront aid organizations, donors, multilateral banks, and PVOs.

4.1 Issue: When to Destock or to Supplement Feed?

Does destocking increase wealth disparities? In southern Ethiopia, famine caused a polarization of wealth within communities. Prior to the famine, most families owned one or two oxen. After the famine, a large proportion of the households had no oxen and a growing minority had four. (Oxen are the only form of animal traction in the area. Without oxen, the farmer must trade his own labor for the use of oxen.) As traditional famine survival strategies include transferring assets from the poor to the rich, how do relief agencies restock without increasing social disparities and tensions? In addition, who should receive supplemental feed if the goal is to save stock (Lirenso 1988)?

Will maintaining livestock through the crisis period encourage too early a return to rangeland grazing and browsing? Some rangelands in the Sahel may take three to eight years to recover after severe drought. The maintenance of stock through the crisis period of drought may not give these rangelands enough time to recover. Restocking quickly may irreversibly damage the species composition as occurred in the American west in the late 1880's. This mistake should be avoided in Africa, if possible. It is counter-productive to restock quickly and increase the longer-term vulnerability of the herdsmen to drought. Until stocking rates can be controlled, increasing the number of livestock has negative feedbacks on rangeland- overgrazing and overbrowsing--which ultimately increase the vulnerability of the population to more frequent failures of production or low quality production.

Who has the authority to set stocking rates and enforce them? As stated setting and enforcing stocking rates and seasonal patterns of grazing is a never ending controversy. In Mali, traditional rules, Songhai and Fulani Kingdom rules, French colonial rules, and post-independence rules have led to a great confusion of proper authority and methods of enforcement. Until these questions are resolved, any interventions that increase the intensity of use of rangelands may backfire and increase famine vulnerability. This issue is part of the larger issue of secure access and use rights to water and rangeland.

Can stocking rates be managed by stratification of the market? How can prophylaxis culling and early destocking be encouraged? This is a long-term issue that addresses the question of offtake and carrying capacity. For instance, excess calves have a special market in St. Louis, Senegal, for wealthier buyers and elders. Right now, the markets work against

increasing vulnerability to famine. Livestock prices fall as famine proceeds and herdsmen hesitate to sell during times when markets prices are low. However, holding onto stock increases range damage and spreads disease risk.

If destocking is important, what kind of infrastructure (roads, trucks, chilled meat refrigeration) and pricing and subsidy policies must be started? If destocking is important, then what kind of financial institutions and credit systems must be brought into the rural areas (see 4.3)?

What is the role of food supplements in the times of crises? Are grazing reserves and crop residue reserves realistic? Who benefits? Is forage storage/silage realistic? Where will nitrogen-supplements come from? Should donors create an industry for feeds? As noted below, agropastoralism may be able to benefit from industrial by-products, crop residue improvements, nitrogen supplements, and forage storage. The logistics increase in difficulty with pastoralists and nomads. Grazing reserves are politically difficult and access and use questions can become complex.

4.2 Issue: Secure Access and Use of Pastures and Water

Will settling land tenure conflicts promote the greatest amount of access and use security and encourage sustainable rangeland production?

What pricing policies increase range degradation, further marginalize the poor, and increase vulnerability to famine? A controversial case is Botswana where EEC-subsidized prices and meat standards tend to push for over-stocking and elimination of the small, subsistence livestock holder. World Bank-subsidized abattoirs support large-scale cattle/trader operations and transform smallholders into hired cowhands. These hired herders are more vulnerable to food shortages than livestock owners. Lack of local banking has increased urban investment in cattle. Livestock ownership has transferred to urban civil servants with hired hands who may have little interest in long-term sustainable rangelands. The favored market structure for export beef has increased pressure by the Tswana on the remaining Bushmen as use of their lands and water becomes an increasingly secure and profitable investment. Botswana provides a clear example of top-down decision making, measurement of success by export profits vs. the bottom-up approach which emphasizes economic security of a larger segment of the population, especially kin-based smallholders.

This example raises the major questions in the livestock sector. At what level do we want to intervene? In what time frame to we want to benefit productivity? In what time frame are the level or risks reduced and for whom is the level of risk reduced by any intervention?

Can better forms of disaster credit be developed for agropastoralists and pastoralists? Grain shortages are the major cause of malnourishment due to high prices, low exchange rates for livestock, and lack of income, the establishment of credit to purchase grains during disaster periods might mitigate famine. These credits would be based on the recovery of the smallholders stock after the disaster with a low interest rate subsidized by banks or governments.

4.3 Issue: Restocking After Disasters

What is the best package for returned refugees? The rate of restocking needs much more thought both as to species, sexes, ages and how to schedule the restocking. In Ethiopia, a token package of a cow and a few small ruminants encouraged refugees to return to camps with a changed name or enter other camps as a technique to build up stock more quickly.

4.4 Issue: Single Interventions

Will single interventions always backfire? When is veterinarian intervention beneficial and when does it cause long-term harm? All pilot projects must be "packaged" so that one intervention does not negatively affect another. Immunization must be coupled with destocking and seasonal grazing; institution building with widespread communication; market access with land tenure; stocking rate controls with the development of a financially guaranteed monetary, savings and interest plan. Good long-term models are in progress in Senegal by the GTZ and in Mali by IUCN.

How will projects in the livestock sector influence or be influenced by other interventions? How do fuelwood production and nurseries work with rangeland production?

5. Mitigation Measures

At this point, most interventions to help reduce the vulnerability of the marginalized, poorer herdsmen and smallholders cannot be done in short-term projects. Ultimately, policy dialogue with the government and changes in both land and water tenure as well as marketing structure will be required. Improvement of rangeland is unlikely until land tenure and institutional arrangements (graziers associations, service co-ops, enforcement) have been established. Pilot projects, including the formation of grazier or pastoralist associations as well as service co-ops will be necessary, if the most vulnerable are to be reached. Until then, agropastoralists and special pastoralist centers of activity (homeland base-camps) will receive most attention.

5.1 Early Warning Systems

"Distress sales" have been used as an indicator of famine. The relation of distress sales to famine has been mixed. Sometimes distress sales occurred more frequently as grain prices soared. Sometimes there were unpredictable lags between grain prices, distress sales, and malnourishment (Walker 1988). Some who have worked in relief claim that asset prices for livestock are better indicators of impending famine than the comparison of grain and distress sale prices.

LeHouerou (1989) has summarized the relation of remote sensing, primary and secondary production, and cattle densities for northern Senegal. This is the best example of combined ground-truthing and remote sensing for an arid, livestock region.

5.2 Radio Communications

Information on market prices, locations, pasture quality, water availability, and prospects would greatly help pastoralists and nomads. Setting up a communications dish and solar-run radios would increase market efficiency and help herdsmen avoid long, fruitless treks. This has been suggested for the Lake Chad region (Warshall 1990).

5.3 Shrub and Tree Nurseries

The creation of native plant nurseries for leguminous and other forage trees may help famine mitigation. The effectiveness will be greater with secure tree tenure. Homebased, short-term pastoralists and agropastoralists should be targeted. There is a trade-off in areas of little available land between cropping areas and forage planting. There is some indication that after 10% of the land has been used for forage trees many reject further use of cultivated land for this purpose. Combinations of windbreaks and property line markets with forage plantings may be possible to increase the number of trees or shrubs. This is a potentially beneficial area but requires increased funding.

5.4 Alternative Animal Protein Sources

At the moment, alternative animal protein sources are not integrated into famine mitigation. In nations such as Mozambique and Angola, marine fisheries could help offset losses from livestock products. Marine fisheries tend to be independent of droughts. Wildlife, especially game, is a critically important drought fallback food in many countries (Vincke n.d.). Up to half a young boy's animal protein may come from slingshot hunting of small game (lizards, birds, rats). Maintaining small game and drought fallback game would allow more reliable diversification of diet during disasters. Perhaps there has been too much concentrated effort on middle-sized and large livestock. Maintaining poultry, fish ponds, and other small livestock may be a more efficient method of providing animal protein during disaster periods.

5.5 High-Protein By-Product Crops

Encouraging multi-purpose crops (noug, groundnuts, soybeans, irrigated cotton seed) and the increased efficiency of use of these products for livestock may help reduce livestock vulnerability to short-term disasters. They are important as a source of supplemental nitrogen with the use of low value forage and fodder. They could be successfully combined with Forage Banks (see 5.6).

5.6 Forage Storage Banks

Little explored in sub-Saharan Africa, forage storage banks have been a useful method of evening out forage supply in north Africa. More details are needed. A combination of credit or exchanges for early offtake with credit for stored forage have not been well explored. Technical work on storage and various crops also is needed.

5.7 Increased Efficiency and Coordination of Industrial Byproducts

The waste products of certain industries (bonemeal, fishmeal, distilleries, molasses, poultry waste) should be explored for recycling as feed supplements (McDowell 1990).

5.8 New Feed Supplements

Burning *Opuntia* cactii as a drought food is done in Mexico and may be appropriate in Africa. Other exotics that have been brought to Africa could be better integrated into famine mitigation programs.

5.9 Offtake Incentives

By bartering vaccinations and medicines to improve milk production and to maintain prize breeding stock for less desirable age and sex classes, early offtake may be encouraged. This would serve the double purpose of improving animal quality in difficult times and relieving pressure on rangeland resources.

5.10 Stubble Quality Improvement

In years with adequate rainfall, intercropping or undersowing specialty plants can increase the nutrients available to livestock that enter the fields after harvest. Much work needs to be done in this area because intercropping may reduce grain production when rainfall is inadequate or poorly distributed. In irrigated areas, intercropping with improved varieties could improve stubble quality.

5.11 Milk/Beef Breeds

Interventions in breeding have been dominated by industrialized countries that prefer specialty animals. But Africa has a mixed beef/milk system and some breeding efforts might try to meet these needs rather than alter the existing structure of livestock raising. Similarly, the use of cow/traction breeding is little explored.

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Water Resource Interventions and Famine Mitigation

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1. Introduction

Simple, low-cost techniques of water management can be used to stabilize and rehabilitate areas suffering from drought. Drought is a relative term without regard to rainfall zone. It indicates lower than normal rainfall whose effect is injurious. Although droughts in arid zones are generally more common, drought can also severely affect people living in the more humid zones.

Recurrent drought and/or civil strife results in a breakdown of normal support structures and reduces options available for coping with drought. Affected people need activities that can be completed rapidly and require low or no investment of capital. For the relief agencies, the extent and urgency of drought- and famine-related problems often require that relief agencies use simple and broadly applicable interventions.

The goal of water resource improvements in famine mitigation is to assure minimal quantity and quality of water for human needs (approximately 10 liters per person per day for drinking and cooking and an additional 15 liters per person per day for washing and bathing) and for livestock, and to introduce water conservation techniques for agriculture.

Wells provide the best assurance that sufficient water will be available for people and animals. In cases where aquifers and established wells cannot provide sufficient quantity or quality of water, surface water sources may need to be improved or developed to reduce the demand on wells. However, if severe droughts are prolonged over several years, deep wells that tap geologic water may be the only alternative for providing people with sufficient water.

Once domestic water is assured, mitigation activities can concentrate on introducing drought resistant agricultural technologies, water conservation, irrigated gardens, wells, and water-harvesting ponds for livestock.

These water resource interventions can directly increase the value, or perceived value, of the land and may create jealousy and conflict among people in treated areas. Land tenure and equity issues are likely to present themselves at each intervention site; this is one of many reasons that the affected people should be consulted before activities are started. Water resource technicians need to work with social scientists and land tenure specialists to develop methods of introducing interventions that are minimally disruptive.

2. Domestic and Livestock Water

In developing countries, people and livestock usually compete for the same water sources. This communal use of water can complicate supply and sanitation problems and be a source of conflict among users, especially when drought increases the demand for well water and often reduces a well's output. Activities that can mitigate water supply problems are (1) improvement of surface water sites, (2) deepening of established wells, (3) digging of new wells, and (4) construction of water conservation structures around wells which can help recharge the aquifer. Lack of regional and local information on subsurface hydrology is one of the major problems in identifying regions for mitigation activities and for planning site interventions. Interviews with people from the affected areas can provide general information such as number and quality of wells and the output and strength of aquifers. This information can be used to plan regional as well as local activities.

2.1 Wells

In many cases, village wells are dug into shallow-perched aquifers that are very dependent on annual rainfall. The earth and rock in which they are dug dictates the method of well construction or well deepening used. Many well-digging techniques are available with their own particular advantages and constraints. These techniques and the organizations with experience in using them may provide better alternatives to methods currently practiced in the affected countries. For example, Church World Service has developed, through modifications by their well diggers, a relatively inexpensive method of digging new wells in sandy material, and Peace Corps/Mali uses a well capturing method that is effective in deepening wells in sandy materials. Digging wells deeper or digging more wells is not always an option. Shallow aquifers can dry-up completely or become saline. In these cases other mitigation activities are needed. Deep wells that tap geologic ground water are an expensive option when less expensive alternatives are not possible.

2.2 Water Harvesting and Surface Water Improvement

Collection of rainfall runoff provides easily accessible water that reduces work loads and reduces the demand on well water. The latter is especially important for areas with weak aquifers. Constructing earth dams and pit ponds are common methods of harvesting rainfall runoff. However the soil must be sufficiently clayey to minimize losses to infiltration. Proper site selection is essential to their success and can greatly affect the amount of labor needed to construct them. Collection systems from roof runoff are also possibilities.

2.3 Improving Recharge of Ground Water

Water conservation structures directly improve the recharge of aquifers, mostly from drainage ways. Many examples exist where construction of water retention dams along drains has dramatically increased the level of ground water. Water conservation activities can greatly improve the recharge of weak aquifers. These aquifers are identified by large annual fluctuations of water levels in the wells.

2.4 Sanitation

Water quality also is an important factor although less important than quantity. Wells, dams, and ponds should be designed and constructed so that risk of contamination is minimized. Disposal sites of waste water and location of latrines should be at least 20 meters away from a water source.

3. Water Conservation for Crops

Water conservation for crops includes a wide spectrum of activities, from wind breaks to water harvesting. Owing to the need for simple techniques that provide immediate benefits, the activities discussed will concern those that concentrate runoff water. Water conservation has been a neglected subject of research in Africa. There are numerous examples of successful experiences but few that quantify the effects so that optimal structures and cropping systems can be designed. Therefore experience and concepts will weigh heavily in the design and implementation of activities.

Site selection for a particular activity is very important. It determines cost of construction, cost of maintenance, and the amount of benefit received. Within the design requirements of a particular structure, those structures that are constructed on the most productive soils will usually provide the best return on investment. Farmers, both men and women, know very well the productivity of the different soils, and they should help decide the location of different interventions.

Owing to high infiltration rates, very little can be done in the short term on sandy soils in terms of water conservation. Therefore mitigation activities should be limited to less sandy soils that have noticeable runoff and to those soils that flood, preferably high-productivity soils. An exception to this is when runoff from low-value land threatens to erode and degrade high-value land.

3.1 Check Dams

Check dams are gully control structures that dissipate the erosive energy of flowing water by forcing it to fall on the downstream side of the structure. They should be constructed in a series so that the downstream one backs water to the base of the upstream one and protects it from being undermined and collapsing. Two basic types of check dams are commonly used: small ones that are constructed with loose rock and large ones that use gabion to contain the rocks. Loose-rock check dams are used in small drains and protect the land, usually agricultural fields, from being incised by small gullies. Gabion check dams are constructed in medium to large drains that have incised themselves, causing lateral gullies to form quickly. These gullies usually threaten the best agricultural land. Check dams raise the base level of the drain to near normal levels, which reduces or stops lateral gully formation. It also plugs the incised channel causing flood water to spread over the flood plain more frequently and for longer periods of time. Farmers are aware of the negative effects of gullies and can help relief workers identify priority activity areas.

Check dams require rocks or other dense objects that can absorb the impact of flowing water without being washed away. A protocol of design options needs to be developed in terms of material availability, expense and labor needs.

3.2 Water Retention Dams

Water retention dams and dikes, like the earth dams described above, can be used for domestic water but their design and site selection are for increasing agricultural production. They can help control water levels in rice fields, provide water for small scale irrigation, and/or increase the area of land flooded which provides supplemental water to crops. Like large check dams, they can be located along drains or at the water-exit of basins. Site requirements, intended use, and potential benefits all factor into the design and cost of these types of dams. The dams sometimes have a large effect on local aquifers so their proximity to wells is another factor in site selection.

3.3 Contour Cultivation

Contour cultivation and structures such as tied ridges reduce rainfall runoff by holding the water on the surface and allowing it to infiltrate into the soil. The resulting conservation of water reduces a crop's risk to drought. Land that was once cultivated during higher rainfall years may once again be brought into production by using contour cultivation. This intervention is appropriate on gently to moderately sloping soils that have noticeable runoff during storms. Farmers generally lack the skills and tools needed to identify the land's topographic contours. Unless the contour is followed, the beneficial effects of contour cultivation are lost and severe gully erosion may result. Also, contour construction is labor intensive, which discourages farmers from digging them.

3.4 Water-Harvesting

Throughout the Sahel and elsewhere, land degradation and soil erosion have resulted in the loss of large areas of arable land. One of the main processes of this degradation can be exploited to create a highly drought-resistant cropping system, that which uses water harvesting.

The subsurface of soil is generally more clayey and has less organic matter than the surface. These two factors make it more prone to crust formation when it is exposed through erosion. The resulting crusts can reduce water infiltration by 20 times. In areas with marginally sufficient rainfall to produce crops, the loss of the soil's surface and the resulting slower infiltration rates cause many potentially productive soils to be abandoned. Farmers have names for these soils and some know that crops can be grown on them during high rainfall years if they plow and fertilize them with manure. Many of these abandoned areas are excellent sites for water-harvesting agriculture, especially for the land-poor farmers.

Zais, crescents or Vs, and contour catchments are three simple techniques of water harvesting that could prove useful as famine mitigation activities.

3.4.1 Zais

Zais are small (20-30 cm diameter) shallow holes dug in the crusty soil for each pocket of millet or sorghum grown. The earth that is removed is piled in the form of a small dike which intercepts rainfall runoff and directs it into the hole. Farmers often place manure in the holes during the dry season. Besides providing fertilizer, this encourages termites to make a network of tunnels at the holes, which increases water infiltration.

3.4.2 Crescents and V's

Micro-catchments in the shape of crescents or Vs are larger scale versions of zais. They typically have radii of around 2 m. Within each micro-catchment, spacing of sorghum and millet should be four to seven pockets per square meter. Yield of 0.3 to 0.5 kg/m2 can be achieved with fertilization during low rainfall years. The initial construction of these structures is labor intensive, which discourages their construction, especially on the hard crusty soils. However once they are made, maintenance is relatively easy.

3.4.3 Contour catchments

Contour catchments are like the crescent and V micro-catchments except that they are stretched along the contour in order to increase the efficiency of construction. By stretching them along the contour, construction costs, on an area-affected basis, can be cut in half. However, these structures need a higher level of skill to build and are less tolerant to improper construction and poor maintenance than the other types.

3.5 Simple Tools

Water resources interventions for famine mitigation need to be as simple as possible and should emphasize use of locally available materials. For example, the water level, a tool that is accessible to farmers under non-crisis situations, may not be the appropriate tool on which to base famine mitigation activities. On the other hand, the A-frame level, which can be made from locally available materials, three sticks, string, and a rock, may be ideal even though it can not be used in windy weather and is slightly less accurate than the water level.

Also, the dividing lines between acceptable and unacceptable risks have changed. Risk of a structure failing is likely to become less important while that of a crop failing becomes more important. Technicians should reevaluate levels of risk from all perspectives when designing water conservation structures. For example, is it more important to build two dams that can survive hundred-year floods, or to build three dams, at the same cost, that can only survive fifty-year floods?

3.6 Adaptive Strategies of Farmers

There exists a wealth of farmer-based initiatives that can be used in famine mitigation activities. For example, farmers in Mauritania build water-retention dikes by constructing brush fences across drains. During the dry season the fence acts as a windbreak and collects windblown sand at its base, forming a dike 50 to 80 cm high. The area behind the dike and the fence becomes prime agriculture land even during drought years.

A catalog of simple, farmer-proven techniques and adaptive strategies is needed. Catalogs of water conservation interventions exist but they are orientated to project activities and are not targeted toward what an individual farmer can do.

4. Small Irrigated Gardens

Small irrigated gardens become very important for famine mitigation when people have sufficient point sources of water. There are many simple, inexpensive techniques that can be used to increase water-conveyance and water-distribution efficiencies for irrigated gardens.

5. Livestock Wells and Ponds

Well and pond construction can be a useful intervention for increasing water availability to livestock and wildlife. However, indiscriminate construction of water sources can lead to degradation of rangeland if they allow the establishment of unsustainable concentrations of livestock. This intervention should be coordinated with range and wildlife specialists.

6. Summary

There exist many water resource interventions that are simple and inexpensive to build. Table 1 outlines their attributes. They address a spectrum of possible situations and all but one provide immediate benefits to the people affected.

Some of the issues that need to be addressed during this meeting are:

-- how to coordinate these interventions with other mitigation activities, such as food or cash-for-work;

-- how best to involve the local people in site selection of activities;

-- how to address land tenure and equity issues, especially for those interventions that benefit individuals;

-- what are the best ways of extending these technologies to the people and what are the skill levels needed among extension agents and technicians; and

-- what are the criteria for selecting intervention areas and how should activities be prioritized?

TABLE 1: Attributes of Water Resource Interventions

INTERVENTION	SKILLED LABOR	LABOR DEMAND	MATERIAL COST	MAINTEN-ANCE	DIFFICULTY OF SITE SELECTION	BENEFIC-IARIES	EFFECT
Wells	H	H	H	L	M	Multiple	Immediate
Dams and Ponds	H	H/L	L/H	L	H	Multiple	Immediate
Small Check Dams	M	H	L	L	L	Multiple	Long term
Large Check Dams	M	H/L	M/H	L	M	Multiple	Immediate
Water Retention Dams	H	H/L	L/H	L	M	Multiple	Immediate
Contour Cultivation	M	M/H	L	H	L	Individual	Immediate
Zais	L	L	L	H	L	Individual	Immediate
Micro-Catchments	L	M	L	H	L	Individual	Immediate
Contour Catchments	M	M	L	H	L	Individual	Immediate

H-High, M-Medium, L-Low

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Cash-for-Work/Food-for-Work Programs for Improving Household Food Security During Food Deficits

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1. Overview

Cash-for-work/food-for-work (CFW/FFW) programs can be implemented in food-emergency situations in such a way as to address food security, employment, and infrastructural needs simultaneously. The effects of public works on household food security are in many ways a function of the program design. This paper will focus on how food security issues can be integrated into public works programs so that alternative sources of food and cash may be offered to poor households, leading to sustainable asset creation rather than the liquidation of productive assets or the pursuit of unsustainable coping strategies.

During drought years, relief efforts can be instituted that target resource improvement and promote better resource management. Rather than an outright distribution of relief aid, cash-for-work or food-for-work programs can be implemented to promote efforts in soil conservation, water harvesting, reestablishment of forest reserves, and other development projects aimed at restoring degraded resources and improving agricultural productive potential. These types of programs not only provide relief in crisis years, but they do so in ways that are less likely to create farmer-dependence on food aid, enabling farm families to return to agricultural production. Work programs in bad years can help to improve the resource base of a local area, reducing the vulnerability of local communities to future droughts.

Channeling food aid through CFW/FFW programs can create physical assets at the community level, improve local infrastructure, and increase local productive capacity. These programs help rural people to forestall employing desperation measures to meet immediate subsistence needs. Work programs have been found to be effective at reaching the most needy in an area, allowing people to remain longer in their homes and communities rather than migrating to relief camps for aid (Bryson et al. 1991). By raising the income level of the most at-risk farmers, CFW/FFW programs enable farmers to refrain from liquidation of productive assets, preserving future productive potential.

The decision whether to employ a cash-for-work or a food-for-work program depends on a number of considerations, particularly on the state of the local market infrastructure. It is therefore impossible to discuss one type of works program without mentioning the other, or to recommend CFW universally without considering cases where FFW would be more

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appropriate. However, both types of programs can serve important long-term development goals. By improving local asset and resource bases, public works programs demonstrate to marginal farmers that they can participate in and benefit from the development process. When designed to target the poorest of the poor, CFW/FFW can reach the most needy, raising income levels and changing income distribution patterns within a community to more equitable levels. CFW/FFW thus uses food aid to create systems that eliminate the need for future aid (von Braun et al. 1991).

Programs can identify work projects that improve local food security by building community infrastructure, restoring depleted resources, and improving agricultural productive capacity. These projects might include land- or agricultural-improvement efforts, such as agroforestry, afforestation, terracing, land reclamation, irrigation, drainage, watershed conservation and water-resource activities, and garden promotion; infrastructural development, such as road building and maintenance, and storm-drain construction; and public services, like construction of rural health facilities, schools, or public buildings.

2. Key Issues

2.1 Employment Provision vs. Asset Creation

In determining program objectives, planners must consider the inherent trade-off between the dual output benefits of public works programs: short-term employment provision versus long-term asset creation. The former is more often the result of employing CFW/FFW schemes to mitigate crises, wherein programs may become mere "make-work" projects without real development goals (von Braun et al. 1991). Though public works programs can have important roles in crisis mitigation, it is important to recognize that the effectiveness of these programs lies in their ability to restore resources and improve infrastructure while providing aid to the needy. Public works are perhaps best regarded as providing a transition from immediate food insecurity to more sustainable development over time.

2.1.1 Institutionalization

One way of facilitating the transition from short-term aid to long-term development is to institutionalize the public works program within the broader structure of the national government's development framework. Rather than creating parallel, donor-driven projects, institutionalizing programs within government operations is essential to ensure that these programs persist beyond their immediate role in crisis mitigation (Webb and von Braun 1991).

2.2 The Rural Safety Net

In regions affected by famine or chronic seasonal food shortages, CFW/FFW programs can promote short-run food security and income enhancement for the rural poor. By maintaining farm income levels in times of crisis, CFW/FFW can assist households to retain control of their productive assets, enabling them to persist as viable productive units after the crisis has passed.

2.2.1 Self-targeting

CFW/FFW programs can also serve to direct food aid to the most needy. Self-targeting of program participants can be achieved by setting wage levels at submarket rates, ensuring that in the good agricultural years only the poorest will participate, or by offering payment in foods that only the poor will consume, such as red sorghum. In this way, CFW/FFW will be less likely to offer disincentives to farm production. In the bad years, program participation will expand as crops fail. Expanding numbers of people seeking employment can serve as an indicator of worsening agricultural conditions.

2.3 Disaster Preparedness

As worsening conditions tend toward famine, the issue becomes one of how to adapt the normal-year development activities of existing CFW/FFW programs to the expanding needs of the local population. The effective public works program is one that can respond quickly to meet the increasing demand for employment in a crisis area. In areas where no ongoing CFW/FFW programs exist, mitigation plans should be designed to facilitate rapid intervention in crisis situations.

2.3.1 Project expansion

One means of project expansion is to have a "shelf of projects" on hand to put into operation rapidly when a crisis hits. Without advanced planning for expanded work, emergency situations may rush project implementation resulting in poorly organized, undersupported, "hole-digging" activities. Establishing a set of low-cost, easy-to-implement projects, to remain on-shelf during noncrisis years, can enable rapid expansion in an emergency, when on the spot planning otherwise might be difficult.

2.3.2 Intervention planning

Areas identified by risk mapping, early warning, and disaster-history analysis as being at risk to famine can be targeted for rapid implementation of CFW/FFW projects in crisis situations. Such planning entails identification of potential development opportunities; assessment of existing food-transport and distribution capabilities, and local management and administrative apparatus (including accounting, supervision, and technical support); and establishment of locally managed food reserves for payment or monetization in support of works projects.

2.3.3 The role of NGOs

Nongovernmental organizations (NGOs) have been important in past efforts to rapidly institute public works projects in crisis situations. By maintaining a presence in at-risk communities in noncrisis years and preparing the groundwork for project implementation, NGOs can both administer CFW/FFW programs in some areas and maintain vigilance in others. NGOs can be instrumental in establishing local food stocks, training local people in the management and distribution of these stocks, and setting up a national network of personnel trained to respond to impending disasters. In Ethiopia, for example, CARE has been involved in training people from local communities in extension activities related to soil

conservation. These efforts can enable CFW/FFW projects to operate in local development in good years, and to be converted rapidly to emergency mitigation when crisis hits. NGOs also have considerable experience in promoting natural resource management improvements. This experience can provide input into programs aimed at soil conservation, water harvesting, and reforestation.

2.3.4 Technical and supervisory staff

The capacity of governments and NGOs to implement and expand programs is an important consideration. If public works projects are expanding in bad years and contracting in better ones, more engineers, supervisors, and support staff are going to be needed during periods of expansion. Sources of trained personnel need to be identified, so that these people may be brought in quickly when their skills are needed. In addition, planners should determine what role these people will play once the crisis has eased and their services are no longer required. One possible solution to this problem is to improve the technical and managerial capacity of the local population, to meet project supervisory needs locally (as discussed in section 2.6.1, below).

2.4 Project Selection

As pointed out above, one great benefit of CFW/FFW programs is their ability to provide subsistence for the poor and unemployed while also improving the resource and asset base of a community or region. Project selection is therefore a complex process of identifying work that serves the dual objectives of assisting the poor and providing real development in local communities.

2.4.1 Community priorities

In order to ensure that projects will serve the development needs of local communities, the communities themselves must be involved in the identification of development goals and the selection of interventions to be implemented through public works projects. The rapid appraisal of a target area can perform the initial collection of local input on development priorities. The effort also will involve including local representatives in the planning process. Such collaboration may present difficulties, particularly if local development goals conflict with regional or national priorities. Problems may also arise in communities where political, historical, or ecological crises have fragmented the community and caused a breakdown in traditional leadership. In such cases, achieving a community consensus on development priorities may present a formidable obstacle to program organizers. Nevertheless, community involvement in the decision-making process is essential if planners hope to instill in the local people a commitment to the project's success.

2.4.2 Improving the safety net

As mentioned above, the types of labor-intensive projects selected should be those that improve local food security and production potential. Local needs will determine the type of project chosen. In Sahelian countries, resource conservation and afforestation efforts may be

the most needed interventions, whereas in Mozambique and Angola, other infrastructural projects like roads or village waterworks may be more appropriate (von Braun et al. 1991).

2.5 Disincentives

Concern exists over the possible disincentive effects of CFW/FFW programs. These include suggestions that CFW/FFW can create a "welfare mentality" among project participants, who become dependent on food aid with a consequent disinclination to return to agricultural production. It has also been cautioned that CFW/FFW can breed taste changes through the introduction of foreign foods, with the result that demand for local staples declines as people become more reliant on imports. At the macro level, public sector sales of food aid may depress prices in local markets, further discouraging local agriculture (Maxwell et al. 1990). Because little empirical data has been collected on this issue, this discussion remains hypothetical. However, as the following sections describe, careful management of food disbursement, coupled with public sector support for agricultural production, can help to avoid the possible disincentives that CFW/FFW might produce.

2.6 Community Involvement

It is important to stress that community involvement in public works projects is essential to the success of those projects. Involvement demands more than token participation in decision-making: it requires that the entire project be oriented towards meeting local needs and realizing local goals. Success requires that the community feel an investment in the project, and a commitment to seeing its goals achieved.

2.6.1 Local management

One goal of program planners should be to enable local management of the works project. Some NGOs are already working to train local people in the operation and management of ongoing projects. However, in projects supported by PL 480 funds, legal mandates require the application of certain administrative and accounting procedures that are not conducive to the establishment of community-managed projects (Bryson et al. 1991). Where donor regulations hinder project success by requiring continued external supervision and management, these regulations should be reconsidered as being destructive to the very development goals which they hope to achieve.

3. Considerations and Constraints

3.1 Cash-for-Work vs. Food-for-Work

It is often assumed by planners that payment in cash is preferred by participants to payment in kind. However, the decision to conduct a FFW or CFW program in a given area must be made on a project-to-project basis, as many factors influence the demand for cash or food (Coates 1987). In general, the type of wage offered should be appropriate to the prevailing market conditions (von Braun et al. 1991).

3.1.1 Cash-for-work

In regions where people have relatively easy access to marketed food at stable prices, cash wages may be preferred. Payment in cash enables people to purchase foods that meet their taste preferences, leaving extra cash for nonfood purchases (e.g. medicine) without forcing them to sell some of their food to raise cash. At the macro level, the introduction of large quantities of food into a local market may depress local food prices, creating a disincentive to local agricultural production. In such cases, payment in cash is a better option.

3.1.2 Food-for-work

Where in-country restrictions prevent travel and market integration, or where access to food is constrained by poor infrastructure and fluctuating prices, people often prefer payment in food to payment in cash. In general, payment in food may be preferable in areas where food prices are unstable and rise in bad years, and where markets are isolated and prices high. Payment in food may increase individual flexibility, as many people choose to sell part of their food payment on the market to acquire cash for other purchases. Food payments are also more likely to find their way into the household, whereas cash may be spent on other nonfood items, translating to a lower overall nutritional benefit. At the macro level, large injections of cash into an area may raise food prices in the local market. One survey in Ethiopia found that project participants overwhelmingly favored payment in food; these people are familiar with the local markets, and know that they would be able to purchase less food on a cash wage (Bryson et al. 1991). Another study in Ethiopia (Webb and von Braun 1991) found that one site favored payment in food while another preferred payment in cash, due to the marketing and food-access considerations discussed above.

3.2 Monetization

Monetization allows planners to convert portions of food aid to cash, providing resources for the additional needs of public works projects. The sale of commodities to finance development projects gives these programs an added flexibility in paying workers and acquiring inputs. Table 1 provides an outline of some of the conditions under which monetization would be the preferred option to distributing food aid (Maxwell and Owens 1991).

3.2.1 Closed monetization

Project participants may be paid for their work in cash, but allowed to purchase food at subsidized prices. This "closed monetization" has been used effectively by projects in Mali and Ghana (Bryson et al. 1991).

3.2.2 Where to monetize?

As mentioned above, the injection of large amounts of food into local markets can have a disincentive effect on local production, while a sudden cash infusion can increase local market prices. If food is widely available locally, it may be advisable to monetize food aid

outside of the local area, perhaps in the nation's capital. However, if a cash injection would push food prices up, it may be better to monetize locally to maintain price stability (Maxwell 1986).

3.3 Wage Rates

Wages cannot be so low as to prohibit survival, yet not so high as to make public-works employment more profitable than agricultural production. Wage levels can serve an important self-targeting function: if wages are set just below the market price for labor, the program will tend to attract the most needy (i.e., those who cannot find work elsewhere, or who cannot make a better living in agriculture). This method will be effective only if a physical fitness recruitment criterion is not applied (see section 3.9, below). The alternative is to set higher wages, but to regulate access to program participation. The latter solution requires greater administrative supervision, and may be less equitable than a self-targeting approach.

3.3.1 Possible disincentives

The policy of setting wages at submarket levels is effective in preventing a labor disincentive in farming, as the low wage will discourage any but the poorest from leaving agriculture in order to participate. However, offering bare subsistence wages may stigmatize project participants; the repercussions could include diminished self-esteem among workers, and a consequent disinterest in the completion of productive development work. Another potential disincentive lies in the fact that although public works offer low wages, they are consistent, predictable wages. In a context of fluctuating conditions for agricultural production, people may choose to give up the higher paying but riskier farming, opting instead for a steady wage in public works.

3.4 Non-Food Program Requirements

For CFW/FFW programs to make real improvements in local resource bases or infrastructure, resources in addition to food are required. It has been estimated that in Africa food comprises only 15-40% of the total cost for public works programs (Ezekiel 1988). Nonfood resources may include materials for road construction and maintenance, tools and technology for various activities, skilled managers to run the operations, and cash for purchases and project support. These resources may be acquired through monetization of portions of food aid, or allocation of counterpart funds for project support. Institutional ties between public works programs and other aid structures can be useful in this regard (Mellor 1989).

3.5 Labor Productivity

If CFW/FFW is to be used for real development work and not just for relief distribution, it is necessary to link pay to performance (Bryson et al. 1991). If project participants are paid just for showing up without performing any real work, it will be difficult to establish productivity requirements later on. Therefore, it is essential that projects be organized at the outset, that the necessary equipment and resources be on hand, and that the work chosen be meaningful to the project participants themselves.

3.5.1 Fixed production contracts

One method of ensuring productivity is to negotiate contracts for fixed amounts of labor with organized workgangs. This technique has been pursued successfully by a WFP-funded project in Ethiopia (Bryson et al. 1991). Norms of productivity are agreed upon, and the work is divided among group members based on individual ability. Full payment is contingent upon completion of the contract.

3.6 Timing

Programs must be well timed to provide relief when it is most needed without drawing people away from agricultural labor. Many work programs are organized in the dry season, so as not to provide a disincentive to agricultural production. Timing questions may be especially problematic in the "hungry season" immediately preceding the harvest, when stores have been exhausted and food need is great, but the demand for farm labor is also near its peak. Again, a CFW/FFW program that pays subminimal wage offers employment to those who are most in need, and can be run all year long.

3.6.1 Rapid appraisal labor mapping

Rapid appraisal techniques are useful in determining when CFW/FFW interventions should be scheduled to be most effective. By mapping annual farm-labor requirements and identifying labor bottlenecks and slack periods, rapid appraisals can target periods when works programs would be most beneficial without drawing needed labor away from agriculture.

3.7 Taste Preference

Payment in food runs the risk of not matching local taste preferences, resulting in sales of food at submarket price, or simply discarding of the unwanted food. On the other hand, payment in unfamiliar grains such as wheat may create new taste preferences, making local foods less desirable and biasing the market towards imported foods and decreasing local production. A solution to both problems is to exchange imports for local varieties prior to use of food as payment for work (Maxwell and Belshaw 1990).

3.8 Indigenous Experience

In some communities, historical experience with work projects may influence the willingness of local people or politicians to participate. During the colonial period in Africa, some colonial regimes impressed rural people into forced labor gangs, paying them in food for work in community or infrastructural development. Clearly, the memory of such experiences may disincline people from participation in work programs. On the other hand, in some African societies it was a traditional practice for the chief to organize community labor teams to work on local projects, feeding the participants for the efforts. An investigation of indigenous experience with CFW/FFW-type activities should form part of the initial assessment of the viability of such programs in a region.

3.9 Equitable Participation

Public works projects have been criticized as being biased towards able-bodied workers, to the exclusion of more vulnerable community members. In Ethiopia, physical fitness criteria are often applied to workforce recruitment, effectively excluding some of the neediest people (Webb and von Braun 1991). Works programs may be supplemented by school feeding programs, maternal/child health and feeding programs, and support for the aged and infirm, to insure that benefits are distributed throughout the community (Maxwell et al. 1991).

3.9.1 Targeting women

Women also should be targeted for participation, though it has been suggested that this may have the consequence of reduced attention to child care (c.f. Clay 1986). The issue is a complex one, and further investigation is needed to determine the actual social costs of female participation in public works. However, the importance of encouraging female participation in works projects lies in the fact that many impoverished households are headed by women, and that payments to women are more likely to go towards improving household nutrition than payments to men. Effective targeting of women may be achieved through the use of food as payment: in communities where many aspects of food production are seen as "women's work," FFW may attract more female participants than males (Bryson et al. 1991).

3.10 Private vs. Communal Property

One possible dilemma is whether public works projects (often employing the poor and landless) should be used to improve private land, or whether efforts should be confined to communal property. While the work would benefit the poor in the short run, and possibly provide greater employment opportunities for them in the long run, the work inherently will promote or perpetuate inequitable asset and income distribution. Maxwell et al. (1991) suggest that the argument can be resolved by having farmers pay for work on their land, payment to be collected after the farm improvements have demonstrated an increase in income to the farmer.

3.10.1 Maintenance of assets created

In order for assets created through program activities to be sustainable in the long term, some degree of maintenance must be provided for. This may be particularly difficult to promote when assets (e.g., roads) are created on public lands, and no individual farmer feels a special incentive to maintain them. Maintenance provisions should be an integral component of works projects from the outset, to ensure that assets created continue to produce benefits in the long term.

3.11 Technical Constraints

Work projects need to be technically feasible and well-planned prior to implementation. Project design should bear in mind local availability of labor and resources, and should be appropriate to the local environment. Most public works projects are labor intensive, rather than skill extensive, and may not require a great deal of training prior to start up. However, what rural communities often lack is medium-level administrative preparedness, and it is here

that a need for training may exist. These constraints can be addressed through the work of NGOs in the area, training managerial and supervisory personnel in project operation.

3.12 Measurement of Benefits

Project design should include a component for measuring the streams of benefits from assets created within a community. Planners must be able to identify who is benefiting from works projects to determine if the project is meeting its goals of improved food security and broadened equitability of access to resources. In addition, measurement of benefits will help planners to identify which types of projects are producing the greatest returns to the target population, to guide them in determining the types of projects to pursue in future efforts.

4. Conclusion

Effective CFW/FFW programs are those that are appropriate to the conditions of the local market infrastructure, have a high level of preparedness for expansion to meet crisis situations, and actively foster community involvement in project planning and management. Well-managed projects can be instrumental in using food aid to promote sustainable food security, in that they reduce community vulnerability to famine by improving the local resource base.

An understanding of indigenous coping strategies is important to appropriate and timely implementation of public works projects in crisis situations. As farmers tend increasingly toward reliance on loss-management strategies to maintain survival, such as selling productive assets and outmigration, implementation of CFW/FFW projects that can forestall reliance on these strategies becomes appropriate. Effective monitoring of coping strategies will indicate when to intervene, and the intervention can arrest the downward spiral into impoverishment that becomes increasingly irreversible the longer it persists.

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Table 1: Project Food Aid: Distribution in Kind Versus Monetization

Conditions under which MONETIZATION is the preferred option	Conditions under which DISTRIBUTION IN KIND is the preferred option
1. The project objective is a general income transfer, not specific food supplementation; or, where food supplementation is the objective, cash funds will be transferred reliably to food expenditure;	The project objective is an increase in food intake which will not result from cash transfers;
2. Targeting within households (e.g. to women or children) is possible using cash transfers;	Targeting within households can only be successful with food;
3. Social traditions are favorable to remuneration in cash; or direct distribution might cause taste changes;	Social traditions favor re-numeration in kind; and food aid will not cause undesirable taste changes;
4. Food is available to buy; local food markets or distribution mechanisms (e.g. fair price shops) function, or can be ex-pected to adjust or be established in response to increased purchasing power; there are no serious distortions in local food markets;	Food is unavailable (drought, civil dist-urbance, inadequate logistics, seasonal shortage) or over-priced (traders making supra-normal profits or not serving remote areas); and government intervention using food aid cannot improve the functionning of the market;
5. Government bureaucratic managerial capacity is adequate for the deposit/ transfer/expenditure/auditing of cash funds; no particular risk of diversion of funds;	Government bureaucratic managerial capacity is more suitable to handling food in kind than cash funds; risk of diversion of food less than of funds;
6. Additionality of cash payments, and their targeting on the poor assured or possible to arrange without violating Government budgetary policies or procedures;	Additionality and targeting on the poor more easily assured for food than for cash, given Government budgetary policies and procedures;
7. Cash-supplementation of specific target groups (e.g. civil-service staff) acceptable; no particular dependency/phase-out problems that argue against cash;	Government prefers food as a temporary addition (topping-up) to e.g. civil salaries, rather than cash; food is preferred because it is easier to phase out; particularly during structural adjustment programs.
8. Monetization is more cost-effective than distribution in kind.	The cost-effectiveness of direct (overall administrative/logistical costs against net local value of food transferred) is signifi-cantly more favorable than monetization.

Source: Maxwell and Owens, 1991.

Taking Conflict Into Consideration: Implications for Famine Mitigation Activities

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1. Overview

The character and context of disaster relief has changed substantially since the end of the Second World War. Natural calamities still occur, such as the cyclone that recently hit Bangladesh, and the drought currently affecting parts of the western Sahel. International conflict such as the ten years of warfare between Iraq and Iran and the more recent Persian Gulf war, though less frequent than in previous decades, produce a level of devastation, death, and displacement that exceed national capacity for redressment and require the intervention of external assistance. A number of countries that in times past were required to resort to massive external assistance in times of natural calamity are now able, through a combination of disaster preparedness and social equity compromises, to mitigate the more devastating effects of disasters such as drought and guarantee the social minimum required for affected populations. India is a shining example of improvement in this regard.

The most consequential changes in the character of disaster relief and rehabilitation involve the rapidity with which relief efforts are mounted, the increasingly active role of the United Nations in relief coordination and negotiations, and the preponderance of private and voluntary organizations in the implementation of relief activities. The character of disaster relief and rehabilitation has also changed in terms of the types of interventions and their objectives. There is growing agreement among agencies that have historically provided relief and governments of countries that are the recurrent site of disaster that a more proactive model of intervention is required. Specifically, the thrust is now toward the development of famine mitigation capabilities, oriented at the community and individual level, that taken together will allow disaster prone countries to avoid the catastrophic loss of life and productive capacity that marked previous disasters.

The most significant changes in the context of disaster relief and rehabilitation are the internalization of conflict and the virulence and breadth of protracted civil strife. International rivalries have been internalized and allowed to exacerbate domestic tensions, such as in the case of Afghanistan and Nicaragua, while other countries such as Sudan, Ethiopia, and Somalia are rent by civil strife. Local people are increasingly implicated in violence as government forces and insurgents alike use populations as strategic assets or liabilities for the furtherance of their political and military objectives. The distinction between combatants and non-combatants is often blurred as conflict organized along racial or ethnic lines is prolonged and as the practice of recruitment among the very young becomes more pervasive.

This discussion paper focuses on conflict and its implications for famine mitigation. Some of the key issues raised in providing disaster assistance and famine mitigation in conflict areas are treated in section 2, along with practical considerations for implementing famine mitigation initiatives in areas of civil strife and armed conflict. Specific information needs in areas of conflict are presented in the final section.

2. Disaster Relief and Famine Mitigation Under Conflict Situations

Although the physical manifestations of natural calamities occurring in areas of relative domestic tranquility and of disasters in areas of conflict are similar, there are some key differences. Chief among these is the element of volition, either at the stage of the onset of the disaster or in its prolongation. Drought conditions may provoke national mobilization for attenuation of its effects for afflicted regions as is the case in India and increasingly in the West African Sahel, or the drought may proceed to the creation of severe hunger and massive destruction of life as has been the case in Ethiopia and Sudan where national mobilization is prevented by the presence of civil strife.

The presence of conflict also creates a striking difference in the location of the populations most at risk. Whereas drought-induced famine most seriously and immediately affects the populations residing in the geographic area of drought, under conflict situations other populations are also at risk, including the increasingly significant numbers of displaced persons and refugees who may reside outside the center of drought but lack the organizational or physical resources to protect them from price increases and reduced availability of foodstuffs. The plight of the internally displaced is particularly sensitive since they tend to be outside the purview of multilateral humanitarian assistance agencies that work with refugees (by definition those who have sought refuge outside the boundaries of their country of origin), and are often viewed with indifference if not distrust by national authorities in civil strife areas.

The following table provides estimates of internally displaced persons, resident refugees, and the number of persons who have sought refuge outside of the country in question for the five key conflict countries in Africa. Although there is substantial variation in the figures reported, it is clear that the numbers of internally displaced persons is alarmingly high, both in absolute terms and relative to population. The presence of substantial numbers of refugees from neighboring countries resident in countries that have a high level of internal displacement further compounds the difficulties faced in addressing both natural disasters and conflict-produced famine. Finally, the eventual repatriation of refugees that have fled to neighboring countries presents the challenge of reintegration but also provides a ready group of participants for training in famine mitigation activities.

Table 1: Displaced Persons and Refugees in Countries with High Levels of Civil Strife, 1989

Country	Internally Displaced Refugees	Resident Refugees	Source of Refugees	Pop. (millions)
Angola	638,000-1.2 million	-------	438,000	8.5
Ethiopia	700,000-1.5 million	740,000	1 million	49.8
Mozambique	1.7 million	------	1.3 mill.	14.3
Sudan	2 - 3.2 million	350,000	388,600	24.5
Somalia	70,000 - 400,000	694,300	435,100	8.2

Source: World Refugee Survey, 1989 in Review. U.S. Committee for Refugees, 1990. PC Globe.

Although the situation of many refugees is clearly unenviable, the situation of those who have fled violence or famine in their homes but remained within their national territory is sometimes even more precarious. International conventions relate to refugees but are not explicitly applicable to internally displaced persons.

2.1 Famine Produced by Conflict

There is a growing consensus that conflict has become the principle contributing factor to the deadly face of famine in much of Africa. Yet the nature of conflict itself is very specific to its context, varying from one country to another and even among conflict zones and time periods. The highly variable nature of conflict makes it impractical to provide uniform guidelines for specific activities. The most common consequences of civil strife are the destruction of life, property, livestock, and foodstuffs, the displacement of producers from the land with the consequent reduction in agricultural productive capacity, and the disarticulation or destruction of exchange networks. Freedom of movement is often severely restricted, thereby jeopardizing the redistribution of surpluses or emergency supplies. The ability of the local population to seek food aid, seasonal or emergency employment, collect wild foods, or maintain transhumance activities is also threatened.

> *... [I]t is a sad commentary that civil strife and warfare is now becoming a leading factor in prolonging the food crisis, not only in Ethiopia, but in several other hard-hit countries of Africa -- including Sudan, Angola, and Mozambique. Conflict and violence - not drought or agricultural failure - are now the leading contributors to continuing famine conditions.*
>
> [From testimony provided by Jerry Tinker and John Wise in 1986.]

A group of prominent researchers, specialists and practitioners in the fields of disaster relief and famine mitigation meeting in Bellagio, Italy concluded that the elimination of death due to famine by the year 2000 was an achievable objective, given advances in the global system of providing emergency aid, improvements in early warning capabilities, and increased knowledge of measures required to avert disaster. The Bellagio Declaration acknowledged however,that "[t]he major obstacle to eliminating famine remains the destruction or interdiction of civilian food supplies in zones of armed conflict" (Food Policy, August 1990).

2.2 Conflict Modification

The clear evidence of the destructive and disruptive consequences of civil strife has led to a call for the modification of disaster relief and famine mitigation activities. Although this would appear to be a reasonable response, to do so would be to concede that civil strife has become normative. Although conflict must indeed be taken into consideration when designing and implementing mitigation activities, it is hoped that the object of our efforts will be the modification of conflict so as to allow for the routine life activities of production, consumption, freedom of movement, commerce, and social development.

2.3 Conflict Resolution and Famine Mitigation

Since civil strife and conflict are the primary contributors to famine in Africa, famine mitigation may best be advanced through conflict resolution. A peace settlement between factions, although it may be the overarching objective, is not the only desirable goal. Of greater immediate importance to survival at the community and individual level is the negotiation of safe passage for emergency relief aid, the establishment and maintenance of "corridors of tranquility", assurance of the freedom of movement of populations affected by conflict or calamity, limiting the use of anti-personnel security practices such as undisclosed mine fields and destroying crops, eliminating forced relocation, and agreeing to accept the principle that all noncombatants have a right to food and emergency relief regardless of their location, race, religion, ethnicity, or political orientation. Although these measures fall short of total peace, they may be more readily achievable and contribute to the search for a peace solution for the larger conflict.

Conflict resolution should be an objective at all levels - international, national, and local. Peace initiatives at the international level may lead to some progress, especially in the early stages of civil strife or when both national and world attention is focused on a specific emergency situation. International pressure may be less effective however in the case of famine mitigation outside of emergency situations. For famine mitigation activities directed at communities and individuals an important role must be accorded to internal conflict resolution initiatives and processes, especially those which find their legitimation in the cultural realities of the concerned communities.

By privileging indigenous conflict resolution mechanisms and institutions, external agencies are in effect contributing to the long term sustainability of famine mitigation activities while preparing the way for a possible increase in effective deconcentration, democratization, and local governance.

3. Famine Mitigation Issues Specific to Conflict Situations

The existence of civil strife in areas that are prone to drought or otherwise subject to the threat of famine raises issues that would not be critical or even relevant in non-conflict situations. These issues range from the global to the specific and are here divided into three categories: global policy issues, strategic concerns, and tactical considerations for implementation.

3.1 Global Policy Issues

The leading issue at the level of global policy is whether famine mitigation activities are to be considered as a form of humanitarian aid or as development assistance. The distinction is by no means academic or trivial. By assuming the mantle of humanitarian aid, those who proffer assistance in famine mitigation must be willing and able to accept the guiding precepts of neutrality, impartiality, accountability, and transparency. Humanitarian relief agencies have struggled to create an international consensus that all civilians have a right to humanitarian assistance, and that access to such persons, wherever they may be located, must be assured. This was the principle underlying the creation of Operation Lifeline Sudan in 1989, and perhaps its greatest accomplishment.

The ability of these agencies to provide humanitarian aid is to a large extent dependent upon the confidence that those involved in conflict have that the agencies will not take sides in the conflict (neutrality), that they will provide assistance on the basis of the actual needs of the individuals, regardless of who they may be (impartiality), that the agencies will be accountable first of all to those whom they serve but also to donors and local authorities (accountability), and that they will be forthright in the explanation and conduct of their activities (transparency). The hope is that by following these precepts, agencies will have access to populations that neither side would have permitted individually.

If, on the other hand, famine mitigation activities are to be treated as part of the development portfolio of multilateral, bilateral, and private voluntary organizations (PVOs), neutrality as such will be impossible and most activities will be conducted to the advantage of recognized governments. Given the nature of the conflicts in the countries under consideration, it is clear that access to critical population groups, especially displaced persons and those who continue to reside in areas considered to be under the control of the adversary would be severely limited.

A related issue of general policy importance is the weight to be given to national "sovereignty" in the provision of famine mitigation activities. This would be of little salience in countries without deep internal tensions but is of critical importance when civil strife leads to the exclusion of famine-prone areas for political or military reasons. The claim of national sovereignty is often used to justify attempts by the government to manage relief activities. This may take the form of excluding areas that are considered to be under the sway of the adversary, such is the case of the northern region in Somalia, Tigray, and Eritrea in Ethiopia, and large portions of southern Sudan. Governments may also attempt to capture a larger share of planned activities or benefits than would be justified on a needs basis. Examples of this are found in the claims made by the government of Sudan for approximately 80% of assistance provided through OLSII, or the disproportionate claims

made for goods passing through the Port of Massawa to be distributed in government held areas in northern Ethiopia. In cases where access to at-risk populations is denied by the recognized government, it will be necessary to decide whether cross border or cross-line assistance is justified. The same issue is raised in areas that are effectively administered by the insurgent forces.

The third global policy issue concerns the determination of the appropriate institutional framework for designing and implementing famine mitigation activities. In recent years, the United Nations has taken an increasingly visible and active role in the direction of humanitarian assistance interventions. The effectiveness of the U.N. Coordinator during the 1984-85 famine in Ethiopia was widely acknowledged. The existence and relative success of Operation Lifeline Sudan I was also due to the leadership of the United Nations. More recently, U.N. police forces were sent to Iraq to assure the security of Kurdish civilians in their home communities. Yet the U.N. is subject to many of the same constraints as traditional bilateral aid and in some senses is even more susceptible to claims of sovereignty made by a member country. No clear answer emerges in terms of who should assume leadership of famine mitigation and disaster assistance initiatives in conflict situations.

Perhaps it is more important to stress who should participate in design and implementation activities. In addition to multilateral and bilateral agencies, it is highly advisable that private and voluntary organizations be invited as active partners. PVOs and NGOs, both international and domestic, have accumulated valuable experience in the field. Many of them have built a reputation in the country of concern and have access both to local and national leaders and to geographic areas of special concern for famine mitigation. Finally, special attention should be given to involving local organizations and institutions from the outset. This will allow external agencies to benefit from the critical time and place information that they possess, while strengthening the capability and effectiveness of these organizations thereby contributing to the sustainability of famine mitigation initiatives.

3.2 Strategic Concerns

The long term effectiveness of famine mitigation initiatives will depend upon the ability to reach the populations most affected by drought or conflict produced famine. Three issues are of strategic importance: access, coordination, and the selection of intermediaries.

3.2.1 Assuring widespread access

Unlike the case of countries without a recent history of civil violence, populations in conflict countries suffer massive dislocation with the creation of large groups of displaced persons and refugees. **Famine mitigation activities must seek to reach three categories of producers: displaced persons, refugees, and residents of at-risk areas.** Given the importance of the first two categories in the countries of primary concern, it is clear that working only with rural producers who have remained on their land in areas under at least nominal government control is not sufficient. Wider access is more likely, though not assured, by adhering to the precepts of humanitarian assistance mentioned above.

The case of large numbers of displaced persons in the central Khartoum area illustrates the importance of access. Reports have been made regarding the forced relocation of displaced persons, most of whom fled violence in the south, in areas at some distance from Khartoum. There are also accounts of displaced persons returning to the south without adequate preparation of the returnee or of the recipient community. Displaced persons in the central Khartoum area are distrusted by the government who sees in their numbers and point of origin the danger of instability or insurrection. Reports of climbing prices and declining access to food among this displaced population has not resulted in an appropriate response from the national authorities.

A number of questions emerge in relation to access. Does the venue of administration and coordination of relief and famine mitigation activities create a problem of (perceived) neutrality? Rebel opposition to OLSII was in part due to a perception of activities being run by the government of Sudan once the logistics center for coordination was moved from Nairobi to Khartoum. What should be the relationship of agencies working on famine mitigation with government ministries? Obviously, it is best to avoid collaboration with politically sensitive ministries such as defense, interior, and finance. Technical ministries such as health, education, and public works generally have a more apolitical reputation both at the national and local levels. In areas under insurgent control, should relief and famine mitigation activities be linked to the relief arms of insurgent organizations, such as the SRRA in Sudan or the REST in Tigray? Will partisan organizations, whether aligned with the government or its adversaries, adhere to the impartiality precept in making benefits available to local communities and individuals?

Finally, transparency in objectives and actions is also important to obtain and secure access to sensitive populations/areas. Agencies must be clear in their description of the activities to be organized, the materials to be transported and distributed, and the specific populations to be involved. The conduct of cross-border and cross-line assistance in cases where either governments will not authorize access or access is impossible from government controlled areas raises a particular dilemma in regard to transparency. Some organizations involved in assisting both sides of a conflict have taken the position of transparency limited to the activities of direct benefit to the antagonist in question. Assistance to their adversary is not raised by the assistance agency and most governments have preferred not to make this an issue. Again, attention to neutrality, impartiality and transparency contribute to the success of such initiatives.

3.2.2 Insuring coordination and improving efficiency

The key issue in regard to coordination is who will assume the lead role. **Who will coordinate what activities by whom and for whom?** Due to the number of actors involved, the coordination of humanitarian relief and rehabilitation activities has become increasingly important. The introduction and adoption of famine mitigation activities by the agencies involved in disaster assistance will not lessen this need. The objectives of coordination include (a) the gathering and sharing of information, (b) improved targeting of assistance, (c) avoidance of overlap and gaps in coverage, (d) efficiency in the delivery of benefits, and (e) leverage in negotiations.

There are practical limits and obstacles to coordination as well. Adversaries in conflict, and especially government officials, prefer to deal with external (and indigenous) agencies on an individual basis. Agencies, too, have their own agendas and may be unwilling to submit to directions from the coordinating authority. NGOs differ widely in their professed objectives, approach to assistance, and dedication to the precepts of humanitarian assistance. The rapid creation of special interest organizations in support of specific U.S. policy objectives (especially in Central America) during the Reagan administration led to the designation of such organizations as GONGOS, or government originated NGOs. Some religious based PVOs are hesitant to join with secular NGOs, and vice versa.

This diversity in objectives, approach, operating styles, and philosophies should not be viewed as shortcomings but rather as offering the promise of creative experiences and alternatives. Diversity may lead to increased effectiveness, despite some cost in operational efficiency.

3.2.3 Choosing intermediaries for field-level implementation

At the operational level, field implementation will benefit most from the involvement of local intermediaries. Organizations with established track records in the area, and indigenous institutions and organizations offer critical local time and place information, operational networks, social acceptability, and political connections both at the local and national level. Local organizations should be implicated as full partners in famine mitigation if optimal impact is to be attained.

The first task in choosing implementation partners is to identify the variety of institutions and organizations in the area under consideration. This may range from the local chieftaincy to the leadership of the government sponsored Peasant Association or other grouping of rural producers. Local governments or administrative authorities should also be included in the initial identification and assessment of organizational partners. Local capacity building should be a key objective of famine mitigation initiatives.

The impartiality of local partners in famine mitigation may be at question. Some religious based local groups tend to orient benefits to co-religionists while depriving others of equal access. Indigenous institutions may not reflect the democratic values of external organizations, especially in regard to the treatment of women and members of subordinate social groups or castes.

The accountability of organizations involved in famine mitigation activities is another serious concern. A system for monitoring and evaluating performance should be decided upon at the outset, with clear and explicit descriptions of roles, rules, procedures, objectives, and indicators of performance. Under conflict situations, it may not be realistic to expect the same level of performance as in non-conflict situations. In the area of famine mitigation, outcomes tend to be more important than measurement of traditional outputs, such as number of persons served, quantity of materials distributed, training sessions held, or populations contacted.

3.3 Tactical Considerations for Implementation

Field level implementation of any disaster assistance or development activity requires careful consideration of a host of context specific factors. A number of issues of particular importance to conflict situations are presented below.

3.3.1 Monitoring and assessment

The collection of data is particularly critical, and difficult, in areas of civil strife. Access is often uncertain or impossible, the participants in armed conflict may have strategic interests in concealing or falsifying information, and the information obtained is difficult to verify. The displacement of producers, disarticulation of input supply and marketing systems, and the physical danger of carrying out production activities, further exacerbates the problem of food scarcity and of reliable data collection. Traditional early warning mechanisms and rapid appraisal methods must be modified to compensate for the disruption of civil conflict.

3.3.2 Targeting assistance

It is generally held that disaster assistance should be organized so as to benefit those most in need. Does the same criterion, i.e. need, hold for famine mitigation activities? Or should famine mitigation be oriented toward those most likely to put the initiatives into practice? **Who should be the targeted participants: poorest of the poor, assetless rural producers, refugees, displaced persons residing in peri-urban centers, or the rural producers that have been able to remain on the land?** The desirability of targeting famine mitigation activities, **to some degree**, is clear. However, when directed at refugee or other closely defined groups, mitigation initiatives may be perceived as favoring these groups to the exclusion of long-term residents, neighboring communities, and others in need.

3.3.3 Security considerations

The protection of civilian participants and the personnel of implementing agencies must be the primary security concern in disaster relief and famine mitigation activities. All parties to conflict have their own security priorities and interests. When designing and implementing famine mitigation activities, the security priorities of government, rebels, local people, and implementation partners must be considered. If interdiction of movement within a zone of armed conflict is a priority for one of the adversaries, it will be necessary to negotiate a safe passage corridor, devise an alternative method of reaching the population, or accept that the population in question will not be included. Rural producers may be reluctant to place storage facilities along roads or in central villages for fear of confiscation by soldiers or insurgents. Transportation of agricultural produce and supplies may also present security considerations for armed combatants who may suspect that supplies for the adversary forces may be hidden away, or conversely for producers who fear that the level of appropriation will be too high if a large amount is shipped at one time. It is also important to be aware of the conflict tactics practiced by the antagonist parties. Specifically, it is necessary to determine the effects on freedom of movement, production, consumption, and communication. In some conflict situations, lines of conflict and the boundaries of zones of conflict are relatively stable and clearly defined. Conflict tactics, though destructive, are predictable and rarely exercised outside of zones of conflict.

In other situations, the objective of conflict is instability, and unpredictability is a tactic used by anti-government forces. A senior State Department official highlighted the varying nature of conflict in Africa by comparing the cases of Sudan, Ethiopia, Angola and Mozambique.

> *Conflict caused food shortages in Mozambique are less easily understood than in the other countries...and still harder to overcome. There are no definite or even approximate battle lines in Mozambique. Nor are clashes between opposing forces and hit and run attacks confined to a few provinces or a single region but occur throughout the country. Roads that are safe one day may be attacked the next.*
>
> *As a result, safe passage of clearly marked trucks transporting relief goods is impossible.... These factors make the usual means of arranging humanitarian relief deliveries in conflict areas -- "food truces", "mercy corridors", or "open roads, own risk" -- untenable in Mozambique.*
>
> [From testimony presented by Roy Stacy, March 1988.]

3.3.4 Resolving conflict

Conflict is a part of social life; conflict resolution mechanisms have been developed, tested, and utilized at the local level to seek acceptable solutions to complex problems. Indigenous organizations have been able to produce important agreements among combatants to allow for help for those in need. In 1986, Sudanaid and the Sudan Council of Churches were able to negotiate safe passage to an area that had been cut off from supplies for two years. Local communities throughout conflict zones have had some successes in reaching agreements with combatants.

Local institutions and organizations cannot be expected to resolve the underlying issues in prolonged large-scale conflict situations. They may, on the other hand, be able to produce specific limited agreements that will improve their chances of survival and conditions of life during conflict.

3.3.5 Empowering local institutions

The disruption, devastation, and displacement resulting from civil strife place serious strain on traditional institutions, yet even under the most severe conditions these institutions retain their legitimacy for many people. Traditional institutions such as land tenure, natural resource use patterns, rules regarding the internal division of labor, and other resource mobilization systems are traditional only in the sense that they find their legitimation in the domain of a shared cultural identity. They are neither stagnant nor archaic, but evolve in response to changing conditions.

Local people in conflict areas are the ultimate survivors; they are doing something right and we should acknowledge that and try to learn from their experiences. As John Prendergast noted in a recent Pacific News Service article, "The most incredible thing about the last five years of the Sudan's history is not that hundreds of thousands died of starvation,

but that millions lived." According to the Oxfam Field Directors Handbook, 95% of aid is raised locally in most disasters. Famine mitigation activities will be most productive by supporting and encouraging local people's desire and ability to help themselves.

House Resolution 1454, currently introduced before Congress, is an example of the increasing recognition that disaster preparedness, famine mitigation, and ultimately the end of civil strife begin with strengthening local institutional capabilities. With the stated purpose "to assure the people of the Horn of Africa the right to food and the other basic necessities of life and to promote peace and development in the region through grassroots participation," H.R.1454 proposes that it should be accepted U.S. policy "to provide assistance to indigenous nongovernmental institutions working in government-controlled or opposition-controlled territories that have the capacity or potential to promote conflict resolution, to advance development programs, or to carry out relief, which routinely includes rehabilitation activities..."

The following points should be considered when working with indigenous NGOs.

Begin by acknowledging the existence and legitimacy of local institutions such as leadership structures, land tenure and natural resource management systems, and resource mobilization practices.

Present famine mitigation problems and request assistance in defining potential solutions. Be clear regarding what external assistance can do and the timeframe for activities.

Famine mitigation activities should reflect a locally expressed and verified need, add to local capacities, and lead to self-sufficiency and sustainability.

Reinforce the effectiveness of indigenous NGOs and strengthen coordination between them.

Do not ignore local government officials or administrators. The local institutional framework is and will remain important long after famine mitigation activities are completed.

4. Information Requirements Specific to Conflict Situations

The indicators used in contemporary early warning systems and rapid rural appraisal methodologies are generally appropriate in conflict situations. In addition to these indicators are specific types of information related to conflict and to local organizational resources.

4.1 Conflict Specific Information

- geographic delimitation of zones of armed conflict
- conflict tactics employed and level of physical threat or violence

- limitations to freedom of movement
- conditions of access to or between zones of armed conflict

4.2 Local Organizational Resources

- existence and organizational capability of indigenous NGOs
- priorities and activities of partisan organizations involved in humanitarian relief and rehabilitation or development
- physical resources and availability for famine mitigation activities: logistic resources, storage and supply facilities; operational facilities

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Section II: The Berkeley Springs Meeting

Berkeley Springs, West Virginia
July 31-August 2, 1991

Berkeley Springs Workshop

Introduction and Summary of Major Findings

Introduction

Although famines resulting from natural disasters such as drought have occurred throughout history, modern famines are more likely the result of civil conflicts. These conflicts often cause major disruptions in the migration routes, market systems, and distribution networks that normally provide an area with adequate food supplies. The current trend for responding to such famine emergencies is by direct food aid assistance from the international community, through relief agencies and donor groups. Recognizing the important relationships between conflict, food aid, and famine, a follow-up to the Tucson workshop was held in Berkeley Springs, West Virginia, to discuss these particular topics.

Discussion Topics and Ideas

1. **Target Countries:** The primary target countries were identified as Angola, Ethiopia, and Sudan; each of which suffers from a broad range of conflict and non-conflict situations. Mozambique and Somalia will be considered at a later date.

2. **Interventions:** Interventions should be "catalytic", serving as a starting point and not necessarily as end products in themselves. An example would be providing localized training in improved grain storage techniques that could be applied to traditional structures, rather than provision of complete grain storage containers from external sources, materials, or labor.

3. **Food-for-Work Programs:** To ascertain the appropriateness of food- or cash-for-work programs as intervention strategies, it is necessary to determine 1) at what stage in a developing famine situation the proposed intervention will be implemented, 2) the accessibility of affected locations, and 3) the logistical capabilities that are in place.

4. **Military Strategies:** It is necessary to evaluate mitigation activities in terms of how they will be viewed or used by military combatants. In addition, it is possible that understanding and applying principles of military strategy may be applicable for identifying, designing, and implementing appropriate interventions.

5. **Market Interventions:** Interventions aimed at marketing systems may, under certain situations, have significant impact on both food availability and access to available food.

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6. **Activity Schedule:** The overall projected timeline was viewed as ambitious but possible. Timeframes for each stage were considered to be minimal for production of quality results. Time frames were based on free access to countries.

7. **Strategy Papers:** Strategy Papers for each component area should be presented as drafts during proposed Orientation Workshops; revisions to guide papers will be made based on participant experiences and input.

8. **Orientation Workshop Presentations:** Target country participants for the proposed Orientation Workshop should prepare and present a review of their collective experiences, capabilities, and strategies in famine mitigation.

9. **Famine Intervention Matrix:** A matrix should be developed to help identify stages in a developing food crisis, appropriate strategies for each stage, and potential intervention options.

10. **Possible Famine Scenarios in Target Countries:**

    a) drought or other naturally-induced (e.g. - locusts, disease, flood) food shortages where access to vulnerable areas is not a constraint.
    b) food shortages in rebel held areas where access may or may not be a constraint.
    c) food shortages in transition zones (areas between combatants) where access is constrained by both parties.
    d) food shortages in non-conflict zones where access is not a constraint, but where resources are diverted to support conflict.
    e) flood induced food shortages where access is likely to be a constraint and markets and production areas may be affected.

11. **Activity Guidelines:** In some component areas, a number of potential interventions already have been developed and tested; a small group of experts may be able to develop these into Activity Guidelines for rapid deployment and testing. Alternative strategies for development of Activity Guidelines should be explored.

Follow-up Actions

1. Produce and distribute a proceedings of the Tucson and Berkeley Springs Workshops for component teams and other collaborators.

2. Plan and conduct a one-day Review Meeting with U.S.-based PVOs and USAID Bureaus to: a) provide an update on the status of the Mitigation Activity; b) determine PVO presence and capacities in the target countries; c) solicit document retrieval assistance; and, d) identify in-country resources that could be utilized in developing activities.

3. The Concept Paper should be revised and finalized based on OFDA input and feedback. In addition, a project implementation paper detailing activities, timelines, and methodologies for achieving Activity goals and objectives should be developed based on input recieved from OFDA and other sources.

4. Initiate procedures with core development personnel for development of project outputs.

Section II: The Berkeley Springs Meeting

Issues Papers

Berkeley Springs, West Virginia
July 31-August 2, 1991

Potomac Edison Plant

Using Food/Cash for Work in the Famine Mitigation Activity

Judy C. Bryson

1. Introduction

This presentation discusses the issues and potential for using food/cash for work (FFW/CFW) in the Famine Mitigation Activity (FMA). It is a preliminary effort as the individuals involved in the FFW/CFW component have just begun to study the different stages of famines and the experience with using FFW/CFW in those circumstances in Africa. In addition, the specific ways in which FFW/CFW can be used to support the other components of the famine mitigation activity will evolve as the plans for those components are finalized. The issues of FFW/CFW are discussed first, followed by consideration of the ways in which they can be used in the famine mitigation interventions.

2. Issues in Food/Cash for Work

The issues of FFW/CFW can be expanded almost indefinitely given the controversies surrounding both food aid and employment creation/public works. Additional issues arise when the two are combined. In a recent paper on gender and food aid prepared by Emily Moore and Judy Bryson, eight current food aid issues were listed. *Food for Work, A Review of the 1980s with Recommendations for the 1990s*, by Judy Bryson, John Chudy and James Pines, February 1991, identified five broad areas of current concern which encompassed a much larger number of specific issues. Daniel Goldstein and Timothy Frankenberger identified six key issues in their paper "Cash-for-Work/Food-for-Work Programs for Improving Household Food Security During Food Deficits," presented at the May 1991 Workshop of the Famine Mitigation Activity (FMA) in Tucson, Arizona. There is an overlap between the issues discussed in these papers although the emphasis changes depending on the focus of the analysis.

Attached is Chapter 5 of *Project Food Aid, User's Guide to the Design of Food-Aided Development.Projects*, by Judy Bryson and Steve Joyce with Daniel Edwards which was published by USAID in May 1991 and is in the process of dissemination to Private Voluntary Organizations (PVOs) and USAID Missions (see Annex 1). Work on the "User's Guide" started in 1986 and it was extensively reviewed by both PVOs and USAID. before it was finalized. In the process, six basic issues were identified for programs which involve food as a component of wages:

- appropriateness to the activity
- the work site location

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- worker selection
- the wage formula and additional incentives
- complementary resource support
- maintenance of completed infrastructure

These six issues are covered in detail in Chapter 5, in relation to their relevance in development projects. This discussion considers the additional aspects or modifications of the issues which are relevant to the use of FFW/CFW in famine mitigation.

2.1 Appropriateness to the Activity

The discussion of this issue in the attached chapter is most concerned with whether it is cost effective to use a food wage in the planned activity. The impact of introducing wage paid labor on community voluntarism is also discussed. In a famine situation "appropriateness" will be concerned with finding those activities which are appropriate for the households experiencing famine to undertake, in terms of the fit between the tasks and the physical condition and size of the resulting labor force.

"Appropriateness" will also be related to the effectiveness of activities in achieving famine mitigation. The specific activities chosen are likely to vary from site to site depending on what needs are most critical, e.g. seed distribution, water collection, roads. It will be important to involve the local population in the selection of activities as their enthusiasm or lack of interest will be reflected in the quality of the work achieved and maintenance of finished structures where required.

The activity should also be appropriate to the numbers and types of technical and administrative personnel present in the area. If no individuals with technical expertise are available, the activities identified for support should require very limited technical skills. Even in this case, however, administrative personnel who can set the tasks, assure that they are completed and arrange for payment are necessary.

2.2 Work Site Location

Most issues concerning worksite choice are raised in the attachment and questions such as is there a severe food shortage or is a labor force available are resolved in the case of planning for famine mitigation. Instead, the question becomes one of finding appropriate activities to carry out at sites where famine is imminent or already in progress.

2.3 Worker Selection/The Wage Formula

These two issues are dealt with together here as the wage formula is a critical component of worker selection in the case of famine mitigation. In development projects it is important to assure that sufficient able-bodied workers, or well-qualified workers are attracted

to projects so they can be completed on time and cost-effectively. In famine mitigation the issue is assuring that needy households have access to employment. Assuring that this is met is closely tied to the wage formula.

Reviews of the experience of long term FFW/CFW activities such as those in India indicate that keeping the wage low, below the prevailing minimum wage, is an important factor in targeting the poor. In Africa, the standard food wage is 50 kilos of grain usually supplemented by two to three kilos of oil per work period of three to four weeks. This amount of food is judged to be needed to sustain a worker and four dependents. When the local market value of the wage is calculated by using commodities which are the same or similar, the resulting value is often higher than the minimum wage. The ability of FFW to target the poorest in normal times usually results from the wage being in food which is less desirable than cash. However, in famine situations food prices rise dramatically, and providing sufficient food for household needs whether in food or in cash sufficient to purchase the food results in a very high wage.

An analysis of the experience with FFW and CFW during the recent famine in Ethiopia (Webb, von Braun, and Yohannes, "Famine in Ethiopia: Policy Implications of Coping Failure at National and Household Levels, International Food Policy Research Institute, (draft) 1991) found that the FFW activity (which did not reach everyone in the villages) included a substantial portion of households in the upper income bracket. The CFW activity included in the sample avoided the problem by providing employment to all households in the villages where they worked. The better off were included but none of the poor were excluded. However, this approach increases the costs of the FMA significantly and can be justified only where all or nearly all of the inhabitants of the village are in need. These issues will have to be addressed in the design phase of activities, possibly in partnership with other market interventions designed to reduce the price of food.

Most of the villagers interviewed in Ethiopia expressed a preference for food rather than cash as remuneration. The time and expenses involved in reaching markets where food was available for purchase were factors. Government regulations on food movement during the famine were also a problem in some areas. Individuals who made the long trips might have their purchases confiscated on the way home. Those who attempted to purchase in the limited home markets drove up the price of food (ibid). These problems did not occur everywhere, however. This experience illustrates the importance of identifying local conditions at the time activities are planned, factoring in the impact of the works project on local markets and the likely transaction costs individuals will incur in purchasing food if paid in cash or selling any excess if paid in food.

A possibility to consider is whether low remuneration for a "part-time" activity would be sufficient to provide the extra food households need to meet their crop or other income shortfalls. The activity would be more likely to attract those in need with low opportunity costs and could reach more individuals with the same budget. The intervention might include transferring other assets, as is discussed in the example under water resources management below.

A further issue involved in the wage formula which requires attention is identifying ways in which task working can be used on the activities. Even if the tasks set are light (as compared to the usual work norms applied in non-famine conditions) it is highly likely that more will be accomplished than through daily paid working. In addition, supervisory staff are generally limited and authorizing payment based upon task completion will be much easier than assuring that attendance records are correct.

2.4 Complementary Resource Support

There is a broad range of activities which can be helpful in a famine mitigation context; choice of activity will depend partly on the complementary resources available for program support, including technical and administrative personnel, material, and logistical resources. The questions listed in the attachment with respect to the issue of complementary resource support are equally relevant to famine mitigation activities.

It is important to remember that the food in a FFW project provides only the wages for the workers. Additional resources are needed to assure proper technical design for the activity, and technical supervision of the work. In addition, inputs such as tools, wheel barrows, cement and wire mesh are often needed for quality work outputs. In some cases, food for sale can be included in the project to generate cash to purchase these other budget items. However, if they are not available locally, they may have to be imported (and paid for with foreign exchange) or purchased elsewhere in the country and transported into the area. Similarly, project budgets for CFW activities must budget for these other resources as well as for wages.

Complementary resources are essential to assure that the FFW/CFW activities are not merely "make-work". When people are already facing the challenges of famine conditions, those who are attempting to improve the situation should not require them to work on useless activities. Road works can harm the environment if not properly aligned as can conservation works. Project designers must carefully access what resources they have available and choose activities (together with the local population) which can be supported adequately.

2.5 Maintenance

Whether or not-maintenance is an issue will depend on the content of the famine mitigation activity. Many work activities such as hauling drinking water for humans and livestock, guarding stores, monitoring markets will not create any physical structures. In some other cases there may be no long term role for the infrastructure created despite its importance in the short term for famine mitigation. For example, rudimentary roads may be constructed to service refugee populations whose location is such that they have limited usefulness in normal times. In these situations, maintenance will be a concern only for the life of the activity.

However, maintenance needs to be addressed in those cases where it is important to the continuing success of the famine mitigation activity, or where the structure has a long term use. In either case the questions to address are those raised in the attachment: how

can maintenance be assured; what entity will organize or supervise the activities; and how will the costs be met? A most important element in assuring maintenance of structures is the involvement of the local population. Although the famine mitigation activities will be short-term in nature, time should be taken in the design phase to discuss the proposed interventions with the local population to assure their understanding and interest in what will be constructed, and determine their willingness to be involved in subsequent maintenance activities.

For some structures, such as roads, it is likely that either a national or regional authority will have to be involved in maintenance to supervise, provide tools, and a budget for the activity. Local authorities may also be involved, e.g. in providing workers or collection of road user charges. Where the agency involved in the famine mitigation activity is established in the country it can make initial contacts with the higher level authorities and follow-up periodically; otherwise it should arrange for follow-up by an in-county organization. Other structures, such as those for water collection and retention will generally be the responsibility of local communities to maintain. Here arrangements for organization of maintenance, collection of funds for materials, and training in maintenance techniques should form part of the works activity.

3. Uses of Food/Cash for Work in Famine Mitigation Interventions

The attached chapter 5 of the "User's Guide" provides illustrations of the types of labor-intensive work in development infrastructure creation which can be organized using a food, combined food/cash or cash wage. Subsequent chapters in the User's Guide discuss employment possibilities in the other standard uses of food aid: long term income generation, child survival, strengthening primary education, and natural resources management. Throughout the "User's Guide" there are references to the possible uses of employment for emergency relief. However, such employment was not dealt with in a separate chapter as the "User's Guide" is specifically concerned with designing development projects. Some preliminary examples of ways in which FFW/CFW can be used in the FMA are outlined below.

3.1 Early Warning/Rapid Assessment

FFW activities are presently operating in several of the famine prone countries in Africa, e.g. Sudan, Ethiopia. Monitoring the numbers of individuals applying for work provides a means of identifying stress. When food supplies contract, the price of food rises and more and more households are prepared to participate in FFW activities. This technique was used by the British in India who established FFW activities in areas which were reported to be nearing famine conditions. The activities were called "test relief" as the numbers reporting for work were used to determine the severity of the food deficit (Dreuze, Jean, *Rural Public Works for Famine Prevention: The Indian Experience*, London School of Economics: London, 1986).

3.2 Seeds and Tools

The seeds and tools activity is divided into two parts: field crops and garden crops. It is planned to experiment with seed and tool packs for both field and garden crops in three of the target countries. Activities in the other countries may be limited to information collection. FFW/CFW can support the operational activities in several ways:

- construction of storage facilities;
- preparation and distribution of seed/tool packs; and
- providing remuneration for individuals working in fields and gardens -- this may be necessary in situations where individuals are too weak to work in the fields for lack of food, or when they are producing food which will be used to meet the needs of themselves and others living in camps.

A variation of FFW, which could be called "seeds for food" could be arranged to preserve seed stocks. Households would be encouraged to barter seeds they would otherwise be forced to eat, for food. The seeds could then be stored and distributed at planting time.

3.3 Water Resources

There are many opportunities to use FFW/CFW in addressing water resource provision in pre-famine /famine conditions. Water is required for three types of needs: field crops/gardens; animals, and households requirements for drinking, cooking and washing. There are obvious differences in the water needs of herders and settled agriculturalists.

Settled agriculturalists in drought prone areas typically face water shortages. It is a common occurrence in the dry season for water sources near to settlements to dry up forcing the water carriers (who are usually women and children) to walk further and further to collect it. In a drought collection trips become longer and longer and the individuals have less and less strength to undertake them. Provision of "low -tech" equipment such as a frame for carrying four water jars with a handle, fitted over a single wheel, would reduce their burdens.

The equipment could be provided to women (or whomever normally carries water) in return for their providing an agreed amount of water for needs such as those of households with no able-bodied members to fetch water, schools, clinics, refugee camps, animal vaccination centers etc. If the women are weak themselves, the payment period could be spread over time and they would receive payment in food for part of what they deliver. This is the example of part-time work referred to in issue 3. "Worker Selection/Wage-Formulation". Once the equipment was paid for in work provided, it would be the property of the individuals, providing them a means to lessen their burdens. It could possibly become a source of income for them as there is often a market for water.

Other FFW/CFW opportunities would be provided by construction activities. Wells often need to be deepened as water tables drop. In addition, or small scale or more elaborate water harvesting structures need to be constructed. In some cases bore holes may be required. Some of these activities will involve substantial technical assistance and equipment. They should not be attempted unless those resources are available.

3.4 Livestock Preservation

Livestock preservation activities will involve attempts to maintain animal health by finding sources of food and water and through animal health activities. Arrangements may also be made for destocking/restocking measures which avoid the impoverishment of herder households. This typically results due to the severe drop in the amount of grain which they receive per animal in famine conditions.

FFW/CFW employment can include construction of crush pens for vaccination/marketing activities, aides to vaccination teams, water provision at vaccination sites, preparation and distribution of feed cakes and salt licks. Available labor may be used for longer term measures to improve livestock handling, e.g. training in animal handling and health, establishing grazing boundaries, painting markers, guards to enforce compliance. As conditions begin to improve, activities such as reseeding grasslands, and planting forage crops can be undertaken.

3.5 Food for Work/Cash for Work

In addition to FFW/CFW activities which will support other elements of the FMA, FFW/CFW can be used for emergency operations and for general development purposes. Employing individuals as guards, loaders, record-keepers and to transport commodities are common. Passing on skills and creating local capacity to manage future activities should be emphasized ("learning by doing"). This is especially important in conflict situations.

FFW/CFW can also be used for the long list of infrastructure creation activities discussed in Chapter 5 attached. These resources will help to make the areas less vulnerable to future famines. The choice of specific activities will depend on the responses to the questions raised in the issues section above.

Annex 1

5. CONSTRUCTING DEVELOPMENT INFRASTRUCTURE

5.1 INTRODUCTION

Infrastructure creation is essential to the development process. Infrastructure such as national road networks and water impoundments support overall development, and facilities such as classrooms or warehouses are needed for specific development purposes. Another aspect of development infrastructure creation is the formation of human resources.

Employment generation may be a secondary objective of infrastructure creation. In some situations, such as impending famine emergencies, employment generation may be of primary importance. In these cases, infrastructure creation projects have social as well as development objectives.

The food resource can provide valuable inputs to the process of infrastructure creation. The programming requirements of this resource can also focus greater attention on social equity concerns related to infrastructure and promote efforts to ensure that the poor receive direct benefits from new infrastructure development.

INFRASTRUCTURE CREATION USING A FOOD AID RESOURCE

A Definition

Assuring that quality development infrastructure in terms of physical assets and human resources are available in poor areas is the primary purpose of these projects. The principal features of the activities are:

- **Food deficit areas and/or areas with a high proportion of poor households receive priority in project selection.**
- **Employment generation is targeted on individuals from households that are at or below the poverty line.**
- **Sufficient technical assistance, supervisory personnel, tools, and materials ensure the infrastructure is of adequate quality for its intended use.**
- **The food resource addresses critical constraints by:**

- **supplementing cash resources to pay wages of workers**
- **supporting training for needed skills**
- **providing funds for other resources through monetization**

Infrastructure is generally created to support achievement of development goals. Basic infrastructure such as roads provides access for a whole range of services and promotes market growth. Other types of infrastructure are needed to achieve specific development goals such as long-term income generation, child survival, enhancing primary education, and natural resources management, as is discussed in chapters 6, 7, 8, and 9.

The problem analysis should indicate the requirements and the technical specifications for the infrastructure. Questions to consider include the following:

- What infrastructure (physical or human resources) is critical to solving the development problem?
- What quantity and quality of infrastructure is needed?
- What minimum standards must be met?
- Is unemployment or underemployment a critical problem in the area? Where will the labor force be recruited?
- How will any physical infrastructure be maintained once it is constructed?

The objectives of the project will depend upon the answers to these questions. The information will also provide a preliminary assessment of the magnitude of the activity and an indication of the technical issues presented by the project.

This chapter raises many questions, some of which are partially answered on the basis of what has been learned about using food in infrastructure projects. However, as with any good project development process, the complete answers will be specific to a given locality.

Section 5.2 discusses the project activities involved in infrastructure creation. Section 5.3 covers project design issues.

5.2 PROJECT ACTIVITIES

The activities included in the project will depend on whether its objective is the creation of physical structures or human resources or both.

Construction of physical structures involve a fairly standard set of activities which include:

- surveying the area and the quantities of work to be accomplished
- preparing plans for the structure or facility
- establishing the supervisory staff

- arranging for the availability of materials and equipment
- recruiting the labor force
- constructing the infrastructure
- establishing mechanisms for maintenance

The creation of human resources may be carried out in a variety of ways. The project activities discussed in this chapter concentrate on skills needed for employment and on-the-job training. Subsequent chapters on long-term income generation, child survival, enhancing primary education, and natural resources management cover other types of training activities.

When employment generation is one of the objectives of the project, it will affect the choice and management of activities. For example, more labor intensive methods of construction may be used, and the tasks and remuneration may be designed to attract certain types of individuals.

The following sections discuss the ways in which food can be used in the project activities. It is emphasized that food alone is not sufficient to carry out infrastructure creation activities. Technical personnel, materials, and equipment are also needed on the activities.

The activities discussed below are not intended as a catalogue of all possible activities but as a starting point for project designers. Each project should be specifically designed to address local conditions using the process set out in chapters 2 and 3.

5.2.1 Food as a Component of Wages

The use of food as a component of wages is appropriate in activities where the primary objective is to create a physical asset or to develop human resources through on-the-job experience. Applied to these project activities, food can help stretch project funds so that more can be done.

Food supplements the cash funds available to the activity sponsor. It can make it feasible to carry out activities that would otherwise be too large for the available resources or to support additional activities critical to project success. The combination of development and social welfare functions of food also can make it possible to support activities in areas that would be considered too marginal in normal financial terms.

The use of a food wage or a combined food and cash wage can also help to target employment creation to poor, food-deficit households with underemployed members. This group is more likely to respond to the incentive of a food or partial food wage.

Human resources development occurs when food-wage laborers build skills on the job that are essential to project efforts and that will eventually bring them a full cash wage or make their own farms or businesses more profitable. Using the food wage to pay project personnel, at least initially, helps assure that jobs are going to those who are most needy. Examples include tree nursery and out-planting workers, gardeners, and tailors.

A partial cash wage is preferred in most situations. However, a full food wage is considered acceptable for project activities that are community based, since they are in most cases directly tied to the population group from which the food-wage laborers come. Levels of remuneration and wage formulation are project design issues that are discussed below.

The box lists some of the development activities where a food wage has been used successfully.

Development Activities with Successful Food-Wage Use

Construction of schools	Bridge construction
Construction of clinics	Road construction
Road maintenance	Soil conservation
Urban gardens	Tree nurseries
Community gardens	Woodlot planting
Tool manufacture	Woodlot guarding
Water systems	Woodlot maintenance
Irrigation systems	Firebreak establishment

5.2.2 Food for Employment Generation

The use of food as a wage component is appropriate in infrastructure development activities that are primarily intended to provide employment opportunities for people facing particular hardships.

In these situations, providing "a job and food" to people is determined to be critical for their survival. Such employment generation activities are seen as most helpful in serious food deficit situations as a means of keeping people from migrating for work. Examples include employment guarantee schemes for landless laborers or famine-affected groups.

However, even when employment generation is the primary objective of a project, it should have secondary objectives that are developmental. If a full food wage is to be used, the most appropriate activities are those that will directly benefit the workers and enhance their future income prospects.

However, in emergency situations where there is no ongoing activity that can be expanded, basic infrastructure creation activities usually offer the best assurance for

development results. Other types of development projects require personnel and technical and material inputs that may not be available on short notice.

Basic infrastructure projects should be limited to public works activities that provide generalized benefits to the local population as a whole and are not monopolized by more-advantaged economic and social groups. Examples include community centers, dams, schools, and clinics.

In long-term employment guarantee schemes, a total food wage should not be used unless the workers derive direct benefits from the activities or learn new marketable skills from their employment. In most cases, the food resource can stretch the cash resources available for wages, but it should not totally replace them.

As a supplement to cash wages, food allows the activity sponsor to undertake additional or larger activities, employing more people than would be possible under normal budget situations. Moreover, the combined food and cash wage can be as valuable to the worker as a full cash wage, given that a portion of the full cash wage would need to go for food anyway. The cash component provides money for other basic needs such as fuel and clothing.

5.2.3 Food for Monetization

Sales of food can assist in providing cash needed in infrastructure creation projects for items such as tools, cement, other materials or transportation. Project designers should follow current monetization guidelines in developing their proposals.

Closed monetizations of commodities, where food aid is sold to the participants in activities, may also be appropriate in projects. For example, food commodities can be sold at subsidized prices to low-paid workers on construction activities and the funds used for project budget needs. This use of food can be helpful in attracting a labor force and can also help to ensure food is available for workers. This can sometimes be a problem, especially when large numbers of laborers are working in areas with small populations and limited markets. Monetization policy requires that commodities be sold at full commercial price, but waivers can be granted provided the lower prices are justified in the monetization request.

5.3 PROJECT DESIGN ISSUES

The project design issues discussed below concentrate on the questions that arise when food is used as a component of wages. Each country will have its own special set of conditions and issues that must be considered when designing and implementing projects that use food as a wage component. Nevertheless, there are a few basic issues for any programming discussion at national, regional, and local levels.

The most basic issues that should be considered in deciding whether to use the food resources as a wage component in a particular project activity are the following:

- appropriateness to the activity
- the work site location
- worker selection
- the wage formula and additional incentives
- complementary resource support
- maintenance of completed infrastructure

5.3.1 Appropriateness to the Activity

Key Factors To Consider

Will project targets for quality and completion dates be met if the activity is carried out with food-wage labor?

How much external management and technical assistance would be required to oversee the food-wage laborers, and at what cost to other project activities?

Do food aid distribution networks already exist?

Could the work be done by community volunteers, without introducing the food wage?

Is payment in food culturally acceptable to the proposed workers?

Cost effectiveness and "community volunteerism" are two issues to weigh carefully in determining the overall appropriateness of the food wage for a particular activity.

Cost Effectiveness

The food wage is not a free resource. Food distribution, management and technical supervision of workers, training, quality, and timeline requirements—all are factors determining the labor cost of a particular food-assisted activity.

Thirty food-wage laborers might need two weeks to dig a fish pond, a job that a bulldozer could do in one afternoon. Is a bulldozer available, and at what cost? Are the laborers capable of meeting project targets for quality and completion dates?

Will subsequent project activities be on hold until completion of the food-wage activity? Who would provide technical and management supervision of workers?

If some tasks require training, it will be essential to provide the food-wage labor force with enough incentives—food rations, part-cash wage, or other appropriate incentives—to assure minimum turnover. Skill development takes time, and constant training of new workers will burden supervisory staff.

Can the project tap into existing and reliable food aid distribution systems? When rations are delayed one or two months, worker absenteeism results.

It may be possible to distribute food rations in collaboration with other projects, such as child survival projects, or with World Food Program and other donor food aid projects. But it may be necessary to establish a separate system, if costs are justifiable.

Community Volunteerism

A common criticism of activities involving food for work has been that community motivation and participation can become dependent on food aid when it is given as an "incentive" for time volunteered. Over a period of time, the argument goes, food aid and volunteerism become meshed, and the spirit of volunteerism as a value within a community is eventually lost.

On the other hand, community volunteers have successfully worked side by side with food-for-work laborers on community projects when the food commodities have been clearly defined *as a wage*, rather than compensation for time volunteered.

This distinction is particularly crucial in projects that rely on the food-wage resource for some aspects of project implementation and on voluntary participation for others. So which project tasks should be earmarked for food-wage labor, and which tasks can community volunteers be expected to do?

Before this question can be answered, another key question needs to be asked: How much volunteering are people willing to do? They may well recognize the need, but can they afford to volunteer the time?

The example shows how these concerns might be addressed in a woodlot project.

The Food Wage and Community Volunteerism

An Example

A 7-hectare woodlot was prepared for planting by 15 local food-wage workers. They cleared the site, fenced it, and plowed furrows 4 meters apart. In these plowed furrows, they dug water catchments every 3 to 5 meters.

On National Tree Planting Day, the entire 7 hectares—which is roughly equivalent to 13 football fields—was planted by a large turnout of community volunteers. The food-wage laborers supervised the work to make sure the tree seedlings were planted correctly.

5.3.2 Work Site Location

Key Factors To Consider

Is there a labor surplus in the area? Will the activity attract both men and women?

Is the area sufficiently food deficient to attract an appropriate labor force, e.g., able-bodied workers for hard physical labor?

Does the site meet technical criteria for success, e.g., adequate soil conditions, rainfall, land tenure?

The food-wage resource often attracts considerable interest in a country, because it is a visible resource that reaches the local level.

In programming the food-wage resource, site selection often comes under pressure from various interest groups. For this reason, criteria for site selection should be established early on to protect projects from too much outside influence in the planning and implementation of food-wage tasks.

When work activities have developmental objectives, the sites selected should have reasonable prospects for success. In selecting a site, technical requirements should be weighed equally with more traditional criteria. With reforestation projects, for example, the site-selection criteria should address growth-rate potential and land tenure, in addition to the need for reforestation and the severity of food shortages.

Site Selection Criteria

In food-wage assisted projects with developmental objectives, the following site selection criteria should be considered:

- severity of food shortages
- site technical requirements
- work-force availability, capability, and stability
- cost factor in distributing food-wage rations
- need for the expected outcomes
- land ownership

Another important criterion for site selection location is labor availability and labor capability. Site location and labor availability are two closely linked factors that influence the strength of the food wage as a development resource. Put simply, the food wage is a useful development resource *when* and *where* it can attract productive workers.

In food-deficient areas, where few employment opportunities exist, food-wage assisted projects do attract capable workers and experience very little labor turnover. In rich agricultural areas, on the other hand, imported food commodities may prove less desirable to people, or the equivalent value of the rations may be less than the region's going rate for cash-paid labor. These project locations will likely attract a smaller, less capable labor force than required, and one that turns over frequently. Finally, as previously mentioned, the cost of distributing food rations to potential work sites is another key criterion to consider. Is there a nearby distribution center willing to assist, or would a new distribution outlet need to be established? Are sites widely dispersed?

The cost of administrative and logistical support for use of the food resource—transport, warehouses, accounting requirements—will be lessened if existing food aid distribution networks can be tapped.

5.3.3 Worker Selection

Key Factors To Consider

What are the various tasks required to carry out a particular work activity?

- Can women be considered for nontraditional roles in a given culture?
- Can any of the tasks be done by elderly or handicapped people?
- Which tasks will require an able-bodied worker?

What is the target group from which the food-wage workers will be selected?

- How will potential candidates be identified?
- Who will determine which individuals are selected?

When worker selection uses very basic criteria, the job of selecting productive workers is expedited and will likely lead to better project results.

How one defines a "productive worker" will vary from task to task. What performance level is required to carry out a task adequately and within a planned time frame?

When work tasks have developmental objectives, the workers selected should be able to perform the task adequately. Different tasks require different worker capabilities, particularly with regard to health and age. The worker who digs holes to plant trees must be more physically able-bodied than the one who manages the tool shed, a position that may require the ability to read and write.

Tasks requiring more physical strength should be identified for the more physically able-bodied, and those requiring less strength should be reserved for the less able-bodied. The food wage is most effectively applied as a development resource when participants are selected on the basis of their ability to carry out the work-task requirement.

Worker selection, like site location, often attracts special interest. Where labor opportunities or food is scarce, employment may not go to the best qualified or the most needy, but to the politically favored. When special interest groups instead of project staff select food-wage laborers, worker capabilities may not be considered. Those selected to carry out a particular task may be in poor health, or too young or old to do the task reasonably well.

The food wage, when it goes to the more able-bodied family members of needy households for those tasks requiring hard physical labor, not only feeds the rest of the family, but also builds roads and plants trees more efficiently.

5.3.4 The Wage Formula and Other Incentives

Key Factors To Consider

What food aid commodities are available?

- How have they been received in the past?
- What is their estimated local market value?

If the food wage does not match the going rate for paid labor, could other project-provided incentives complement the value of the food payment?

- Is a part-cash wage feasible and justified?
- Can daily work hours be reduced?
- Can the volume of commodities in the wage formula be increased?
- Will some of the workers receive direct benefit from project activities?

Social and economic factors weigh heavily in the search for the right answer to the question. What is required to attract productive workers?

What is the distance to the site? Is it in an urban or rural area? How high is unemployment? What is the official minimum wage in the country versus the actual minimum wage? What percentage of the unemployed already receive emergency food aid through other sources?

An even more basic question to ask is: *What's in it for the individual worker?*

Generally speaking, the food wage does attract productive laborers when the full wage—food commodities alone, or a combination of food commodities, cash and other incentives—is competitive economically with the going rate for cash paid labor.

Urban Areas

In urban areas, the cost of using the food-wage resource could be higher if ample employment opportunities exist for unskilled labor.

Other incentives, including a part-cash wage, may need to be linked to food commodities in order to attract appropriate workers to the project.

Rural Areas

In rural areas, on the other hand, where fewer employment opportunities exist, the food commodities alone may prove to be incentive enough to attract a stable, productive labor force.

Major determinants in the wage formula for rural areas will be the degree of food deficiency and the number of poverty-stricken families.

Additional incentives, however, are usually necessary in areas that already receive emergency food relief.

Consideration Of Local Factors

Basic Information Required

Local wage/compensation for specific levels of applicable work

Food consumption patterns/nutritional deficiencies

Commodity costs—purchase, ocean freight, overland and internal transport, storage and handling costs

Key logistics constraints

Local Agricultural Data

Agricultural calendar

Local agricultural production levels

Local food imports and exports

Producer prices and market prices

Source: AID Food-for-Work Conference, Annapolis, MD, December 1985.

Wage Formulation

If food commodities are to be defined as a wage, how will appropriate wage formulas be determined? What factors should be weighed in devising the wage scale? The following are key elements to consider in developing appropriate wage formulas for food-wage supported work tasks:

- the degree of labor surplus and food deficiency

- the worker capability required to carry out a particular work task
- the availability of cash to supplement the food wage
- other incentives, such as skill training, half-time employment, or piece work

Ration size and content are significant factors in determining the attractiveness of the food ration as a wage.

Ration Size

The food aid ration, to stand alone as an effective wage, must be fairly equivalent monetarily to the going local rate for cash-paid labor. Flexibility in determining ration size—the kilo amount of bulgur wheat or vegetable oil included, for example—allows for a wage scale more tailored to work tasks and lessens the need for other direct incentives.

Maintenance of "cash wage" equivalency, however, will require periodic adjustments to keep up with inflation. Seasonal adjustments, either to work norms or ration size, also may be appropriate.

Ration Content

The value of the food aid ration is determined by using the prices of similar local commodities and determining how much of one commodity or a combination of commodities is required to approximate the value of local wages. Identified high value commodities such as oil are typically used as part of the ration.

By the same token, an unacceptable commodity can lower the value of the food wage. Some 20 years ago, Scandinavian dried fish was first introduced into southern Rwanda as part of the food ration. People were unwilling to work for it. In fact, there was so much resistance to the dried fish that expatriates were sent in to teach people how to cook it properly. Program officials have since acknowledged that the commodity's unacceptability to the local population weakened the work program considerably.

However, over a number of years, the fish gradually became accepted by people and has since become a very popular culinary commodity in that part of Rwanda. The soaking water used to rehydrate the fish is even saved and heated for broth. Moreover, fish farming has become a viable small-scale enterprise.

Although this example is an exception, it illustrates two important points: (a) unwanted food commodities do not attract productive workers and can undermine a work program; and (b) an inappropriate food commodity may become a preferred food over time, which could encourage local production if the capability is there, but could also create a long-term dependency on imports. Accordingly, the use of commodities that have no local equivalents is not encouraged.

Appropriate Food Commodities

Appropriate food-wage commodities satisfy the following conditions:

- They are valued by the target population.
- They supplement local foods, but do not compete with them.
- They meet most nutritional needs of the household, unless the ration is supplemented with a part-cash payment.

Part-Cash Wage

A part-cash wage should be considered in the following circumstances:

- if the workers will be involved for a significant period of time—more than a month, for example
- if the benefits are generalized—that is, if the food wage participants do not derive assets or new skill development
- if the workers are landless laborers who depend entirely on their wages to meet all their needs
- if the technical standards for the activities are high
- if the pace of work required is relatively fast

The International Labor Office (ILO) has established guidelines that identify when a full food wage without cash supplements is appropriate (see box).

ILO Guidelines on a Full Food-Wage

Under certain conditions, the ILO considers a wage comprised of 100 percent food rations to be acceptable. These conditions are outlined below:

- when there is a stated policy in which the food ration as wage is seen as a transitional phase to a cash wage
- when employment is generated that eventually will not be dependent on food rations
- when the assets created by the food-aid assisted project are for the benefit of the whole community, and not confined to certain individuals
- when the food aid-assisted project helps move the community toward self-sufficiency in food production
- when the food aid-assisted project includes training of local community members as a key component

Standardizing the Food-Wage Resource

Uniformity among donors, sponsors, and implementing agencies in applying the food-wage resource will enable higher project performance standards to be established. Four areas in particular, if standardized, would contribute to higher project performance:

Worker and Site Selection Criteria

As noted earlier, standard worker- and site-selection criteria help reduce the pressures of special interest groups on project management staff.

Work Norms

Experience has shown that using food for wages is more effective when compensation is linked to completion of specific tasks. Early projects that only related food payments to hours of work too often produced poor work performance.

Standard work norms for each food-wage task would permit better planning for future food-wage activities, and a more meaningful evaluation of completed activities.

Naturally, work norms for some tasks will vary from work site to work site.. The number of holes a worker is able to dig in a day, for example, will depend on the terrain, the soil conditions, rainfall, and the tools provided.

Work norms can also be established for a group and cover a working period. For example, a work gang of 20 people may be paid a month's wages when a given section of road or a culvert is completed. The quantities and tasks included are specified in advance, and the group is given a specified time in which to finish the work. They may finish sooner if they wish.

Ration Value

Ideally, the value the participants attach to a food-wage ration should be at least equivalent to the going rate for paid labor in the area—unless the ration is only one half the wage, for example, and cash makes up the other half.

Standardizing the ration value according to going rates for cash-paid labor helps assure that the ration is acceptable to people in the area. This acceptability will help guarantee that a project has a sufficient, capable, and stable labor force.

Other Worker Incentives

Other worker incentives, in addition to food commodities and cash, can also influence the wage formula.

Possibilities to consider

- ***Is on-the-job skill training available?*** The opportunity to gain blacksmith or masonry or beekeeping skills adds a powerful incentive to the wage formula.

- ***Could a "shift work" approach be used?*** Half-time food-wage jobs have proved more responsive to the needs of single women who are heads of households: It gives them an opportunity to both provide for their children and take the time necessary to properly care for them.

  Long distances to the work site could make a two-shift day unfeasible, but perhaps not a two-shift week, in which, for example, two crews each work three days per week.

- ***Are there project tasks that could be done as "piece work"?*** Paying with food commodities for the brush fencing panels that the project needs enables food-wage laborers to do the work when it is most convenient for them: at the end of the day when their own farm work or other chores are finished. Older or younger family members are also able to help out.

- ***Are there promotion possibilities?*** The promotion of food-wage laborers to cash paid positions provides a powerful incentive, not only for good performance, but also for the acceptability of food aid as a wage. It is an incentive that has proved effective in many food-wage projects.

5.3.5 Complementary Resource Support

Key Factors To Consider
What resources are available? From what sources?
What management and other support will be required?
How much technical input will be required during the design phase of a food-wage assisted project, and who will provide it?
How much technical supervision and training of workers will be needed at the project site to assure that work tasks are properly carried out?

The food-wage resource works most effectively in combination with other resources: management, technical, material, and logistical resources, in particular. What technical know-how is needed, at which points, in carrying out a work task? What tools and other materials are required? When? What other resources are anticipated? How much support can the host government provide?

In many developing countries, the government infrastructure at regional and local levels is not strong enough to adequately support food-wage activities.

Moreover, tapping the existing government infrastructure for supervisory and technical manpower to manage food-wage work sites could hinder other development efforts in the area. A food-wage activity may well result in an earth dam, but if scarce government personnel have been enlisted to supervise workers, what is the cost to other regional and local development priorities, and essential services to urban and rural communities?

A good approach is to integrate project food aid resources into ongoing infrastructure projects. Project designers should also seek ways of separating technical personnel from management of resources.

Resource Assistance

A Role for PVOs and Peace Corps

It may be neither appropriate nor feasible to rely on existing government infrastructure for resource assistance with food-wage activities. If not, where can this assistance come from?

A strong PVO or Peace Corps role may be critical, at least initially, to the successful design and implementation of food-wage activities.

Certain policies will help assure that the food-wage resource does not cause waste or inefficient use of other scarce resources, such as technical assistance or financial assistance.

Separate Technical Support From Logistical Support

When a government technical agency, such as the extension service or the forest service, becomes the sole implementer of a food-wage supported project, and allocates scarce personnel, vehicles, and other resources to food aid management and support, its technical effectiveness diminishes.

Foresters and health technicians need to provide technical supervision and skill training, not distribute food rations.

Encourage a Stable, Capable Food-Wage Labor Force

Close supervision and constant training are required when labor turnover is frequent, or when food-wage laborers cannot perform work tasks adequately. These situations undermine production targets and tax management—which most projects can ill afford.

Rotating food-wage laborers out of their jobs after a two- or three-month period, for example, may maximize the number of food aid participants, but it may not maximize the use of other resources, or allow skill development to occur.

Incorporate a "Shift Work" Approach Whenever Possible

There are several advantages to the *shift work* approach to worker employment.

- It doubles the number of participants with essentially the same management structure.

  With shift work, better coordination of workers will be required, but line supervisors can oversee up to twice as many half-time food-wage laborers as full-time food-wage laborers.

- It allows participants to build skills and capital resources.

  Building skills and capital resources takes time. Shift work keeps people in their jobs longer and allows them to carry on with other capital-building activities, such as farming.

- It responds to the needs of women.

  Half-time food-wage jobs enable women with children to combine wage labor with their multiple roles as mothers and producers.

- As a project approach, it is more sustainable over the long term.

  In countries with many food aid participants, limited host government and donor resources, and limited management capacity, the food wage applied to a shift work approach enables other scarce resources to extend further.

Technical Support

The special value of the food-wage resource is that it can support development activities—tree planting, dam construction, road building—as well as supply food commodities to people in need. Creating these developmental assets, though, requires good technical know-how.

With few exceptions, reliable and competent technical support over the life of the food-wage activity will be vital to successful results. In the following five areas, technical support is particularly crucial for food-wage supported activities.

Technical Design

Is the task design technically sound? Is the selected site an appropriate one? Will the potential benefits justify the expenditures?

These questions will vary in significance, depending on the task and the sector area. However, the key issue remains the same: the food-wage can be a major contributing factor to where and how a work task gets carried out, but the primary determinant—as with any development activity—should be technical feasibility and appropriateness.

Work Task Planning

Technical input during work-task planning is critical to achieving optimal organization, sequence and timeliness of work tasks, required tools, and other resources.

Developing standard work norms and performance standards for task activities is another function that may require technical input. How many meters of antierosion ditches can a food-wage laborer be expected to dig in a day? How many plastic bags for tree seedlings can a nursery worker fill in a day?

In addition to facilitating planning, standard work norms will also help determine worker qualifications, and help assure that a clear linkage is made between the food rations and the work performed.

Technical Supervision

Daily or even weekly supervision by technicians may be unnecessary for every work task, but there may be critical periods when direct technical support and supervision would greatly enhance the quality and impact of the results. These critical points will need to be identified, planned for, and scheduled.

Technical Skill Transference

Building technical capability at the local level—to lessen reliance on outside services—is a goal of most development projects. Technical skill transfer is one primary way that the food-wage resource can help people break away from dependency.

Technical skill building should be targeted at two levels during work task implementation:

- work site supervisors and other field personnel
- the food-wage participant

In a food-wage supported community tree nursery, for example, the site supervisors should receive periodic training in nursery management; and the food-wage workers—in addition to training in routine nursery maintenance—should also learn seed collection and storage and fruit tree propagation.

Work Task Monitoring and Evaluation

From a technical standpoint, monitoring and evaluation of the work-task accomplishments in food-wage projects serve two important functions: reinforcing performance standards established with workers, and assessing the lessons learned for future planning. The exercise should indicate how closely work task achievements have come to the work norms established for the project and can indicate realistic work norms and incentives to use in future activities.

Technical support in these areas will give much greater assurance that the project using a food-wage resource will achieve development impact.

5.3.6 Maintenance

Key Factors To Consider

How will maintenance of the infrastructure be assured following the completion of construction?

What entity will organize and supervise maintenance activities, including the procurement of any needed materials and equipment?

How will the costs of maintenance be financed?

These questions must be considered and resolved during the project design process. If they are not, it is highly unlikely that the infrastructure created will be available for its projected life and realize expected development benefits.

In cases in which structures are on private land, for example, conservation terraces, designers must make sure that the economic benefits of maintaining the structures are sufficient to encourage the landowners to do so. Where individual economic benefits are insufficient to cover the costs of maintenance and the structures are critical to overall efforts, e.g., in cases of watershed management, appropriate incentives and assistance to landowners are indicated. Training in maintenance techniques should be included in project activities.

When public goods such as feeder roads are concerned, a governmental or quasi-governmental body generally is responsible for maintenance. The organization that will be responsible for maintenance should be identified and efforts made to create any additional resources it will need to undertake the new activity.

Managing and financing of maintenance is a chronic problem for government departments already struggling to meet existing commitments with limited budgets. Wherever possible, local financing (e.g. road user charges) and organization of maintenance should be considered.

Decentralization of responsibility for maintenance to the local authorities directly benefiting from the infrastructure may assist in improving maintenance performance.

Conflict Situation Modifications

Jeffrey Clark

1. Conflict, Conflict Resolution, and Humanitarian Assistance

The context in which international and non-governmental relief and development agencies provide humanitarian assistance to civilian populations affected by internal conflict is on the verge of what promises to be a radical transformation. There is an emerging consensus that existing codes, definitions of terms, and interpretations of international law with respect to such groups and their protection are dangerously inadequate and outdated. There is also some concurrent agreement that the UN and other agencies charged with carrying out humanitarian assistance are undermined by inappropriate mandates and inadequate guidelines no longer relevant to many situations. The validity of such a perspective is verified by the harsh reality of a series of catastrophes -- frequently massive famine -- that have affected millions of people in recent years around the globe, most often in Africa, despite the obvious physical means of averting widespread starvation and suffering. There has been a collective failure of the international humanitarian assistance system to respond adequately to the challenges faced.

A transformation in the international system of responding to the plight of internally displaced populations is already at hand. In Liberia last year a West African regional military force intervened to bring the chaos and carnage to an end. The international relief operation for the Kurds in northern Iraq -- an internationally sanctioned intervention across Iraq's borders ostensibly for humanitarian purposes -- is now winding down with vast implications for many other situations. The lessons of Operation Lifeline Sudan -- a unique case in which the United Nations (UN) and international community orchestrated relief efforts across both national borders and internal lines of conflict -- are being analyzed for application elsewhere.

There is today much more attention being paid to the whole concept -- and practice -- of conflict resolution. Various conflict resolution institutes and ad hoc groups are being established or expanded. Interventions by esteemed persons such as former U.S. President Jimmy Carter's efforts in Ethiopia, Nicaragua, Panama and Haiti to modify or end internal clashes reflects the realization that with recent Persian Gulf exceptions, it is primarily internal conflict that is destabilizing the world and placing millions of people in grim peril.

With such an examination comes debate over the traditional comprehension of "sovereignty." The automatic extension of the international rights of sovereignty to governments such as the current one in Khartoum (which came to power by an armed overthrow of an elected government and which has shown something less than minimal regard for the welfare of millions of people presumably its responsibility) is being questioned by many.

Voices are being raised from significant quarters that freedom from hunger needs to be elevated to the same level as freedom from torture as an internationally recognized right. The interference with non-governmental organizations (NGOs) operations in conflict zones by governments, as witnessed in the Sudan, is being countered by cries for the codification of human rights and the obligations of governments. A new ethic and morality is coming into view. The UN will not long be able to ignore such an ethic (and defend an interpretation of sovereignty that serves as a guise for the greatest of evils -- genocide) and still remain relevant.

The end of the Cold War offers both opportunity and peril for the resolution of conflicts. The apparent end to the horrible civil war in Angola with the attendant famine trapping vast numbers of peasant Angolans not involved in the conflict offers dramatic illustration of opportunity. The recent end to the thirty year civil war in Ethiopia, though a far more complex situation than Angola, can also be partially credited to the easing of superpower rivalry in Africa. But the near-total lack of attention to the present suffering in Somalia offers a glimpse of an unexpected price to be paid for an end to the Cold War: events even in areas formerly the scene of war or prolonged struggle by proxy but now deemed no longer relevant to the superpowers may simply be ignored -- with ominous implications for the affected populations.

The United States, hopefully emulated by other major bilateral donors, is poised to strengthen its humanitarian assistance mechanisms. Significant changes could take place at the UN relatively soon. The growing strength of non-governmental institutions in many developing countries increases the prospects for an early response to incipient famine situations. In short, the capacities of various players to mitigate conflict and provide relief in conflict situations are going to be strengthened. The implications of such an evolution of strength and capacity are encouraging.

Today, however, millions of lives continue to be affected by conflicts new and ancient. The long-predicted famine for the Sudan, with its roots almost entirely in internal conflict, has now commenced (current reports indicate significant numbers of deaths by starvation in several locations). The terror in Mozambique continues. Peace is hardly even a distant prospect in Liberia. No one knows the toll being suffered in Somalia. It is clear not only that the need for relief activities in conflict zones continues but that the efficacy of such operations has to improve dramatically.

New international accords and conventions on the rights of individuals caught by conflict await implementation. No one can say if Operation Lifeline Sudan and the recent intervention in northern Iraq are to be recognized as legal precedent. The international legal system is still stacked against "rebels" fighting central governments with obvious implications for relief operations. It is not clear to what extent the United States, the United Nations and other players will consistently make clear to governments or rebel groups that certain actions detrimental to civilian populations are inherently offensive to the world community. (Unfortunately, U.S. tolerance of UNITA's scorched earth policy in the Angolan civil war in which hundreds of thousands civilians suffered most egregiously offers scant encouragement on this front.)

What is clear is that efforts to reach more civilian victims of conflict and to lower their vulnerability and their susceptibility to famine, must proceed on multiple tracks to become more efficient.

The following pages offer illustrations of modifications of development and relief activities that can be applied by practitioners operating in zones of conflict. The listing is not comprehensive and few apply in all situations. One theme constant among those conducting relief/development activities in areas of conflict is that the modifications required are very situation specific. While general concepts emerge, it is critical that programs reflect the reality of their particular context. Thus the illustrations offered are meant to stimulate discussion and are themselves presented for modification and amplification.

The reader will see that many of the modifications offered share the goal of transferring operational expertise and the means of survival to indigenous agencies. Apart from the obvious objective of developing local institutional capacity for normal developmental reasons, the point is to reduce the dependency on expatriate relief workers subject to expulsion or evacuation as the tides of conflict shift. Another theme is the diversification of resources to lower the impact of hostile acts by various armed forces.

2. Modifications of Relief/Development Activities In Conflict Situations

It is perhaps telling that the modifications practitioners of relief/development programs need to consider when operating in areas of conflict remain largely uncodified. The literature on the topic is not rich. The observations of veteran relief managers tend to be anecdotal. Recommendations are frequently limited in application to a narrow grouping of situations. It may well be that in order to be relevant, the modifications of activities must stem from an astute analysis of specific conflict situations. The development of operational guidelines for specific conflict situations will frequently be required to be generated on site.

But several observations hopefully do lend themselves to a broader implementation. Such observations fall under a few general headings consistent with the organization of the Famine Mitigation Activity undertaking, but many transcend such a structure. The following points are therefore presented as observations from which specific recommendations, organized for the purposes of this activity, can be formulated by the participants in the workshop.

2.1 Situation Assessment: Information Gathering/Sharing

a) It is critical that the field staff of NGOs and other agencies operating in conflict zones remain aware of and sensitive to events inside and outside the country relevant to their situation. Current military/political and economic events and the status of any peace negotiation efforts underway, for example, are not merely of background interest to relief agency personnel, but elements central in meeting their responsibilities. Local political and security issues are often dramatically effected by such events.

b) Organizations have developed codes for communicating sensitive information to and from the field, including evacuation procedures for staff. (And it is important to note that if political factors, such as government concurrence, preclude an NGO from officially evacuating staff from a dangerous situation, it may have to rotate staffers out of the area for "leave" or "training." Frequent meetings in the field at which security issues are discussed is often warranted.)

c) NGOs more clearly and consistently recognize the "inherent political nature" of providing disaster assistance in conflict zones after several years' experience in the Horn of Africa and elsewhere. NGO officials cannot be silent on issues of access to food because that act itself (remaining silent) is political. There is a growing recognition that NGO staffs have to be more politically astute, must develop advocacy skills and become involved in "political issues" regardless of basic inclinations.

d) NGO headquarters must often communicate in a neutral way with all relevant parties to a conflict in order to negotiate access to all those in need. OxFam UK's candid communication with the Eritrean and Tigrayan rebel groups in northern Ethiopia facilitated their effective implementation of relief programs. In shifting situations like northern Ethiopia over the past few years, NGOs simply have had to have a broader scope of reference than operating with government approval if they are to be responsible and effective. Cross border operations are no longer isolated or rare. Relationship with the humanitarian arms of rebel armies are essential in many areas -- again as was the case in northern Ethiopian over the past decade.

e) A new and more significant relationship is emerging between NGOs and the UN system in approaching relief situations in conflict zones. Operation Lifeline Sudan could not have been carried out without the international framework created by the UN -- which provided access to conflict areas -- or by on-the-ground expertise of NGOs.

f) Working with the UN creates complications and restrictions for NGOs in many situations, however. The UN traditionally works only with central government approval and cooperation. It often tries to be negotiator and a relief coordinator -- despite the fact it is impossible to coordinate if working only from one side of the line of conflict. Until the mandate of UN agencies change, NGOs need to be careful about unintended and unhealthy restrictions on their operations.

2.2 Programming: Flexibility, Local Institution Building Critical Elements

a) Flexibility in development assistance is of central importance in general; in famine mitigation activities in conflict areas it is critical. Contingency plans need to be developed. Expectations need to be adjusted. The allocation of resources must be altered to match a shifting situation.

b) It is critical when working in a conflict area to reach beyond the "normal actors" in establishing a presence. NGO ties to the ministry of transportation may take on tremendous value when, for example, the task is to move relief supplies down the Nile

River on a barge. Relief agencies must shape and negotiate a framework in which relief can be provided.

c) The pre-positioning, and the scattered-positioning, of critical supplies -- food, medical supplies, etc. -- is essential. The assumption should be that supply lines could be interrupted at any point. A further assumption ought to be that supply depots are subject to raids by various combatants at any time. Therefore, supplies may need to be put into place early, alternate transport routes and means have to be identified and resources need to be somewhat scattered to prevent catastrophic consequences in case of adverse military acts. As many cushions as possible should be sought.

d) A highly organized NGO coordination mechanism needs to be established and maintained in conflict situations. More than elsewhere, NGOs working to preclude the onset of famine need to be organized to share information and resources. The swapping of food and other relief supplies needs to be facilitated to meet contingencies.

e) The specialization of NGO expertise in protracted conflict situations is becoming more pronounced. It is often highly advantageous for different agencies to take on special roles -- logistics, food commodity management, resource monitoring, animal vaccination programs -- so as to spread the reach in difficult situations. Tapping the comparative advantages of the various NGOs is essential in targeting assistance in conflict zones.

f) Data gathering and accurate record keeping is often more essential in disaster prone areas than elsewhere and is important for the transition into longer-term development activities. It is important to gather and keep good information on affected populations, nutrition levels, the movement of people, reservoirs of local resources and so on. The establishment of baselines and benchmarks is important in monitoring developments from one disaster to another to avoid starting from scratch each time and in avoiding the replication of mistakes.

g) The strengthening of local institutions is critical in disaster prone and conflict areas. The goal must always be helping people cope with disaster where they are, with their own mechanisms, with their own objectives in sight to the greatest extent possible. The management of relief activities ought to be undertaken with an eye to expanding the capacity of local relief agencies in maintaining the operation in case the international NGO is expelled or otherwise removed from the operation.

h) Frequently "soft" inputs to local agencies can have more impact over the long haul than the infusion of massive supplies from outside. There is a tendency, which we need to check, to measure the success of disaster operations by inputs rather than outputs. Emphasis on building strong counter-part relief agencies, stimulating local economic development, road building, and other infrastructure activities can be particularly critical in conflict zones. The goal, again, must be to help people cope with an ongoing situation even if the outside relief workers are not present. Relief programs should be seen as locally "owned and operated" to the extent possible.

i) The transfer of skills and responsibility to indigenous agencies is often more critical in conflict areas than otherwise -- though it is always of first importance.

j) Building on the skills people have is particularly important in working with refugees. People frequently have expertise or knowledge which can be drawn upon to improve the situation of stranded populations. The more programs are aimed at keeping people engaged and busy, the less they will become dependent and increasingly vulnerable.

k) It is critical to think through the possible disruptions of local communities prior to launching relief activities. Even imminent disaster or the proximity of conflict does not mean that the cohesive nature of groups, such as the Afar in Ethiopia, has been destroyed. It is critical to build from that cohesiveness, not destroy it.

l) The stimulation of the local economy is more critical, not less, in conflict situations. The point is constant from observations offered above -- people's vulnerability must be lowered, local coping mechanisms must be strengthened. The extent to which NGOs can rely on private local transport companies, mechanics, and suppliers in carrying out relief activities is an important factor -- sometimes critical -- in stimulating the local economy. The extent to which the local economy is stimulated is critical in lowering vulnerability. Projects that improve the local infrastructure are doubly important in conflict zones -- as people's dependence on the capital city or regional centers may be subject to interruption.

m) Buying surplus grain or vegetables from local farmers for feeding programs is obviously many times more advisable for a host of reasons than depending solely upon food aid shipments from abroad.

n) The selling (monetization) of food supplies by NGOs in disaster prone areas where there is some money but little food can keep at least some people from becoming dependent upon handouts. The constant stimulation of the local economy is essential.

o) A reconsideration of traditional rural programming bias by NGOs in conflict zones can often be warranted. In countries such as Mozambique and Somalia, urban programs for those fleeing conflict can be critical to the survival and welfare of hundreds of thousands of civilians. Save the Children has a special program to provide vocational, literacy and numeracy training and counseling to 30,000 street children in Addis Ababa, for example. Thousands of children in the Sudan have lost up to six or seven years of schooling as a result of war. Shifting emphasis to literacy projects costs little, offers little target to combatants and helps children survive not just war but its aftermath.

p) Some NGO staff members are advocates of negotiating "safe planting zones" for conflict zones. The concept is simply to apply the principles of "safe passage" to the growing of food for local civilian populations. Such an approach is obviously a difficult one to implement and would not work everywhere. But it could be applied selectively. If the national army and the rebels in El Salvador can agree on "immunization days," then such an effort could be explored in selected situations.

2.3 Project Implementation: Modifications

a) NGOs are increasingly seeking ways to implement "traditional" development projects even in conflict zones, believing that infrastructure investments remain the highest priority to reduce local vulnerability. It is also critical to be prepared to move toward such traditional objectives as often and as quickly as possible if a situation stabilizes. Ending a relief operation on a timely basis is as important as starting before famine evolves from drought or other causes. Ending the artificial dependency of people on relief supplies is essential.

b) Low cost, low profile projects such as tree planting, the provision of veterinary medicine, demonstration farm and nursery projects, erosion control, drip agricultural irrigation schemes and food preparation and preservation are preferred by many NGO staffers for conflict zones. Such projects tend to offer less of a target for competing armies, shore up local capacity and have long-term positive implications for development.

c) The provision of seeds and tools -- "ag packs" -- in combination with the training of extension workers and lead farmers is a critical element for effective response to potential or manifest famine in conflict zones. such efforts have several virtues -- low cost, low overhead, low technology dependence, low profiles, long-term value, etc. They can be packaged for short-term crops (especially important in areas where the line of conflict changes dramatically and frequently, as in the Angola conflict) and they are portable. By encouraging inter-cropping and multi-cropping and the growing of a nutritionally balanced crop, the ag packs can reduce the vulnerability of people periodically inaccessible to relief agencies, as seen by the experience of World Vision in Mozambique. Ag packs that utilize local crop production are doubly effective.

d) Even in conflict zones, NGOs have had some success insetting up rather simple agricultural research centers at which local farmers are actively involved in experimenting with the growing of appropriate food varieties.

e) Small water projects (at the village level) are, as always, critical for maintaining the health and viability of people subject to drought or the cut-off of the water supply at regional centers by conflicting armies. The best approach may be to provide inexpensive pumps in return for work on infrastructure projects. The point again is to disperse survival resources to the extent possible.

f) Catholic Relief Services is providing employment for over 18,000 families in Ethiopia on soil conservation, tree planting and spring development as well as access road construction and maintenance. The project purposes are multiple, but the design intended to lessen the prospects that drought in combination with conflict would force people to leave their homes in search of food and water.

g) By shifting responsibility to indigenous partners, Save the Children managed to keep a family planning and community health project operating during various stages of famine in Ethiopia. By training Afar pastoralists as community veterinarians, Save the Children

has helped reduce that's group vulnerability to the disruption caused by conflict. The emphasis of Save the Children was to train local counterparts, not to manage the activities.

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Appendix A

Resource Papers for the Tucson Meeting

Sustainable Resource Management Based on a Decentralized Food Security Monitoring System

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1. Introduction

The dilemma facing limited-resource farmers throughout Africa when coping with threats to their household food security involves a basic trade-off between immediate subsistence and long-term sustainability. When the viability of the household as a productive and reproductive unit is threatened by food shortage, farmers often must employ strategies that increase immediate income sources and subsistence levels but that have detrimental consequences for the natural environment. Recognizing the long-term negative consequences of such actions, rural households will only pursue these activities out of desperation when all other options have been exhausted. Given that there is a patterned response on the part of households to any food crisis, timely interventions could provide limited-resource families alternative means to meet their food security needs before turning to unsustainable strategies. This paper outlines the steps that can be taken to establish a decentralized food security monitoring system that will allow for timely interventions that contribute to sustainable management of natural resources.

1.1 Background

Households do not respond arbitrarily to variability in food supply. People who live in conditions that put their main source of income at recurrent risk will develop self-insurance strategies called "coping strategies" to minimize risk to their food security and livelihood (Corbett 1988; Longhurst 1986). Examples of such strategies include changes in cropping and planting practices, seasonal migration, collection of wild foods, use of inter-household transfers and loans, food rationing, and sale of livestock and household assets (Corbett 1988). The particular coping strategies selected by a household will vary according to: 1) the exact sequence of events resulting in food insecurity; 2) local market conditions; 3) the main source of livelihood; and, 4) the resource endowment at the start of the food crisis (Corbett 1988). Evidence from Africa and Asia has demonstrated that common patterns in coping strategies can be identified (Corbett 1986; Downing 1988; Longhurst 1986; Malambo 1987). In essence, food crises have a logical structure that is predictable. Households will restructure their farm activities to maximize the availability of products and minimize current commitments in the allocation of resources, before beginning the process of disposal of goods and livestock, borrowing, mortgaging, and out-migration (Watts 1988).

In communities marked by landholding and income inequalities, household responses are not the same (Longhurst 1986; Tobert 1985). Indeed, identical climatic conditions can affect households of varied economic levels to different degrees. Seasonal shortages for some families produce famine conditions for others. Poorer households, having smaller holdings and a weaker resource base, are more vulnerable to stress than are wealthier households, and begin to suffer earlier when food shortages hit. The poor resort to early sale of livestock, pledge farms, incur debt, sell labor, and borrow grain at higher interest rates (Watts 1988). In essence, crop failures reveal rather than cause the fragile nature of food security among vulnerable rural families. At the same time, prosperous households buy stock at deflated prices in conditions of oversupply, sell or lend grain to needy farmers, purchase wage labor at depressed rates, and purchase land (Watts 1988). Thus, during a food crisis, a cycle of accumulation and decapitalization can occur simultaneously within a single community.

As drought conditions worsen and conditions of food insecurity persist, the range of options available to resource-poor farmers becomes more limited and inflexible. In such situations, questions of long-term environmental sustainability become secondary; day-to-day survival demands the use of any food procurement strategy available. Particularly in areas like the Sahel, where persistent drought is coupled with increasing population levels, less destructive practices are more quickly exhausted, hastening the onset of desperation strategies.

The unsustainable strategies that resource-poor farmers employ can serve as indicators for an impending crisis. As farmers exhaust the strategies that are available in the early stages of food crisis (e.g., reduction of consumption levels, harvesting of wild foods, changes in cropping patterns, sale of small livestock and household valuables), they begin to dispose of productive assets in an attempt to stave off total dissolution of the household unit. Should these strategies prove ineffective, farmers may then resort to the more destructive practices such as cutting trees to make charcoal, overharvesting wild foods, overgrazing grasslands, and expanding cultivation into marginal areas.

Awareness of local coping strategies, and ongoing monitoring of local conditions and of trends in strategies being employed (e.g., exhaustion of assets, depletion of stores, increased migration), can alert development agents to areas where immediate interventions may be needed. These areas can then be targeted for development plans that enable farmers to prolong the effectiveness of nondegrading coping strategies.

2. A Decentralized Food Security Monitoring System

The generalized patterns of coping strategies discussed above find practical application as tools for food security monitoring. Rather than focusing strictly on the outcome of farmer responses to production constraints and food crises, researchers and development practitioners can develop methodologies that monitor the processes by which households cope with food insecurity. Monitoring these processes will improve famine early warning systems as well as guide interventions for increasing farm productivity.

Building upon the work of the World Food Program (WFP), there are three types of indicators that can be monitored for changing coping responses, thus suggesting worsening conditions and heightened food insecurity. Leading indicators (WFP refers to these as Early Indicators) are changes in conditions and responses prior to the onset of decreased food access. Examples of such indicators include: 1) crop failures (due to inadequate rainfall, poor access to seed and other inputs, pest damage, etc.); 2) sudden deterioration of rangeland conditions or condition of livestock (i.e. unusual migration movements, unusual number of animal deaths, large number of young female animals being offered for sale); 3) significant deterioration in local economic conditions (i.e. increases in price of grain, unseasonable disappearance of essential food stuffs, increases in unemployment among laborers and artisans, unusual low levels of household foodstocks); and, 4) significant accumulation of livestock by some households (due to depressed prices caused by oversupply). Leading indicators can provide signs of an impending problem and may call for a detailed situational analysis to determine the extent of the problem, causes, and need for monitoring.

Concurrent indicators (WFP calls these Stress Indicators) occur simultaneously with decreased access to food. Examples of such indicators are: 1) larger than normal migrations of able-bodied family members in search for food or work; 2) appearances in the market of unusual amounts of capital goods - jewelry, farm implements, livestock (draft animals); 3) unusual increases in land sales or mortgages; 4) increases in the amount of people seeking credit; 5) increased dependence on wild foods; 6) reduction in the number of meals; and, 7) increased reliance on interhousehold exchanges. Concurrent indicators can be assessed while carrying out situational analysis using rapid rural appraisals. Once the nature and extent of the problems have been confirmed, interventions can be introduced that focus on the causes or mitigate the effects.

Trailing indicators (WFP calls these Late Outcome Indicators) occur after food access has declined. They reflect the extent to which the well being of particular households and communities have been affected. In addition to signs of malnutrition and high rates of morbidity and mortality, trailing indicators include increased land degradation, land sales, consumption of seed stocks and permanent outmigration. All of these indicators are signs that the household has failed to cope with the food crisis.

Focusing on coping strategies reveals the actual behaviors of farm households that adverse climatic or market conditions have provoked. Such an orientation allows for an ongoing monitoring of the processes by which people adjust to changing circumstances.

3. Community Participation

Focusing on household coping strategies as an essential part of a decentralized nutrition monitoring system will enable communities to actively participate in monitoring efforts. By compiling this information on household responses, a system can be established based on indigenous strategies for coping with household food insecurity. Local community members can be trained to use an easily learned system for monitoring indicators. Although this system will rely heavily on intuitive assessments by local monitors, information will be

collected on standard indicator categories for targeting interventions by the national government. These can be replicated should there be changes in project personnel. Some examples of these indicators are changes in market prices for staples, changes in the type of assets being sold (liquid vs. productive), increased out-migration, increased environmental degradation, and greater reliance on wild foods. Indicator categories would be grouped according to the three types of indicators discussed above (i.e., leading, concurrent, trailing).

4. Complementarity to Early Warning Systems

To effectively monitor the food situation for a given region, systems must be established that can effectively identify those areas that may be experiencing an emergency (early warning), and that can gauge the magnitude of the potential emergency (assessment). Early warning systems such as the Famine Early Warning System (FEWS) and the Global Information and Early Warning System (GIEWS) operated by FAO have been very effective in accomplishing the first task, through use of satellite remote sensing, but have not been as successful accomplishing the second. In the case of FEWS, the magnitude of the emergency is suggested by: 1) the physical data (precipitation amounts; satellite-derived vegetation indices) describing the current year compared against long-term mean values or reference years; and, 2) reports from host-country ministries relayed to Washington by project personnel. Manpower constraints have limited FEWS personnel from assessing regional food situations first hand and there are problems with relying on data produced by host country ministries. These data suffer from the inherent weakness of reporting systems and, frequently, there are political and economic incentives to either over or under report production figures.

GIEWS differs from FEWS in a number of ways. First, GIEWS reports on all countries, but concentrates on Africa, the Middle East and South Asia. In these regions of special interest, like FEWS, it relies heavily on region-wide ground meteorological observations and satellite-based data site. Second, for the assessment component, GIEWS is built on a food balance sheet approach in which estimated food need is compared to projected crop production, food imports and stocks. Thus, the magnitude of the emergency is measured in immediate food needs. Third, when potential trouble spots are identified, special missions are dispatched to assess conditions on the ground. However, GIEWS also suffers from the inaccuracies of host-country reports. While the use of field missions does help considerably to compensate for inherent weaknesses in the data, they are still aggregate data and tell little about the extent of the emergency at the community or household level.

Despite these local assessment problems, FEWS and GIEWS are valuable tools for systematic expert analysis of food production and supply data on a national level. The proposed food security monitoring system complements these national early warning systems by providing more fine tuning of assessments on a localized level (disaggregated data).

Recognizing that households pass through different stages in coping strategies will help planners identify key indicators for early warning of impending food crises. A thorough understanding of these coping strategies will enable development agencies to more

accurately interpret consumption indicators such as asset sales, price movements and levels of undernutrition (Campbell and Trechter 1982; Corbett 1988). Famine warning systems need to be localized because few indices are universal indicators of impending famine (Corbett 1988; Campbell and Trechter 1982).

5. Targeting Sustainable Management of Natural Resources in a Timely Manner

During drought years, relief efforts can be instituted which target resource improvement and promote better resource management. Rather than an outright distribution of food, cash-for-work or food-for-work programs can be implemented to promote efforts in soil conservation, water harvesting, and reestablishment of forest reserves. These types of work programs not only provide relief in crisis years, but they do so in a way that does not create farmer-dependence on outside aid, and allows farmers to retain productive assets. If only men are participating in cash-for-work programs, a food-for-work program can be instituted which better ensures female participation. This improves the distribution of relief aid to children and others within the household. Work programs in bad years can help to improve the resource base of a local area, reducing the vulnerability of local communities to future drought years when farming is not a viable strategy for survival. In this way, scarce government finances can be conserved and applied to the most vulnerable areas when relief is most needed.

6. Private Voluntary Organization (PVO) Involvement

To effectively establish food security monitoring systems in food deficit areas, PVO involvement is essential. A number of PVO's have been very active in food-for-work and cash-for-work programs in Africa for the past several years (Bryson et.al. 1990). This work often began as emergency relief assistance but evolved into development assistance with a capability for early response to food shortages.

It has become apparent that maintaining a PVO presence in disaster prone areas is critical for adequate response to famine (e.g. Ethiopia). CARE, CRS, WVRD, and SAVE all have large commitments in disaster prone countries. Such a presence provides a basis for mobilization and expansion of food assistance. Almost all of these groups maintain food stocks, trucks, warehouses, experienced staff and good relationships with local communities. This logistical support is vital to timely interventions.

PVOs also have considerable experience in promoting natural resource management improvements. This experience will provide valuable input into cash-for-work or food-for-work programs aimed at soil conservation, water harvesting, and reestablishment of forest reserves. For example, WVRD has been actively involved in promoting such efforts in Mali (Bryson et al. 1990).

Another area where PVOs have made an impact is in training local populations in extension practices. For example, CARE personnel are involved with training people from local communities in extension activities related to soil conservation (Ethiopia). PVOs could provide training for local community members in monitoring consumption indicators.

To effectively involve PVOs in regional food security monitoring systems, the following steps should be taken. First, administrative procedures need to be instituted to allow food-for-work programs to be adapted to community programs. Operational arrangements need to be developed for community management of projects.

Second, food-for-work and cash-for-work programs implemented by PVOs need to be well integrated into national food security monitoring systems. Early warning systems should be built upon two-way communication to improve assessment capabilities. PVOs need to be assured that their input is taken seriously when localized food deficits are identified. Formalizing the data collection may elicit the appropriate donor and government response.

Third, PVOs need to be assured that establishing regional food security monitoring systems will not overburden local staff. Ways should be sought to integrate monitoring systems into ongoing activities of PVOs. Collaboration with indigenous NGOs could increase the efficiency of such monitoring efforts.

Before implementing a food-for-work or cash-for-work initiative in a given area, past PVO experience indicates that several factors should be taken into account. In regions that are food deficit areas, food-for-work programs may be more appropriate. Food-for-work may also be more appropriate for areas where project activities are targeting poor households and women. In addition, land tenure issues must be carefully examined prior to proposing community-based food-for-work programs.

7. Data Needs for Implementing a Food Security Monitoring System

In addition to PVO involvement, a number of kinds of information will be needed to effectively establish a food security monitoring system. These different types of data are the following:

- Risk Mapping - The vulnerable areas within a country or region need to be identified. Such information will include vulnerable population groups and infrastructure.

- Analysis of Disaster History - In areas that have experienced previous disasters, considerable information can be gathered that will help preparedness efforts. Such information might include the causes of the food deficit, the types of responses that were implemented, the constraints to implementation, and the effectiveness of the responses. Such information will help determine weaknesses and constraints for given areas and potential interventions that could be used.

- Baseline Data on Drought Prone Areas - Information on the agroecological, socioeconomic, and nutritional situation in a given region should be collected for each of the vulnerable areas. If the information does not exist, it can be gathered using rapid rural appraisal techniques.

- Analysis of Response Capability - As part of the regional assessment, information should be gathered on resources available in each vulnerable area that can be mobilized when needed.

- Inventory of Potential Interventions - In vulnerable regions, consideration should be given to potential interventions that can be pursued using food-for-work or cash-for-work programs. This may involve expanding the coverage of ongoing projects or having on-the-shelf projects that are preplanned and can be implemented during food crisis periods.

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A Methodology for Conducting Reconnaissance Surveys in Africa

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1. Introduction

Reconnaissance surveys (informal surveys, rapid rural appraisals, sondeos, etc.) are quick, informal, cost-effective surveys that attempt to characterize the farming systems found within a region. These surveys are usually implemented at the beginning of a Farming Systems Research (FSR) project to rapidly familiarize researchers with the key constraints facing farmers within a target area. Five distinguishing attributes of such surveys were identified by Steven Franzel (1984). These included:

1) "Farmer interviews are conducted by researchers themselves, not by enumerators, as in formal surveys." (Franzel 1984:2);

2) "Interviews are essentially unstructured and semi-directed, with emphasis on dialogue and probing for information. Questionnaires are never used; however, some researchers use topical guidelines so as to ensure that they cover all relevant topics on a given subject." (Franzel 1984:3);[1]

3) "Informal random and purposive sampling procedures are used instead of formal random sampling from a sample frame." (Franzel 1984:3);

4) "The data collection process is dynamic, that is, researchers evaluate the data collected and reformulate data needs on a daily basis." (Franzel 1984:3; see Honadle 1982);

5) "Informal surveys are generally conducted over a period of one week to two months during the growing season." (Franzel 1984:3);

Recently, the role of the reconnaissance survey in farming systems research has increased in importance relative to the formal survey (Franzel 1984:3). According to Franzel (1984), this trend can be attributed to the advantages the informal survey provides in

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[1] There is a difference of opinion as to whether topical outlines should be used. See Hildebrand 1981 and Collinson 1982.

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diagnosing farming systems, such as: "1) the low cost and rapid turnaround; 2) the emphasis placed on direct researcher-farmer teamwork; 3) its sequential, iterative data collection procedure in which data are evaluated and data needs are reformulated on a daily basis; 4) it facilitates interdisciplinary interaction; and 5) its conduciveness to collection of data concerning farmers values, opinions and objectives" (Franzel 1984:3).

Despite these advantages, reconnaissance surveys do have some shortcomings. First, researchers cannot be certain that farmers interviewed in the survey are representative of most farmers in the region (Franzel 1984:4). This is due to the way farmers are selected for interviews. Thus, statistical testing is not usually possible (Shaner et al. 1982). Second, such surveys may not be sufficiently focused to determine the relative importance of factors limiting production opportunities for farmers. Therefore other diagnostic procedures may be required to verify and fine-tune hypotheses generated by informal surveys. For instance, confusing and difficult to interpret aspects of the existing system may be investigated through the use of more focused, topic-specific formal surveys.

In spite of these limitations, reconnaissance surveys have come to play a critical role in the diagnostic phase of farming systems research. Therefore, it is essential that the methodology for conducting such surveys continues to be developed and fine-tuned as experience with the technique accumulates. The purpose of this paper is to outline a stepwise procedure for conducting such surveys that was implemented by the authors in a recent study in Liberia (Frankenberger et al. 1984). This procedure should be viewed as a complementary alternative to informal survey procedures previously described in the literature (see Hildebrand 1981; Rhoades 1982; Collinson 1982).

This methodology will be presented as a series of important considerations that FSR teams should address prior to, during and after conducting reconnaissance surveys. The ultimate response to each consideration will be variable and highly dependent upon the circumstances and setting in which the study is conducted. These considerations are presented in an outline format beginning with the major objectives of the study.

2. Methodology

I. Determine What Are the Objectives of the Study - This should be done in collaboration with all participating organizations and institutions involved or directly affected by the research. This step helps insure that all groups involved understand the goals of the research and that information that is given high priority is collected by the team. Unfortunately, if several organizations and institutions are involved, reaching consensus regarding the objectives will be more difficult. The following list consists of some of the possible organizations and institutions whose input might be sought in deriving objectives.

A) Collaborating institutions (universities, consulting firms, etc.)

B) USAID, Washington

C) USAID Mission

D) In-country Research Organizations

E) Regional Development Organizations

II. Determine Who Should Be the Participants in the Diagnostic Research - The make-up of a reconnaissance survey team will vary from one project to another, depending upon the resources available and context of the research. Useful considerations for devising such teams are as follows:

A) Minimal Pair - The minimal pair should consist of at least one social scientist and one physical/biological scientist.

B) Expansion of Team - Decisions regarding the expansion of the team should be determined by:

1) Focus of the project - Is the project being implemented in a wide geographical area? Is it concentrating on more than one crop/livestock enterprise?

2) Environmental/socioeconomic setting - Is the environmental/socio-economic setting extremely complex?

C) The Maximum Number of Team Members Should Be About Six - Six is a good number because it is about all that can comfortably fit into a typical field vehicle, such as a land cruiser. Given the shortage of project vehicles usually available for such survey work, one vehicle may be all that the team can obtain. The team should consist of an equal distribution of social scientists and physical/biological scientists. Other important considerations in putting together a team are:

1) Include female researchers on the team - Make an attempt to include at least one or two females on the team. This could help in situations where researchers are not allowed to interview the females of a household. This is extremely important in situations where females are responsible for a considerable proportion of the farm labor;

2) Use local scientists as much possible - Teams should consist of local scientists rather than a number of expatriates brought in from outside. The maximum number of expatriates on a team should be about two;

3) Attempt to include an extension person on the team - Collaboration between research organizations and extension can be greatly facilitated by including extension personnel early-on in the project. The knowledge that extension personnel have about an area may provide insights into the constraints that farmers are facing, and such information can be extremely useful to the other scientists. However, care must be taken to insure that biased views on the part of some extensionists do not over-influence the teams perceptions of the situation.

III. Review the Existing Literature - Ideally, team members who are going to conduct a survey are already acquainted with the area to be studied or are familiar with the literature. However, this is not always the case. Thus, it is important for team members (especially expatriates) to review the existing literature in-country for at least one week prior to going to the field. Such literature includes books, research reports, government documents, fugitive papers and any other materials which will help familiarize the team with the area to be studied. Begin this literature search with the AID Mission, local libraries, and library at the research station.

IV. Collect Background Information From Knowledgeable Personnel Such as Local Government Officials, Project Personnel, AID Officials, and Other Resource Persons - When contacting these individuals, be aware of the following:

A) Networks of Knowledgeable People - Follow-up leads given by contacted persons regarding other knowledgeable sources. Be aware of the fact that there are networks of knowledgeable people to which you need to gain access.

B) Inquire About Other Written Materials From Each Person Contacted - Through this process, the team can accumulate a sizable amount of material in a very short time.

V. Obtain Maps and Letters of Introduction From the Appropriate Officials - Maps of the area to be surveyed can usually be obtained from geological survey offices within the capital city. Sometimes updated maps may be obtained from agricultural development projects working in the region to be studied. In addition to maps, it may be useful to have letters of introduction from Ministry officials to facilitate collaboration with regional officials and to insure access to the study area. AID Mission personnel may help the team members obtain such letters.

VI. Prior to Conducting the Survey, Contact the People Who Will Use the Results of the Study to Elicit Their Support, Data Needs, and to Obtain as Much Information About the Area From Them as Possible - This interaction will help delineate the research and political limitations. For example, when working with a research station, contact the administrators, department heads and other important personnel (expatriate advisors) to clarify objectives and to elicit information needs. If the team has not been selected or constituted prior to these meetings, the administrators and department heads should participate in the selection process. Criteria for the selection of the members could be discussed with these research station personnel. (see Step II.)

VII. Team Members Should Come Together to Formulate a Topical Outline to Be Used in Guiding Interviews Prior to Going to the Field - Important considerations for constructing such a topical outline are the following:

A) Consult Other Topical Guides to Insure that Major Topical Areas Are Considered - For instance, if previous sondeos or reconnaissance surveys have been done in the area, these should be reviewed. In addition, the topical lists put together by Collinson

and CIMMYT and outlines used in surveys in other countries may be worthwhile to review (see Annex 1).

B) Use the Information Obtained From Secondary Data Sources to Devise the Topical List - Topics may be derived from a variety of sources such as:

1) Written reports;

2) Interviews with resource persons;

3) Information needs of research personnel;

4) Previous Knowledge of team members; and

5) Prior research experience.

C) Consensus Should be Reached Among the Team Members on Every Topic Included in the Outline -This insures that all team members are satisfied with the topics chosen for the outline.

D) The Development of This Topical Outline can be a Crucial Team Building Exercise - This process allows each of the team members to express his/her concerns, interests and biases up-front. This is a time-consuming process. The key benefits derived from this exercise are:

1) It allows the team to function as a single unit or entity;

2) The disciplinary concerns of each member are incorporated into the outline; and

3) Survey priorities are established before going to the field.

VIII. The Topical Outline Should be Tested Prior to Going to the Field - This test can be conducted in a village near the research station before initiating the survey. This procedure will allow the-team to determine the appropriate manner in which to ask some questions and help them refine their interviewing techniques. Following this pretest, tables can be constructed from the topical list that allow for the transfer of data from field notes to a comparative format. These tables have two useful purposes:

A) The Tables Allow for Continual Comparisons Among Farmers Which Helps Focus the Discussion Between Team Members; and

B) The Tables Provide a Means for Immediately Evaluating or Checking the Completeness of the Field Notes - However, sometimes team members will not want to pursue all the topics on the list in order to obtain more detailed information on a

particular aspect of the system. In such cases, the tables will be deliberately incomplete.

XI. Target Area Selection - Often the choice of target area is made in advance of research participation. If there is some flexibility in the choice of the area, the decision should be made in conjunction with the collaborating institutions (i.e., the research organization, development organization, USAID Mission, research station administration/researchers, etc.). Important points to consider when choosing a target area are:

A) When Considering the Target Area, Be Sure to Consider What Can be Reasonably Covered in the Time Allotted - Coverage will be influenced by a number of factors such as environmental uniformity, technological development, socioeconomic conditions, infrastructural development, and access during the rainy season. Compromises may have to be made concerning the amount of time to spend in each demarcated region. The team should plan to spend more time in regions where the agricultural systems are more diverse/variable than in regions where they are more uniform if this can be determined in advance.

B) The Team Should Draw Up a Schedule, Specifying the Number of Days to be Spent in Each Demarcated Region/Area as Well as for Travel, Discussing Results, and Writing - Building in some flexibility in this schedule is extremely useful.

X. When the Team Arrives in A Region to be Surveyed, It Should First Contact Local Officials to Establish Collaborative Links and to Elicit Their Help - Such officials might include regional Administrators, regional project personnel, and/or regional extension officers. These contacts serve two useful purposes:

A) These Individuals Can Help Select Potential Villages for the Survey Based on their Knowledge of the Area; and

B) The Information Needs of These Regional Administrators Can Be Elicited During These Initial Contracts to Insure That the Survey Results Might Be Useful to Them - However, it is important to realize that the objectives of the regional officials may be in conflict with those of the research organization. Thus, it is important for the team to establish its priorities regarding the information it plans to gather even if these are not consistent with the objectives of the regional officials.

XI. Village Selection - There are a number of factors that should be taken into account when selecting villages for the survey. These include:

A) Location in Relation to the Base of Operation - Aside from using variable direction as a selection criteria, distance from the base of operation should be considered for future on-farm trials. Typically, on-farm trials should be within about one hour's drive from the local base.

B) Size

C) Access to Roads

D) Institutional Complexity (Infrastructural Development)

E) Ethnic Distribution (Tribes or Sub-Tribes)

F) Prior Contact of Villages Before the Survey May or May Not Be Necessary and Advantageous - For instance, in Liberia, the survey team found that prior contact was not advantageous for it made the team's arrival a political event. In other areas of the world this may not be the case. The research team should use its best judgement on this matter.

XII. Upon Arrival in the Village, the Team Should First Meet With the Village Leaders and explain to Them, and Other Villages Present, the Purpose of the Study - In this initial meeting, the team members can explain who they represent, what the results will be used for, and why so many questions will be asked. While the group is assembled, general inquiries can be directed to them regarding village infrastructure, land tenure arrangements, sources of credit, marketing, typical labor arrangements and project interventions.

XIII. After the Initial Inquiries With the Assembled Villagers, the Team Should Split up into Groups of Two to Conduct Interviews With Farmers - If the team members do not know the language, a translator should accompany them. Three important points should be taken into consideration when conducting these interviews:

A) Interviews Should be Conducted With the Farm Family, Not Just the Male Farmer - Both the husband and wife should be present for the interview if possible. This is because the woman of the farm household may be responsible for a considerable amount of the labor performed in the fields. This is especially true in most African societies.

B) Interviews Should be Conducted on the Farm Household's Fields, Away From the Village -- This is to enable the researchers to see the fields they are inquiring about and to obtain answers and opinions specific to the farm family being interviewed rather than the group consensus. In addition, farm families are more likely to believe that the researchers are committed to helping them if the researchers make the effort to come to their fields. As a consequence, the farm families responses are likely to be more truthful. However, it would be counter-productive if the team spent all of the time walking to distant fields. Thus farm families should be selected whose fields are less than one hour walking distance.[2] Using this interviewing strategy, each pair of researchers should be able to interview at least two farm families in a day. In those situations where only partial interviews are conducted, more farmers can be interviewed.

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[2] Occasionally, the researchers will want to interview farmers with fields farther than one hour away to see if there are major differences with those fields which are close to the village.

C) Team Members Should Not Work With the Same Research Partner Every Day - (see Hildebrand 1981b) Rotating team members on a daily basis gives each researcher an opportunity to work with and learn from the other team members. This greatly facilitates the exchange of ideas and helps establish better communication between team members. Ideally, one social scientist and one physical/biological scientist will be matched up in each pair.

XIV. After Interviews With Farm Families are Completed for a Selected Village in a Demarcated Area, the Team Members Should Get Together to Formulate Hypotheses About the Farming Systems That Characterize that Region - This procedure helps summarize the important attributes and constraints of the farming systems and provides a basis for comparison when survey work is started in other demarcated areas. The team should reach a consensus for every hypothesis formulated. As with the development of the topical outline, the process can be a crucial team-building exercise. This procedure of hypotheses formulation should be done for every demarcated area that is surveyed.

XV. Once the Survey is Completed and Hypotheses Have Been Derived for Each Demarcated Area, General Hypotheses Can Be Formulated That Apply to All Regions Surveyed - These General hypotheses identify farming system characteristics that are commonly found throughout the surveyed area. This process helps sift out those characteristics that are unique to a given demarcated area. Once again, the team should reach a consensus on all general hypotheses formulated.

XVI. After the General and Specific Hypotheses Have Been Formulated on the Attributes and Constraints of the Existing Farming Systems in an Area, the Team Members Should Derive a Series of Recommendations to Help Alleviate the Identified Constraints - Team consensus should be reached on all recommendations proposed. In addition to being another team-building exercise, this activity gives the team members an opportunity to combine their various disciplinary expertise in formulating possible solutions. In some cases, the team may be called upon to prioritize these recommendations. However, this last step may be handled by the research organization.

XVII. The Results of the Reconnaissance Survey Should Be Written Up in a Time-Effective Manner - Three important points to consider in writing up the report are:

A) The Format to be Followed for Organizing the Report Should be Devised by the Team Leaders;

B) To Facilitate the Write-up, the Team Leaders Should Assign Each Member a Port on of the Report to be Written - When the sections of the report are being assigned, team members should be able to negotiate for the portions they want to write. Flexibility in these assignments is very important;

C) The Finished Report Should be Attractively Packaged - If the report has an appealing cover and is well printed, it is more likely to be taken seriously and more likely to be read.

3. Summary

Due to the increased emphasis placed on time-effective diagnostic research techniques in recently implemented farming system projects, reconnaissance surveys have come to play a more critical role. The primary objectives of this paper has been to identify the major attributes of reconnaissance surveys and to outline a stepwise procedure for conducting them. This procedure was based on the methodology used by the authors in a recent study in Liberia. Viewed as a complementary alternative to other informal survey procedures previously described in the literature, it is hoped that this presentation will help further the development and refinement of such techniques. Such fine tuning should continue as experience with these techniques accumulates.

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Annex 1

Topics of Inquiry

Farming Systems Research Reconnaissance Survey of the Senegal River Valley

GENERAL VILLAGE QUESTIONS

1. Village characteristics

   A. Size of village (number of households or population)

   B. Institutional development

Schools	Health clinic
Market (periodic or permanent)	Other government offices
Access to water	Access to roads
	Milling operations

2. Demographic characteristics

   Ethnic affiliation
   Tribe
   Other social distinctions

3. A. Kinds of crops grown (e.g., sorghum, millet, neibe, watermelon, vegetables, citrus, groundnuts)
   B. Sequence of crops
   C. Length of fallow
   D. Indicators for determining when land can be fallowed
   E. If rains returned, would farmers de-emphasize irrigated agriculture and return to rainfed farming

4. Irrigation system

   General characteristics

   Type of perimeter (large or small)
   Perimeter area
   Cropped area

Location on river (fonde, walo, other)
Soil type
Source of water

Water lifting method
a. pump origin/brand
b. pump size/capacity
c. maintenance program
d. power source
e. parts availability
f. operation (village operator; SONADER; other)

5. Wild foods

Kinds (names)
Uses
Where found
Tree crops

6. Gum arabic

Availability
Economic utilization

7. Trees used for firewood

Names

8. Citrus (orchard vs. garden)

Economic utilization

9. Bananas

Economic utilization

10. Mangoes

11. Interaction between sedentary farmers and nomadic groups

Complementary

Grazing of crop residue
Manure for fields
Products sold to farmers
Products sold to nomads

Competitive

Grazing in fields before harvest
Competition for water
Communal grazing resources

12. Migration routes of transhumants

13. Wild game

Availability

14. Fishing

Traditional fisheries (location)
Fishing patterns
Importance of fish in diet (fresh vs. dried)
Marketing (sales and purchases)

15. Other sources of income

Off-farm employment

Seasonal migration (other agricultural schemes, urban employment)
Local off-farm employment (shops, mills, itinerant trading, government employment, charcoal manufacture)
Arts and crafts
Farm labor
Remittances
Where have most migrants gone and why
How many have left
How many have returned
Other enterprises

16. Credit

Sources

Credit associations
Government loans
Relatives or local merchants
Cooperatives
Others

Terms (period, interest, grace)
Loan justification (social, production improvements, sickness, home improvement)

17. Consumption

    A. Food preferences

       Crops
       Meats

    B. Food habits

       Who eats with whom
       Number of meals (timing and composition)
       Main meal
       Order of eating

    C. Foods by season

    D. Culturally prescribed foods (infants, lactating women, elderly)

    E. Food distribution programs

       Free food
       Food for work
       Market stabilization

18. Health

       Government-provided medical services
       Traditional medical practices

19. Environment

       Energy sources and amount consumed daily (charcoal, wood, manure)
       Location of resources consumed
       Energy costs (price or effort for gathering in terms of hours per day)
       Secondary impacts of exploitation (erosion; sand encroachment)
       Local reforestation projects
       Preferred trees
       Preferred locations for plantings
       Shelterbelts and shade trees
       Have well levels changed (ask women)

20. Project interventions

21. Constraints elicited from farmers

22. Possible interventions

SPECIFIC HOUSEHOLD QUESTIONS

1. Composition of household (participants on the family farm)

   Adults
   Education of household members
   Children
   Outmigration

2. Farm characteristics

   A. Access to land (land tenure inquiries)

      Irrigated land (size of holding)
      Falo
      Fonde
      Decrue (number of plots)
      Dieri
      What is considered good land?

3. Field size

   (May be determined by amount of seed used, but some verification of field sizes must be done by pacing or measurement)

4. Family field vs. individual fields

   Cropping patterns

5. Crops grown

   A. Rice
      Size of parcel(s)
      Irrigation techniques

         Continuous or intermittent inundation
         Water application frequency
         Cropping seasons (number of cultivations)

      Varieties (names, characteristics, sources, selection criteria, growing period)

         Local
         Introduced

Diseases and pests
Inputs used - fertilizer, pesticides (how applied; when)

Land preparation - plowing (how;when); other (i.e., disking, harrowing)
Planting (methods, timing, who, man-days, constraints, intercrops, replanting)
Birdwatching (methods, timing, who, man-days, constraints)
Fencing (methods, timing, who, man-days, constraints)
Weeding (methods, timing, who, man-days, constraints)
Harvesting (methods, timing, who, man-days, constraints)
Post-harvest (methods, timing, who, man-days, constraints), including: drying, storage, threshing, milling
Control of output - who, and portion given to family head
Linkages with other crops

B. Other crops (corn or sorghum) (pursue cropping pattern questions when appropriate)

Types
Growing periods
Diseases and pests
Inputs used (fertilizers; pesticides)
Irrigation techniques (inundation, water application frequency, furrow or flood)
Land preparation (plowing - how and when; other techniques)
Planting (methods, timing, who, man-days, constraints, replanting)
Weeding (methods, timing, who, man-days, constraints)
Harvesting (methods, timing, who, man-days, constraints)
Post-harvest, including drying, storage, threshing, milling (methods, timing, who, man-days, constraints)

6. Market gardens

A. Water source
B. Lifting method
C. Water application method (timing and amount)
D. Location
E. Crops grown
F. Inputs used
G. Land preparation
H. Marketed portion
I. Independent or cooperative organization

7. Recession agriculture (decrue)

Sorghum
Area grown
Site selection (number of days flooded; number of years cultivated)

Number of plots, size of plots and tenure arrangements
Varieties (name, characteristics, source, selection criteria, growing period)

Local
Introduced

8. Other crops in decrue (pursue cropping pattern questions when appropriate)

9. Falo cropping patterns

Area grown
Site selection (number of days flooded; number of years cultivated)
Number of plots and tenure arrangements
Type of crops (names, characteristics, source, selection criteria, growing period)

Local
Introduced

Diseases and pests
Inputs used (fertilizer; pesticides)
Land preparation (tilling or preparing soil before planting)
Planting (methods, timing, who, man-days, constraints, intercrops, replanting)
Bird watching (methods, timing, who, man-days, constraints)
Fencing (methods, timing, who, man-days, constraints)
Weeding (methods, timing, who, man-days, constraints)
Harvesting (methods, timing, who, man-days, constraints)
Post harvest, including drying, storage and threshing (methods, time, man-days, constraints)
Portion marketed and income received
Use of stocks
Grazing use

10. Fonde cropping patterns (other than small perimeters)

Area grown
Site selection (number of days flooded; number of years cultivated)
Number of plots and tenure arrangements
Type of crops (names, characteristics, source, selection criteria, growing period)

Local
Introduced

Diseases and pests
Inputs used (fertilizer; pesticides)
Land preparation (tilling or preparing soil before planting)
Planting (methods, timing, who, man-days, constraints, intercrops, replanting(=)

Bird watching (methods, timing, who, man-days, constraints)
Fencing (methods, timing, who, man-days, constraints)
Weeding (methods, timing, who, man-days, constraints)
Harvesting (methods, timing, who, man-days, constraints)
Post harvest, including drying, storage and threshing (methods, timing, who, man-days, constraints)
Portion marketed and income received
Use of stocks
Grazing use

11. Dieri cropping patterns

Millet
Area grown
Site selection (number of years cultivated)
Number of plots and tenure arrangements
Varieties (names, characteristics, source, selection criteria, growing period)

Local
Introduced

Diseases and pests
Inputs used (fertilizer; pesticides)
Land preparation (tilling or preparing soil before planting)
Planting (methods, timing, who, man-days, constraints, intercrops, replanting)
Bird watching (methods, timing, who, man-days, constraints)
Fencing (methods, timing, who, man-days, constraints)
Weeding (methods, timing, who, man-days, constraints)
Harvesting (methods, timing, who, man-days, constraints)
Post harvest, including drying, storage and threshing (methods, timing, who, man-days, constraints)
Portion marketed and income received
Use of stocks
Grazing use

12. Other dieri crops

Area grown
Site selection (number of years cultivated)
Number of plots and tenure arrangements
Type of crops (names, characteristics, source, selection criteria, growing period)

Local
Introduced

Diseases and pests

Inputs used (fertilizer; pesticides)
Land preparation (tilling or preparing soil before planting)
Planting (methods, timing, who, man-days, constraints, intercrops)
Bird watching (methods, timing, who, man-days, constraints)
Fencing (methods, timing, who, man-days, constraints)
Weeding (methods, timing, who, man-days, constraints)
Harvesting (methods, timing, who, man-days, constraints)
Post harvest, including drying, storage and threshing (methods, timing, who, man-days, constraints)
Portion marketed and income received
Use of by-products
Grazing use

13. Baffou (depressions in dieri)

Types of crops grown

14. Livestock

A. Goats

Number
Feeding practices (free or controlled)
Diseases and mortality

B. Sheep

Number
Feeding practices (free or controlled)
Diseases and mortality

C. Cattle

Number
Feeding practices (free or controlled)
Diseases and mortality

D. Donkeys

Number
Feeding practices (free or controlled)
Diseases and mortality

E. Poultry

Number

Feeding practices (free or controlled)
Diseases and mortality

F. Horses

Number
Feeding practices (free or controlled)
Diseases and mortality

Food Security in Mozambique: War, Markets, and Policy Reform

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1. Introduction

A recent World Bank publication listed Mozambique, with an estimated per capita income of 100 dollars, as the poorest country in the world among those countries with a population over 1 million inhabitants. Of its population of 16 million people, six million depend either entirely or partially on various forms of food aid in order to survive. The estimated basic food assistance required each year is approximately 1 million tons. Malnutrition is widespread, particularly among children. Yet, Mozambique is richly endowed with natural resources, particularly agricultural resources. It has an abundant land base, bountiful surface water, and nearly two thousand miles of coastland with deep water harbors. Moreover, the Mozambican population is essentially rural, with more than eighty percent of inhabitants living in rural areas and obtaining their livelihoods through agricultural activities. How to reconcile such pervasive poverty and fundamental food insecurity with such promising agricultural potential is a source of great frustration to national policy-makers and donor agencies. This paper examines the sets of variables that have played a major role in the current crisis, and it considers the basic policy paths that are currently being followed.

The colonial history of Mozambique differs from the rest of Africa in several ways that help explain the current crisis. First of all, the Portuguese never really gained control over the entire country until well into the twentieth century. Until the final military expedition in the 1920s, the colonial government maintained "European-like" towns at strategic trading points where they attempted to extract as much agricultural value as possible from the poorly-controlled hinterlands. The marketing system described below is the result of this effort to appropriate the agricultural wealth. Less than four decades after control was established, a war of independence began, and warfare has continued--virtually unabated--up to the present day. Second, the Portuguese instituted an extreme class-oriented society comprised of civilized Europeans, the traditional Blacks, and the "assimilados", or those Blacks who had learned Portuguese and had become "European-like". In this society, access to resources was determined along class lines. Since thousands of Portuguese had fled poverty in the mother country to assume positions in the colony, Europeans occupied all the industrial and service sector jobs, including public service. The Portuguese were also the traders and the commercial farmers in the colony. The Blacks, on the other hand, had little access to education, were maintained in their traditional livelihoods (controlled by Portuguese-appointed régulos), and were forced to work either on European farms, in Rhodesia and South African mines, or on other public projects. When Independence arrived in 1975, the Portuguese fled en masse and the country was left without a commercial farm sector, an adequate marketing system, public servants, educators, jurists, factory managers, taxi drivers, or carpenters, to name but a few.

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The FRELIMO government, in its effort to create a socialist transformation, occupied the vacuum left behind by the colonists - the Portuguese farms became state farms and cooperatives, district administrators appointed traders to market goods, all movement of output and input was centrally controlled, and prices were fixed. The result of this socialist experience was that large farms--now under the aegis of the state--were mismanaged, private production was disrupted, and the traditional producers were isolated from the market. As a consequence, food supplies to the urban centers disappeared during the 1980s, and the country entered into a string of food security crises that have not yet been solved. In 1986, the government turned toward market liberalization to stimulate production. The PRE (Economic Reform Program) enjoyed initial success with an increase in economic activity in the production zones around the cities (the "green belts"). However, the country continues in an extreme deficit position, awaiting the eventual benefits of the market reform. The unresolved issue revolves around the agricultural sector and its ability to respond to market incentives. This issue forms the core of the following discussion.

Before entering a specific discussion of agricultural systems in Mozambique, it is necessary to introduce the factor that most threatens food security in the country. Since the 1980s, Mozambique has been assailed by terrorist warfare, first initiated by Rhodesia and South Africa but now of uncertain support. The resistance movement, RENAMO, has no well-articulated political position other than the destabilization of the country. The victims of this terrorist "banditry" are rural people, whose villages have been burned, whose members have been disfigured or massacred, and whose crops have been plundered or destroyed. The war has totally altered the nature of agriculture, has distorted the marketing system, and has resulted in major population movements toward the more secure areas of the country. Traditional farmlands have been abandoned, and shopkeepers have fled to larger provincial capitals. The most disturbing aspect of the war is the suggestion that RENAMO no longer controls the bandit groups, that they have taken on an autonomous semi-permanence in which violence and destabilization have become preferable to any peace agreement. It is in this context that the future of agriculture and food security must be evaluated.

2. Farming Systems in Mozambique

The government of Mozambique recognizes and sets policy on three essential types of agriculture. The public and cooperatively managed farms (state farms and cooperatives) account for less than ten percent of the total farms and less than 15 percent of the total cropland. The second type is the commercial sector, which constitutes about 10 percent of the farms and cultivates approximately 10 percent of the farmland. The private commercial farms vary greatly in terms of size, although the average is estimated at approximately 25 hectares. The traditional family sector accounts for 80 percent of the farms, 75 percent of the cropland, and 80 percent of the marketed output. Current policy in agriculture is based on the assumption that any food security program in Mozambique must focus on the ability of the family sector farm to mobilize its resources and expand its production. The family farm in Mozambique, however, is not well-understood in terms of its current allocative patterns, its marketing strategies, and the constraints to expansion. Theoretically, growth in the family sector could occur through increased cultivation of cropland or through the adoption of land-intensifying technologies, such as increased fertilizer use. Due to the widespread violence,

little systematic research has been carried out among family farms, and, consequently, the existing constraints are still unclear.

As expected in a large country such as Mozambique, there is much geographical variation in agricultural conditions and farm practices. The more favorable climatic patterns for agriculture are found north of the Save river, where rainfall is heavier, better distributed, and more predictable. The northern regions tend to be surplus producers of maize, manioc, and groundnuts and also generate export revenue through cotton production and tobacco production. In the southern regions, rainfall levels are lower, unevenly distributed, and more uncertain. Farms in the south specialize more in rainfed maize supplemented by tree crops such as coconut and cashew. In some river valleys, farms also produce vegetable crops for urban markets.

We have carried out rapid rural appraisals on production and marketing systems in Nampula, Zambésia, and Cabo Delgado provinces in the north of the country. The traditional farming system in the north is based on slash and burn techniques in which the farmer opens a machamba (field), cultivates it until yields start to fall, then shifts the machamba to another area. The system is based on the abundant availability of land. Access to land has traditionally been controlled by village leaders or local FRELIMO officials. Prior to Independence, farms tended to be scattered over the landscape with only a loose village organization. With the FRELIMO policy of "communal villages", however, farmers were brought into more nucleated settlements, where they now remain for security reasons. Consequently, while land is in an overall sense abundant, current settlement patterns have reduced access to land and has resulted in modifications in the traditional fallow periods.

The northern farming systems maximize diversity of production by cultivating several machambas at the given time, by intercropping grains and pulses (primarily maize and sorghum with several varieties of beans), and by the annual rotation of crops. All farms produce maize and manioc (intercropped with beans) as the basic staples, but most farms will also have machambas of peanuts, sweet potato, sesame, and the principal cash crop, cotton. In many parts of the north and the rest of the country, farmers maintain cashew trees, which provide an important source of revenue from the sale of the nut (castanha) and cashew wine. The cropping season begins with the rains in November or December, when the basic grains are sown. Later in the agricultural season (up to February), less moisture demanding "second cycle" crops (sweet potatoes, beans) may be intersown in the machambas. In this traditional cycle, households tend to experience "periodic" self-sufficiency, in that food is abundantly available from May to December, but many families then suffer through the "período de fome", or hungry season, when domestic food supplies have disappeared and the markets are relatively bare.

Livestock are important to rural households, but the once important role of cattle has been severely reduced, due to the war. Throughout the world, cattle constitute a major coping strategy against the unforeseen and uncertain; and although climato-edaphic conditions favor cattle-raising, the war does not allow farmers to keep capital stock on farm, since it attracts the bandits. Consequently, most livestock tend to be small ruminants and poultry. In some zones, fish and game provide protein supplements to the basic diet.

Technology levels are labor intensive and low input. The average machamba averages from one to three hectares. Mozambican rural households both in the patrilineal south and the matrilineal north are frequently polygamous; however, the husband maintains separate machambas with each wife-unit, and there appears not to be the pooling of labor resources that characterizes other polygamous societies. Labor bottlenecks occur primarily at the time of weeding (sacha), and each society has a set of traditional labor institutions, involving exchange, group work, or work-for-food arrangements, in order to meet those demands. Women, as elsewhere in Africa, provide the majority of the labor, often because men seek wage employment off-farm. Organic or chemical fertilizers are not used, and although pests often present a problem, few farms apply chemical control. Farmers do not have easy access to input markets and frequently complain of the scarcity of small tools, such as hoes, axes, sickles, and machetes.

Marketing behavior of the family farm sector has been significantly modified by the war and by local policies. The ever-present danger of bandits argues strongly against on-farm storage of foodstuffs other than the basic necessary minimum. On the other hand, national policy since colonial times (and in fact reinforced after Independence) has been to encourage the rapid marketing of food and export crops. The marketing of farm products is closely integrated with the purchase of basic consumer items such as sugar, oil, soap, and cloth. In essence, these products are only made available at the time of harvest, and, in the past, direct bartering was common. Consequently, the typical household in the north makes an estimate of maize needs throughout the year and stores this quantity along with a safety "cushion" in the case of unanticipated cash needs. The rest of the maize is sold immediately to the local buyer. Manioc is harvested from April to July and is dried. Sometimes the dried manioc is sold to meet immediate consumption needs, then purchased again during the hungry season.

The traditional diet of the family farm household is nutritionally well-balanced. The white maize is ground and prepared as a thick porridge ball (shima), which is eaten with sauces made of dried fish, peanut paste, or manioc leaves. The manioc is prepared and eaten in a similar fashion. The major nutritional problem in northern Mozambique is not the quality of the food, but the availability of food within the context of war and other organizational disruptions.

While the impact of drought and other natural disasters on Mozambican farming systems cannot be ignored--particularly in the more vulnerable southern provinces--nature does not constitute the principal adversary to Mozambican food security. The agricultural potential of the country is such that surplus in the northern regions could more than compensate poor production in the south or in other parts of Africa. The crux of the food security problem lies more in the devastating impact of chronic warfare and a lack of policy attention (and investment) in the family farm sector. In every detail, the constraints to the expansion of production derive from the situation of war or from the lack of services to farm people. One area where policy has failed to provide the appropriate incentives is precisely the rural marketing system.

3. Market Systems in Mozambique

Presently, three general categories of food marketing systems are in operation in Mozambique. First, there is a network of private commercial traders which operates throughout the country. In the past this network has been very closely controlled by the government, but this control is in the process of being removed under the aegis of the structural adjustment program under the PRE. This channel distributes domestically produced and imported (mostly food aid) products to consumers through shops and local markets. In addition, two marketing channels operate under the auspices of the government to provide a "safety net" to different parts of the population. In the two largest cities, Maputo and Beira, there is a food ration system (NSA), designed to ensure at least a minimum amount of basic foodstuffs are available to all consumers in these cities. Finally, a disaster relief program (DPCCN) operates to deliver food and other necessities to rural households displaced or otherwise affected by RENAMO activities. The following sections will briefly describe the public marketing operations which provide social assistance and discuss in more detail the operations of the private marketing channels, including the impacts of recent policy changes on this sector.

3.1 Public Marketing Operations

The food rationing program in the cities of Maputo and Beira is operated by the ministry of commerce in cooperation with local authorities. Families in these two cities are eligible to enroll in the program and receive ration cards for specific quantities of foodstuffs and other essential items each month. In the past these items were available at highly subsidized prices. Now the prices for the rationed goods are approximately equal to border price levels, although they are still significantly lower than domestic market prices. Households must undergo a lengthy bureaucratic process of approval at various levels in order to qualify for the program. This presumably acts as a screening mechanism--wealthier households probably find the inconvenience too great to enter the scheme. However, the lengthy registration procedure probably also hinders recent arrivals from taking advantage of the program. Presently about half the populations of Beira and Maputo are estimated to participate in the program. The quantities of foodstuffs provided to each family are approximately 4-5 kg of cereals, one kg of sugar, one liter of oil, and salt per month. The exact distributions are adjusted monthly based on overall availability. All supplies are provided through foreign aid.

The DPCCN is designed to provide assistance in rural areas. Originally established to provide relief in areas affected by droughts and other disasters, it now also provides material assistance to households impacted by RENAMO activities. The DPCCN has administrators in each district. Local community leaders identify the needy households in their areas to these administrators, who then select families eligible for aid. The district administrators then request DPCCN's central administration for materials they need. The level DPCCN's activities has increased dramatically in recent years in response to the deteriorating security situation. Food deliveries increased from 60 thousand MT in 1985 to over 190 thousand MT tons in 1988.[3]

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[3] World Bank, Mozambique Food Security Study, October 12, 1989, p.17.

These two official marketing channels provide a large portion of the total food to consumers in Mozambique. However, the government is now committed to market liberalization policies which would reduce the dependence on these programs for distribution and rely more heavily on private traders, operating through unregulated markets, to deliver foodstuffs to consumers.

4. Private Marketing Channels for Agricultural Commodities

In general, agricultural markets are in a state of transition as price liberalization policies are introduced. However, these changes are taking place within the context of the previous regime of marketing activities which was highly controlled by the central authorities. The marketing channels presently reflect vestiges of these centralized controls, particularly with respect to restrictions on new entrants into the market, combined with growing flexibility for marketing agents to determine price levels. The combination affords great market power to a small number of merchants who are protected by competition but now have price-setting authority.

Portuguese colonists gained military and political control over the interior of Mozambique only at the beginning of this century. Plantations utilizing forced labor were established. Families were also forced to produce and sell a certain amount of cash crop. In order to control the flow of these products, a network of local merchants (cantineiros) was set up to purchase export crops (cashew, copra, cotton, tobacco) and surplus foodstuffs in exchange for imported household necessities. The colonial government maintained strict control over these marketing activities in order to ensure all traded flows were appropriately taxed. Each cantineiro controlled a specific geographical region, so that farmers had only one, officially monitored, outlet for their marketed products. Thus, the cantineiros exerted local monopsony power with respect to purchases of agricultural commodities and monopoly over sales of household necessities. After Independence, this centrally controlled marketing network was maintained because it fit well with the socialist planning philosophy of the new government. However, the goal of the new government was not to extract tax revenues from the system, but rather to try to ensure the availability of essential products to the population at low prices. In order to meet this new objective, a system of controls over price levels and inter-regional trade flows was put into place.

Separate marketing channels can be distinguished for imported agricultural products (almost entirely food aid) and domestically produced commodities. Looking first at imported goods, Figure 1, panel a) shows the official marketing channel that was in place before liberalization policies were undertaken. (It should be noted that trade took place outside these official channels, but authorities monitored illegal activities, and penalties were imposed on individuals selling in the parallel markets.) State importing agencies provided products to merchants, who were then required sell them to consumers at officially determined prices. Plans were made at the provincial level on how shipments of these products would be distributed among the districts. Distributors would allocate these quotas among merchants.

Liberalization policies have reduced the degree of control over prices by the authorities, although the situation varies by commodity. Imported essentials ("productos da primeira

necessidade") continue to have restrictions on consumer price levels. However, these prices are not so closely monitored, especially in informal markets (candongas). Panel b) of Figure 1 shows the current marketing channels for imported products. Each district has a designated "distributor" who is a wholesaler in the district. Whenever a shipment of imported goods is received by the national distributor, the Ministry of Commerce solicits stock information from distributors and makes up a plan of how to allocate the shipment among the wholesalers in the districts. Only the distributors are directly involved in making up the plan.

Many shop owners now have agents who sell for them in informal markets--either vendors in local retail markets, or itinerant merchants (ambulantes) who deliver products to rural areas. These agents are usually able to sell their products at the prevailing price, which is significantly higher than the official price level. Thus, the established merchants are now able to acquire imported products at the official selling price of the importing agencies but are then able to sell a large portion of these products to the public at prices substantially above the official prices. Competition among sellers within a particular geographical area is diminished, because policy restricts the number of vendors that may operate in a given area.

Before the PRE, domestically produced commodities were supposed to follow the marketing channels as shown in Figure 2 panel a). The objective of this system was to direct all marketed surplus into the AGRICOM warehouses, from where authorities could transfer stocks to deficit regions. A fixed number of merchants at both the wholesale and retail level was licensed to purchase agricultural products, at controlled prices, and then to sell to AGRICOM. The parastatai in turn would distribute supplies to authorized vendors in deficit regions who would sell to consumers--again at officially determined prices. Merchants were prohibited from transferring products between districts without authorization from the Ministry of Commerce. Prices at all levels of the system were controlled.

Currently, merchants are supposed to have more flexibility with respect to determining prices and where they may buy and sell, although the situation varies among districts. Theoretically, merchants may now purchase products wherever they wish, but must sell within the district. However, the situation varies from region to region. In some districts the local authorities have adopted the market liberalization policies. But in other areas, the district director of commerce continues to maintain a high degree of control over product movements, despite the change in national policies. In interviews with officials in these areas we found that they had very little understanding of the changed policies. In many instances, the channels of communication from the central government to the districts are very fragmented and ineffective.

In many areas AGRICOM continues to act as buyer of the last resort, and had to cover costs of transportation to deficit markets. This is particularly true in those districts where the market liberalization policies have not yet been implemented by the local authorities. In other isolated areas, private traders do not wish to hold stocks for fear of attacks by RENAMO forces. In these areas, all stocks are sold to AGRICOM and repurchased in small amounts over the year. AGRICOM is thus responsible for guarding the stocks. Similarly, many areas have very high transportation costs, because of the threat of highjackings on the roads.

Private traders do not wish to incur these transportation costs, so they sell surplus stocks to the local AGRICOM warehouse. The Ministry of Commerce then is responsible for moving stocks between the district warehouses of AGRICOM.

The structure of merchants is very hierarchical, with a small number of wholesalers wielding significant market power within the province. This situation is due to the fact that severe restrictions, specified and administered by the Ministry of Commerce, limit the number of new merchants that may enter into the sector. These restrictions are a holdover from the previous policy regime, which attempted to limit profiteering by black-market operators, and to directly control the whole marketing channel. Under the previous regime, the government restricted access into official marketing channels, but also (in theory) controlled prices at all levels in the channel. With market liberalization, pricing decisions now rest more directly (although still not entirely so for many products) in the hands of individual merchants, but the restrictions on market entry still remain. Thus the set of policies create monopoly/monopsony conditions for traders and at the same time give them freedom to set prices and exercise this market power.

One area where market entry is presently not limited by regulation is the group of small traders (ambulantes) who sell products and purchase agricultural commodities in rural areas. These ambulantes form the link between shops and buyers/sellers in the more remote rural areas. In many cases they are the only market contact that rural households have. Many ambulantes are financed by shop owners (or even wholesalers). We were told that lack of access to capital restricts new entrants into this segment of the market channel. In the areas where the cotton companies have ties to the family sector, the company will purchase food crops from farmers.

A recent USAID document discusses a number of policy constraints to market development.[4] These constraints include differences in interpretation and enforcement of changed commercial laws among districts, restrictions on inter-district trade, a program of designated wholesalers, and licensing of traders and transporters. These restrictions have "failed to prevent altogether the rebirth of private marketing agents and operations, yet have succeeded in effectively limiting their activities and institutionalizing the market imperfections the controls were created to address." (p. 29) In particular, the liberalization of prices, without the concomitant liberalization of entry into commercialization has created a situation in which "many private wholesalers now benefit from state-enforced monopolies" (p.32).

In general, the information obtained about the operation of marketing channels confirms that these constraints continue to be a significant problem. The key constraint is the restriction on entry into commercial activities enforced by the Ministry of Commerce at the provincial level. Inter-regional trade appears to be constrained more by problems of security and transportation cost than by regulatory control--with some important exceptions where the district authorities continue to maintain control over trade flows and price levels. The policy of

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[4] USAID, Private Sector Support Program PAAD Amendment Number Two, July 1990.

designated wholesalers (distributors) continues. Although there may be several wholesalers within a district, the distributors determine how shipments of imported products shall be allocated among the wholesalers within the district. Wholesalers are still legally required to sell within the district where they are registered. However, a few large merchants often dominate trade at the province level. In Nampula province, for example, a small number of wholesalers are registered in several key producing and consuming districts and are thereby able to operate a network of warehouses throughout the province.

The recent changes in marketing systems has had a significant negative impact on consumers. Imported commodities such as sugar, rice, beans, which continue to have price controls in the shops can now move very easily into uncontrolled local markets (candongas), because these markets are now accepted by the authorities. Many of the shop owners have representatives in these candongas where they sell at the going market price. Clearly, this leakage will only take place when the market prices are higher than the official prices. In January/February of this year (the hungry season, just prior to harvest) several commodities, such as sugar and corn meal, were not available in the shops at the controlled prices, but only available in (some of) the local markets at substantial premiums over the official prices.

One of the main arguments for price liberalization is that producers would obtain higher prices for their products which would in turn promote increased production. However, it is not clear whether high consumer prices have translated into higher farmgate prices. The fact that there are still controls on the number of merchants which may operate within each district limits the competition for access to farm products. Merchants have a monopsony position, and they appear able to use this power to keep farmgate prices low. For example, there is now a specified minimum prices for corn, intended to operate as a floor only. The market price is theoretically free to go higher; however, because there is little competition among merchants to bid the price higher, market transactions take place at the minimum floor level, or even lower. Thus, while changes in the marketing system have permitted the effective market price consumers must pay in the (uncontrolled) local markets to increase significantly, the expected corresponding increase in the farm-level price has not yet occurred because of the market power of local purchasers of agricultural products.

5. Food Security Issues in Mozambique

Looking to the future, a number of important policy issues with regard to food security can be identified. First, in short term and medium term, the most reasonable assumption is that the security situation will continue to prevent domestic agricultural production potential from being fully utilized. This implies a continued reliance on food aid. A recent World Bank study discusses a number of macroeconomic and central management issues with respect to improving management of food aid.[5] In addition, the role of the private marketing channels is also critical, and there is a need to better understand how liberalization policies are affecting the performance of the marketing system. The relative importance of the private marketing channel vis-a-vis the public distribution programs--DPCCN and NSA--must be

[5] World Bank, Mozambique Food Security Study, October 12, 1989.

evaluated on the basis of the performance of the private markets and on the adjustment costs of removing the safety net programs from the most disadvantaged portion of the population.

In longer term it will be necessary to consider how the transition to "normal" agricultural production will occur. For a number of reasons, the post-war rural society will be different in many important respects from the pre-colonial situation. Different policies, the history of the communal villages program, and disruption of the war have all caused profound changes in the rural population. However, the specific impacts of these factors on rural households is not yet well understood. Knowledge of the current situation is necessary in order to design future programs and policies to develop the rural sector. Particular issues that need to be addressed include identifying what kind of assistance will be necessary to get dislocated families back into agricultural production, or other activities. It will also be necessary to consider how to manage food aid during the transition period. How quickly or gradually should food aid shipments be reduced? What kinds of signals or triggering mechanisms should be used to guide the process of scaling down aid?

Our analysis suggests two important factors must be taken into consideration in evaluating future agricultural development programs in Mozambique. First, constraints to increased domestic production, particularly in family sector must be identified and quantified. The resource base is currently being underutilized, but there are likely to be many bottlenecks encountered as the security situation improves and more land can be put into production. One very important role for foreign assistance would be to identify and help provide the means to overcome these constraints. A related issue is identification of constraints to improving the efficiency of the domestic marketing system, especially with respect to the transmission of appropriate price signals to producers. The government, at the request of foreign donors, has already begun to introduce policies to improve the operation of private markets. However, recent observations indicate that the policy changes made at the national level have not had significant impacts in market operations in many regions.

Developing Guidelines for Early Warning and Response Farming Based on Agriculturally Relevant Analyses of Historical Daily Rainfall Data

J. Ian Stewart
President, WHARF

1. Introduction

This paper provides an actual example of the value and utility of historical daily rainfall data for:

Development of Criteria - For pre-season recognition of impending drought:

- Aimed at providing seasonal guidance for farmers, their advisors and the entire agricultural infrastructure;
- Provides a basis for early warning analyses and programs.

Risk Assessment - Quantifying upper and lower limits of possible production in the coming season and probabilities of different levels within the identified range:

- Rainy period duration - The risk of early cessation;
- Rainfall amount - The risk of too little water;
- Average season wetness - For specified crops/cultivars, risks related to both rainfall amount and duration.

Risk Management - Preparation of guidelines for crop establishment choices, inputs and practices to negate some risk factors and minimize losses from those which remain:

- Linking past performance of risk factors to onset dates and crop germination - Thereby determining onset dates which signal impending drought and a need to modify crop establishment choices, input levels and practices;
- Negating Risk;

  a) Determining onset criteria which assure safe crop establishment, and final rain date criteria which exclude long dry spells in the late rainy period,

  b) Analyzing merits of 'dryplanting' prior to onset, and application to situations where advantageous,

c) Cultivar selection - Matching maturities to duration of the rains,

d) Crop selection - Matching average daily water requirements to average season wetness patterns.

Minimizing Risk;

a) Adjusting effective land slopes, tillage, weed control, row spacings, seed & fertilizer rates to suit selected crops, targeted yields & rainfall,

b) At germ+30 days - adjustment of plant populations and/or fertilizers according to early rainfall.

2. Summary Of Response Farming Guidelines For Asmara

The guidelines below derive from the analyses graphically depicted on the following pages. Although the analyses are in many ways sophisticated, the resulting guidelines for farmers and others are simple in the extreme. There are separate guidelines for farmers on deep soils and those on shallow soils. The key management factor in both Asmara cases lies in matching cultivar maturity to expected duration of the rainy period. The highest yields and returns will be gained when selected cultivars have the longest growing seasons the rainfall will support. Planting instructions to accomplish this and other goals dictated by the historical rainfall behavior are as follows:

Farmers with Deep Soils:

Onset by Jun 30 -- Sow 80-day cultivars of selected crops immediately following onset

Onset Jul 1-12* -- Sow 70-day cultivars as above

No Onset Jul 12 -- Dryplant 60-day cultivars on July 13

* Failure in 1969 due to too little rain (See Fig 11)

Farmers with Shallow Soils:

Onset by Jun 30* -- Sow 70-day cultivars of selected crops immediately following onset

No Onset Jun 30* -- Dryplant 60-day cultivars on July 1

* Early cessation failures 1987 & 1973 respectively (Fig 14);
Subsistence crop only in 1969 (Fig 15)

All Farmers:

In all onset/sowing combinations above, the majority of applicable past seasons have received sufficient rainfall to produce market level yields of all otherwise adapted crop types, excluding paddy rice or such. However, in all cases, some 1/3 to 1/2 of years receive lower rainfall amounts, mostly in a range capable of producing 40-90% of a market crop. Strictly subsistence level rainfall seasons or outright failures are unusual as may be seen above, but do occur, and sometimes without warning.

These circumstances suggest a crop mix including millets, grain sorghums and drought resistant legumes as food insurance crops. Row spacings and seeding rates should be based on market yields, with an initial fertilizer rate targeted for about 50% market yield. Rainfall amounts in the first 30 days after germination should guide either additional fertilization to achieve a full market yield (high rain) or reduction of plant populations (low rains).

3. Analysis Section I

Generalized Picture Of Rainfall Patterns And Onset Relations

Figures 1-5 on the following pages show the general pattern of rainfall in recent years (1968-1988), and results of an initial analysis which shows how the date of onset of the rains foretells the nature of the season to follow - providing useful guidance for making crop establishment decisions.

Figure 1 - Mean monthly rainfall over the study period

Figure 2 - Mean monthly rainfall as related to dates of onset of the rains, with 'dates of onset' defined in terms suitable for crop establishment purposes

Figure 3 - How duration of the rainy period, from date of onset to the final effective rain date, relates to the date of onset

Figure 4 - How the total cropping season water supply, i.e. accumulated soil water at onset plus rain onward to the final effective rain date, relates to the date of onset

Figure 5 - How the daily average wetness (Intensity Index) of the rainfall season relates to the date of onset

Asmara, Ethiopia: Rainfall 1968-1988
21 Years: Mean Monthly Rainfall

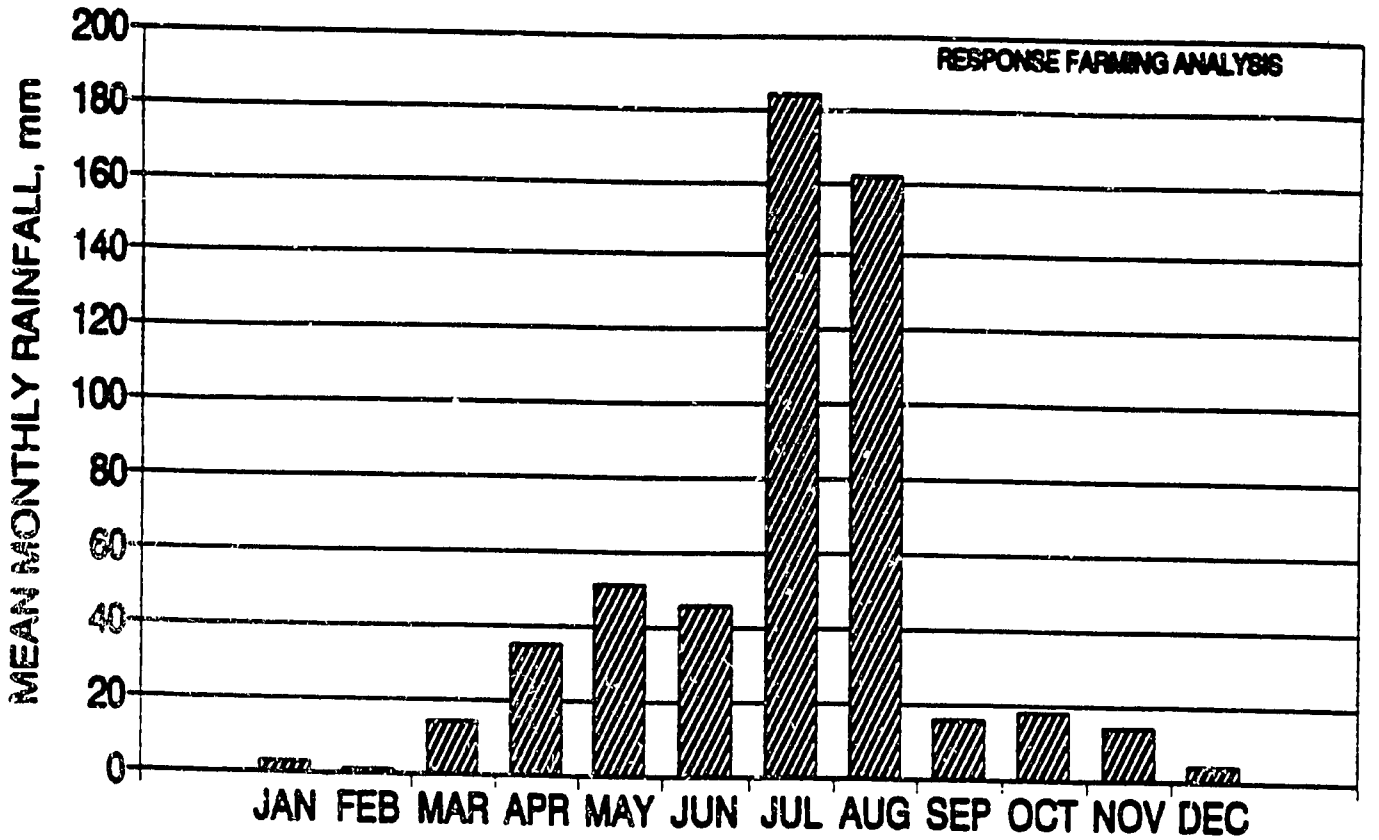

Figure 1

- Capital of Eritrea Province, northern Ethiopia.
- Latitude: 15 deg, 20 min N; Longitude: 38 deg, 56 min E.
- Altitude: 2325 m (7625 ft).
- Although tropical, temperatures are mild to cool all year around, moderated by the altitude and rainfall patterns. Monthly means range from 15 °C (59 °F) in winter to 19 °C (66 °F) in May and June, falling to 16 or 17 C from July through October.
- Evaporation rates, which relate closely to crop water requirements, are also moderate and rather even throughout the year. Class A pan evaporation in the Jun-Sep cropping period averages 5.7 mm/day (0.22 in/day).
- Principal rain months are July and August, but onset conditions suitable for establishing crops may occur any time from late May to late July.

Asmara, Ethiopia: Rainfall 1968-1988
Years with Early, Middle and Late Onsets

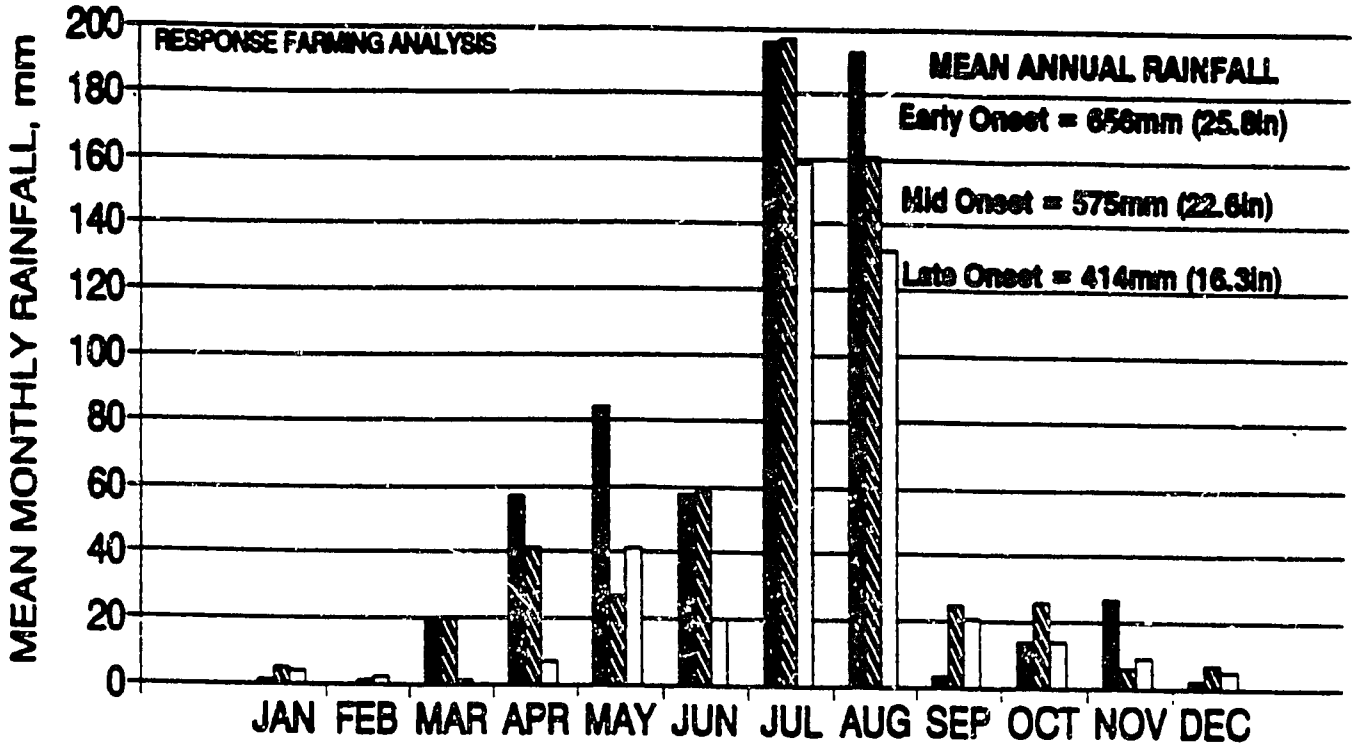

Figure 2

- Figure 2 arbitrarily divides the 21-year rainfall record into three groups of 7 years each.
- The first group contains the 7 years with earliest onset, from Jun 15-28. The figure shows that mean annual rainfall in these years exceeded that of the middle and late onset groups. The greatest differences are in the Mar-Jun period when soil water is being accumulated to create onset conditions for establishing crops.
- Similarly, middle onset (Jun 29-Jul 4) is seen to result in better average rainfall conditions than does late onset.
- These findings are typical of conditions found earlier throughout Africa and other parts of the world.

Asmara, Ethiopia: Rainfall 1968-1988
General Character of Rainfall Patterns

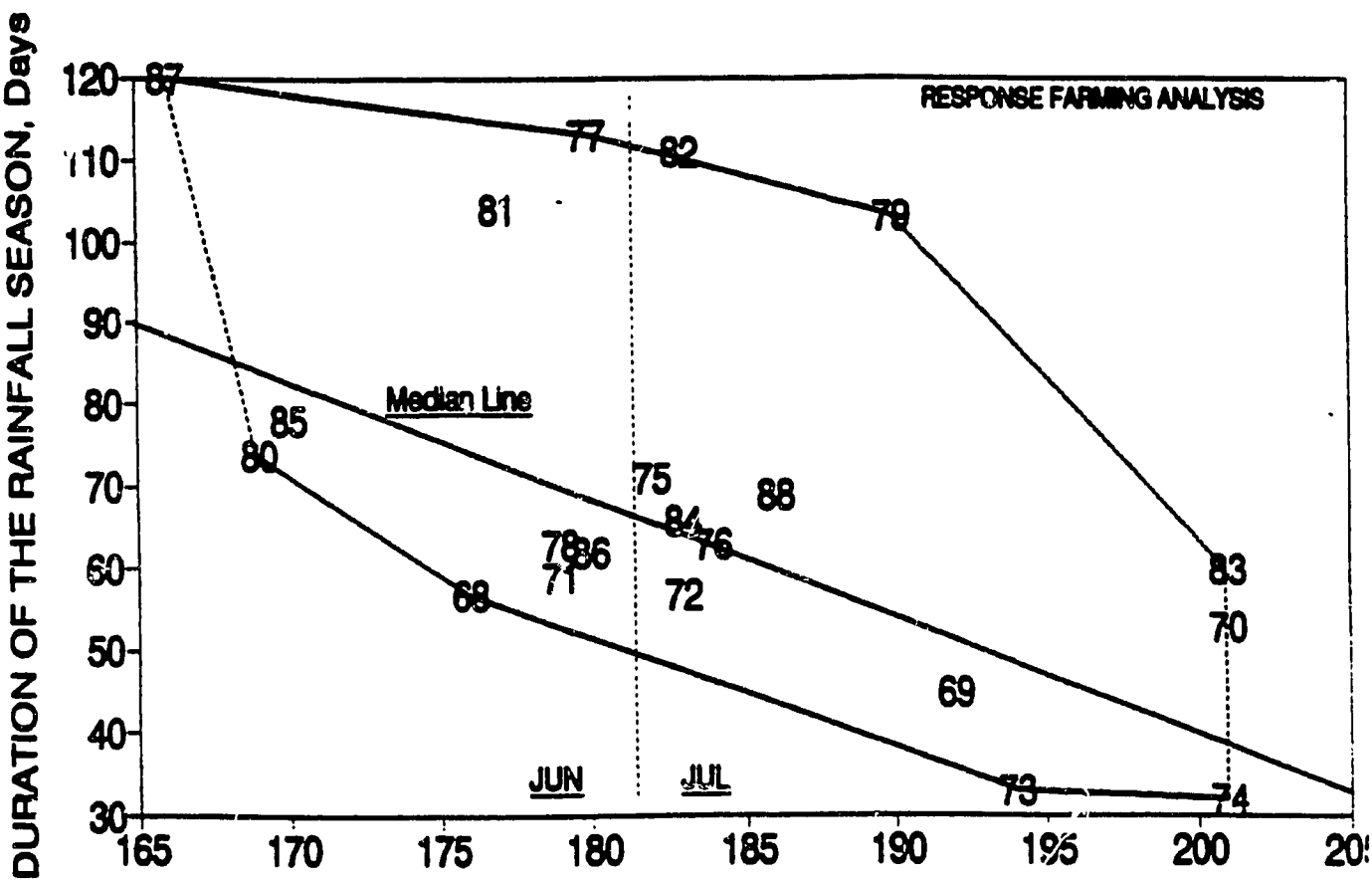

Figure 3

Figure 3 shows how duration (length in days) of the rainy period relates to the date of onset. The performance of each particular study year is made clear by using the year numbers as data points on the scatter diagram. For example, onset conditions in 1988 were attained on Julian day 186 (Jul 5), and the final effective rain date was 69 days later (Sep 12). A dotted line encompasses all data points, forming an oval pattern which represents all occurrences in the 21 years studied. A sloping line passes through the oval, with 50% of occurrences above it and 50X below. The slope indicates that, on average, for each day onset is delayed, the rainfall season is shortened by 1.4 days. Being greater than 1.0, this implies that later onset of the rains is also linked to earlier recession.

Asmara, Ethiopia: Rainfall 1968-1988
General Character of Rainfall Patterns

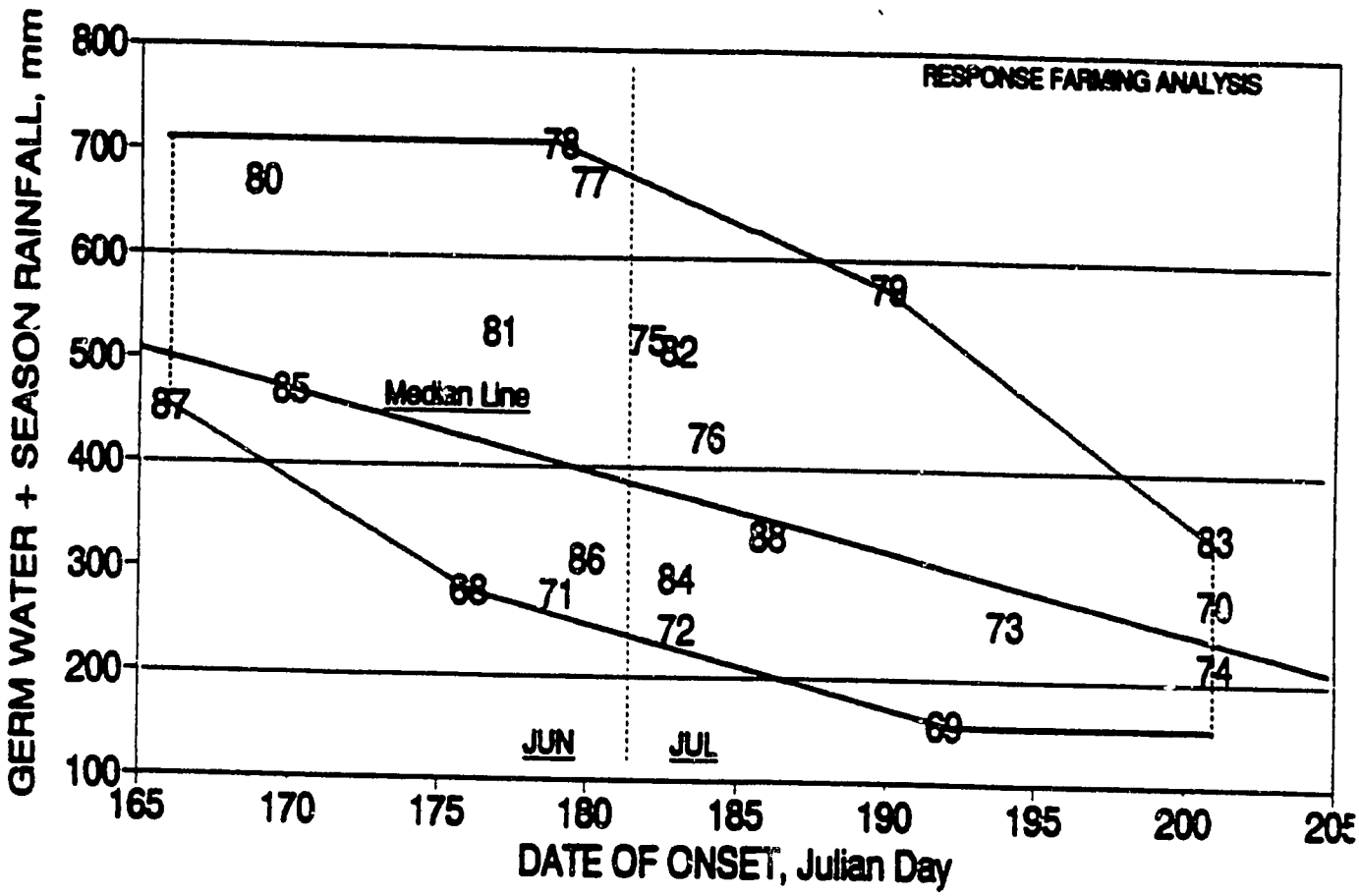

Figure 4

Figure 4 is similar to Figure 3 and arises from the same analysis. However, instead of rainy period duration, the vertical axis shows the total season water supply which a crop with the longest possible growing period might enjoy. It includes the accumulated soil water as of the date of germination plus rain thereafter to the final effective rain date. Once again a median line splits the oval pattern. The slope indicates that each day of delay in onset reduces the expected water supply for cropping by an average of 7.4mm (0.29in). Potentially, this could mean a yield reduction as great as 100 kg/ha (90 lb/ac) of grain sorghum or comparable reductions in other food grains.

Asmara, Ethiopia: Rainfall 1968-1988
General Character of Rainfall Patterns

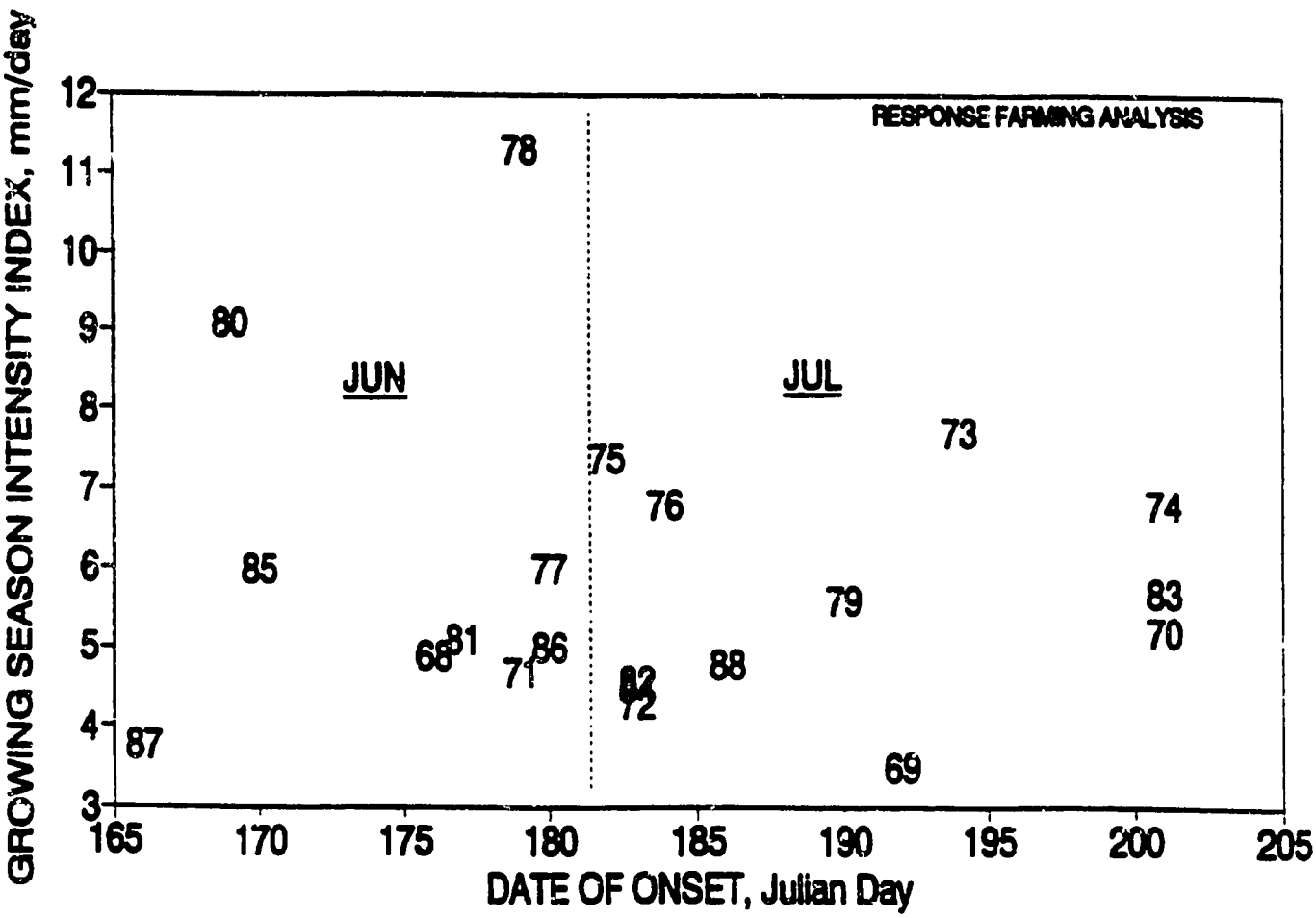

Figure 5

Figure 5 shows the average 'wetness' of each of the 21 study years. It is termed the 'Intensity Index' and is calculated simply by dividing the season water supply (Fig 4) by the duration (Fig 3). The purpose is to assist in making tentative judgements concerning suitability of the rains for supporting different types of crops, and how that might change between seasons with early onset versus those with late onset. The figure shows that in Asmara we find very little change in Intensity Index with date of onset. This indicates that, although late seasons are shorter in duration than early seasons, they are essentially the same in average wetness per day. Therefore, rains in all onset periods will support the same kinds of crops, provided cultivars of suitable durations are available.

4. Analysis Section II

Development Of Response Farming Guidelines For Asmara
Through Detailed Analysis Of Historical Rainfall Patterns

Figures 6-15 provide a real life example of how key crop establishment decisions may be determined from agriculturally relevant analyses of historical rainfall behavior - so that appropriate field actions may be prepared for in advance, and taken with confidence thereafter at the start of each new season. These decisions include (i) identification of onset dates which signal the need to modify the cropping system, (ii) determination of cultivar maturities which will minimize risk of early rainfall cessation in each onset period, and (iii) determination of types of crops for which past 'season wetness' levels would offer minimal risk of crop failure or near failure in each onset period.

Additional key decisions determinable from the same analyses include whether to plant dry or wait for onset, cropping patterns to utilize, whether and how to mix crops, and at what levels to target yields. Subsidiary questions concerning land preparation and tillage, input levels, row and plant spacings, weed control measures, etc, are then more easily decided.

There is a logical sequence for making these decisions, and the first to be addressed is cultivar maturities - even before the crop types themselves are fully decided. The question of whether to wait for onset or plant dry is coupled to that of cultivar maturities. If longer season cultivars are to give way to shorter season ones due to later onset, then early onset must be observed before the longer season cultivars are sown. However, shorter season cultivars may be sown in dry soil on the first day of the designated (later) onset period, providing the record shows an acceptable level of risk that no onset will arrive in time to make a crop, and that the expected rain will be sufficient.

Cultivar maturities should conform to rainy season durations, but crops nearing harvest can survive beyond the final rain date, with soil depth being an important factor in determining how long. This example divides farms with 'deep' soils from those with 'shallow' soils. An assumption is made that deep soils can store sufficient water to carry the crop to maturity as much as 30 days after cessation of rains, and shallow soils 15 days.

Figures 6-11 illustrate the decision making process for farmers with deep soils. Figures 12-15 do the same for farmers with shallow soils. The resulting Response Farming Guidelines have many possible applications, including decision making by (i) farmers and their advisors, (ii) early warning and famine mitigation officials, (iii) food security planners and policy makers, (iv) farm suppliers, (v) plant geneticists, and others.

Asmara, Ethiopia: Rain for Crops 1968-88
Matching Cultivars and Rain on Deep Soils

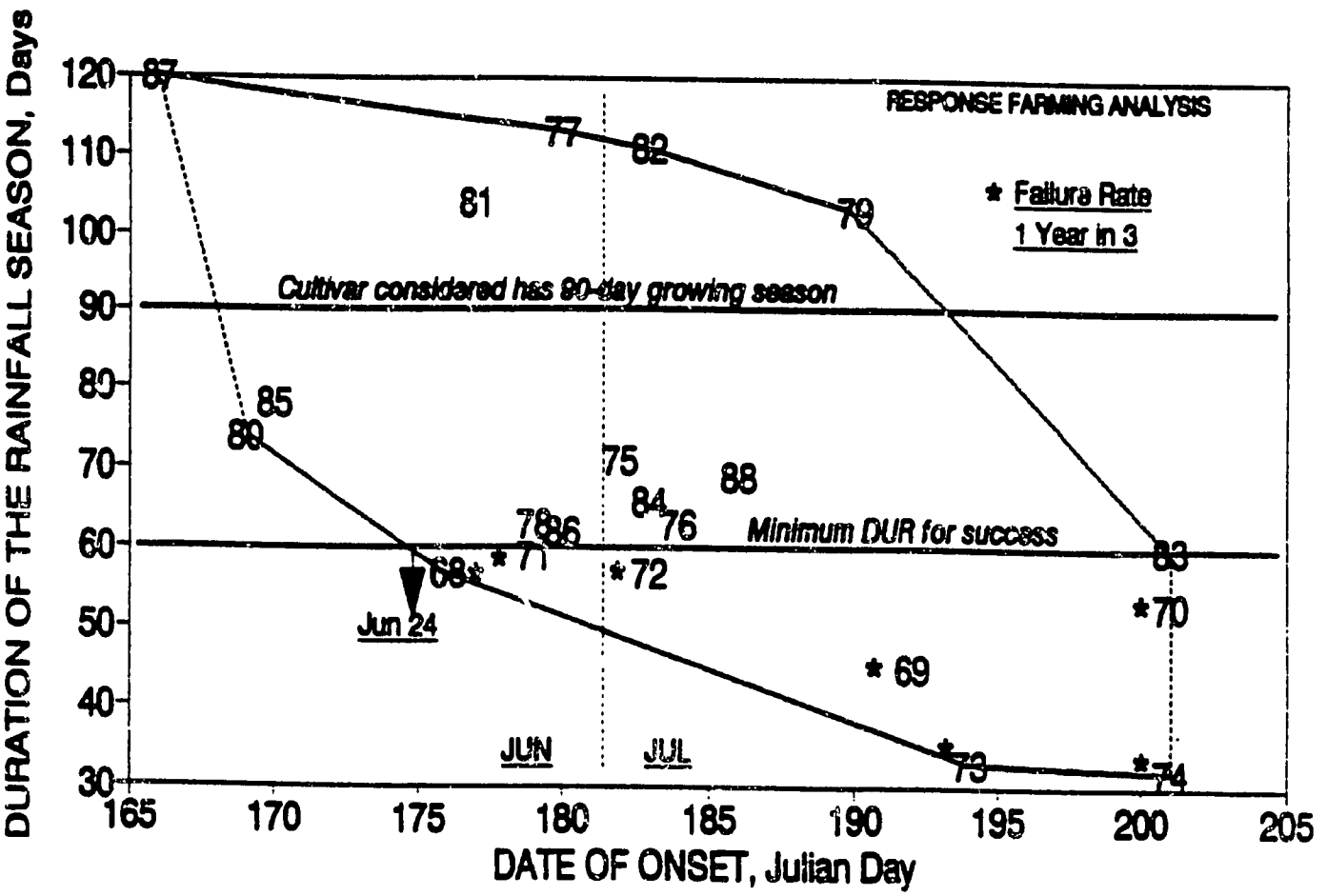

Figure 6

For farms with deep soils, Figures 6, 7, 8, and 9 respectively employ the generalized historical pattern of duration versus onset date (Fig 3) to examine the probabilities of success of 90, 80, 70 and 60-day cultivars. Figure 6 indicates that exclusive use of a 90-day cultivar would have resulted in crop failure in 7 of the 21 study years, but for those years with onset on or before Jun 24, would have had a zero failure rate. Because onset this early is unusual (3 years in 21), and the failure rate thereafter is intolerably high (7 years in 18), the practical use of a 90-day cultivar is ruled out.

Asmara, Ethiopia: Rain for Crops 1968-88
Matching Cultivars and Rain on Deep Soils

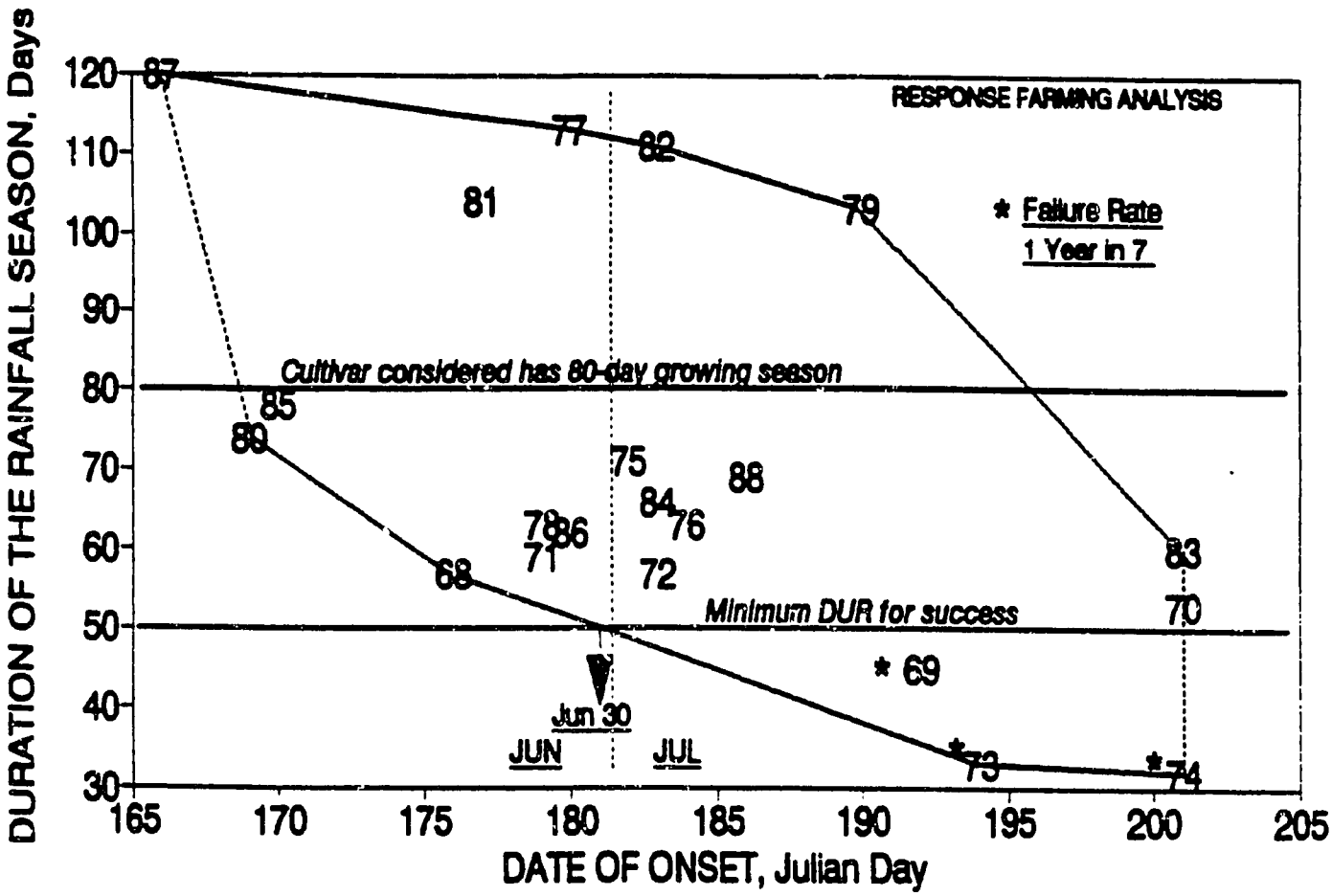

Figure 7

Figure 7 considers the use of an 80-day cultivar, finding an overall failure rate of 1 year in 7. However, the failure rate for the 9 years with onset in June was zero, while that for July onsets was 1 year in 4. The decision is that an 80-day cultivar should be sown whenever onset occurs on or before June 30. This implies waiting for onset before planting, with sowing to follow as quickly thereafter as is feasible.

Asmara, Ethiopia: Rain for Crops 1968-88
Matching Cultivars and Rain on Deep Soils

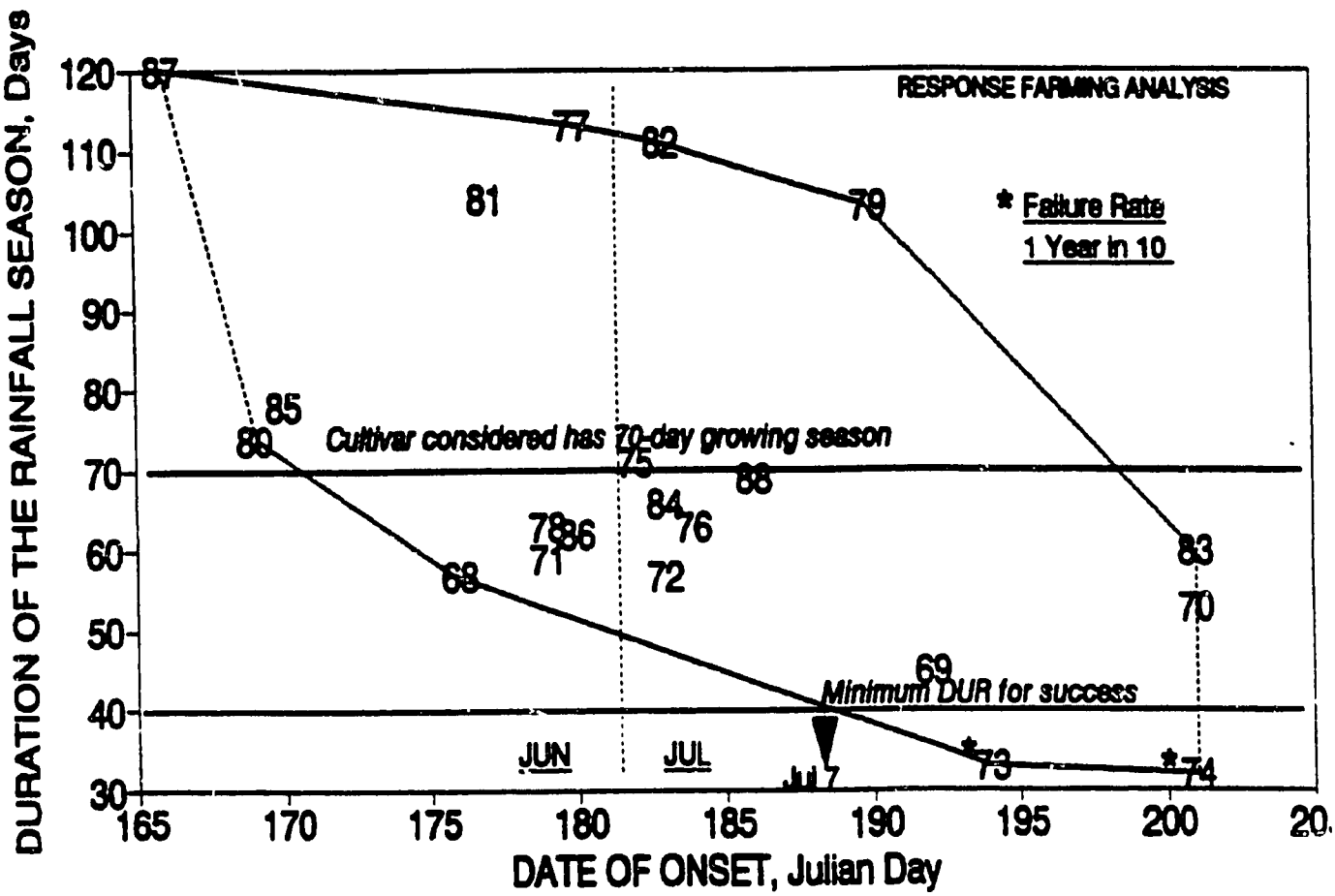

Figure 8

Figure 8 examines the prospects for a 70-day cultivar, finding an overall failure rate of approximately 1 year in 10, but no failures with onset on or before July 12. The line enveloping the data indicates failure is possible with onset after July 7, but the risk is minimal until July 13. The decision is to plant 70-day cultivars if onset occurs in the July 1-12 period. Again, this implies waiting for onset before planting. However, the record shows that the July rains, once firmly begun, produce more than sufficient water for a starting crop. Therefore, the onset criterion in the present analysis is 20mm (0.8in) of accumulated soil water in July, reduced from 30mm in June.

Asmara, Ethiopia: Rain for Crops 1968-88
Matching Cultivars and Rain on Deep Soils

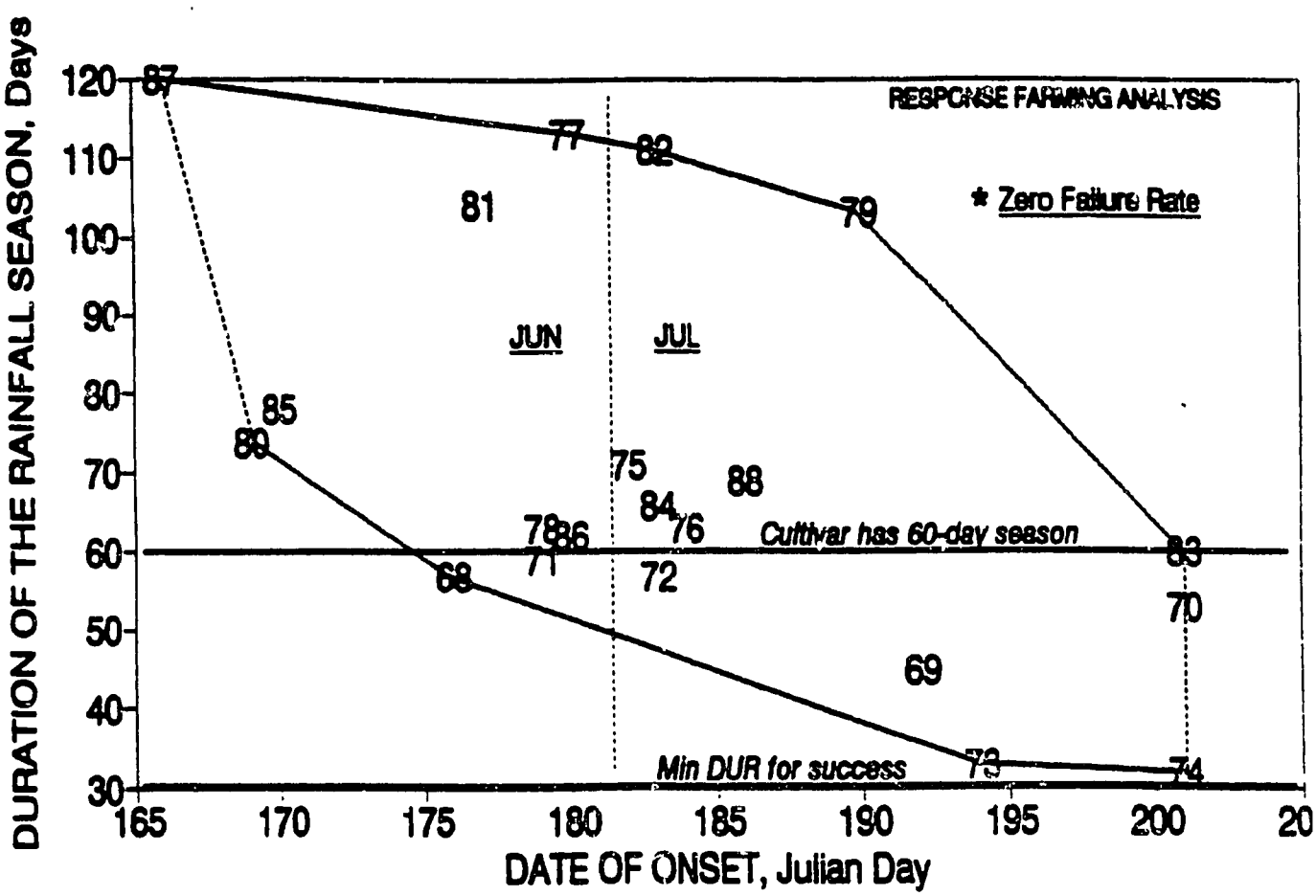

Figure 9

Figure 9 shows that early cessation of the rains should never have caused a 60-day cultivar to fail on deep soils in the study years. The decision is that a 60-day cultivar should be planted dry on July 13 if there has been no onset.

Asmara, Ethiopia: Rainfall Patterns 1968-88
Confirm Planting Times and Cultivar Maturities

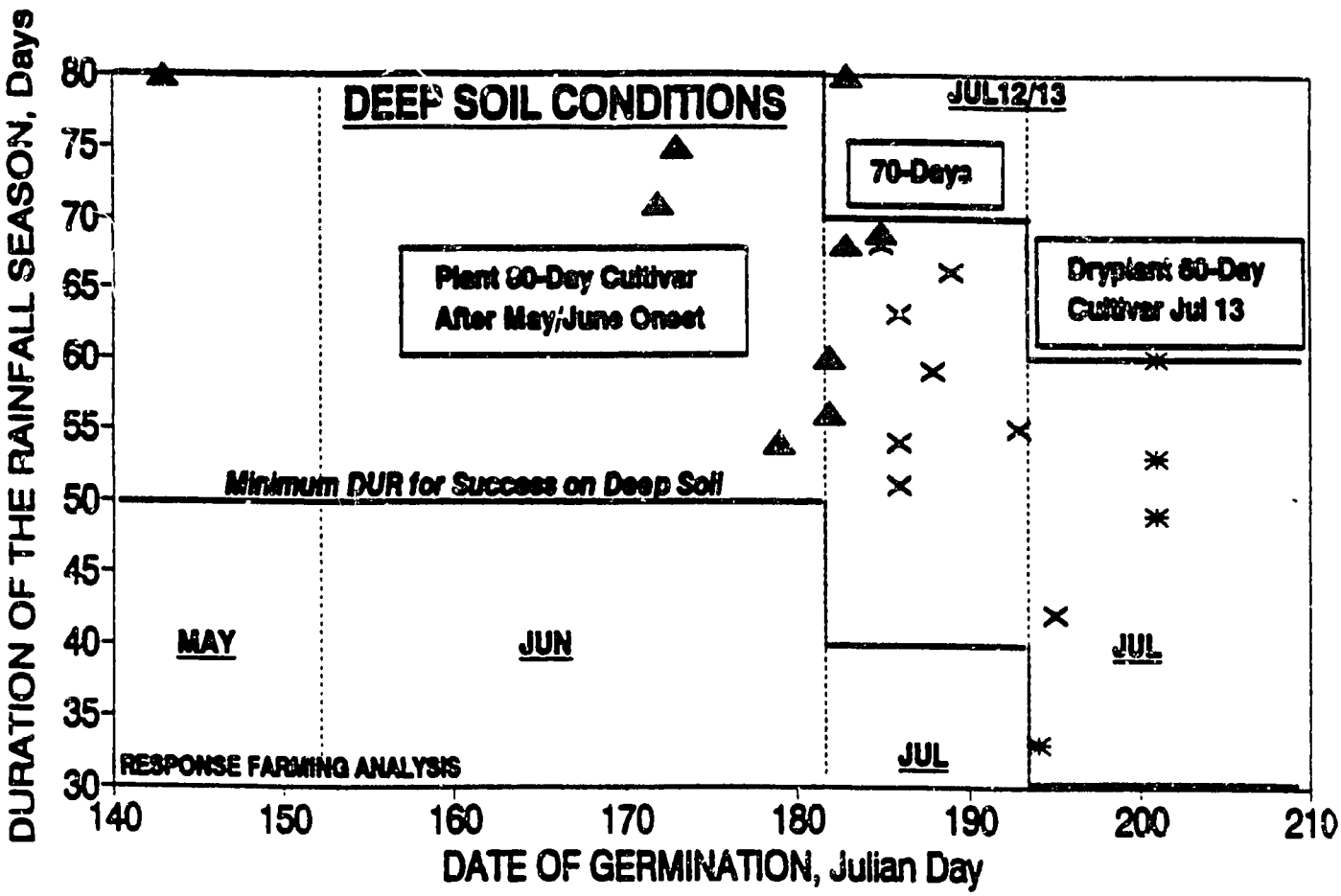

Figure 10

Figure 10 is based on a new analysis of the rainfall which takes into account the foregoing decisions on cultivar maturities, whether the crop is planted wet or dry, a time requirement for sowing, the need for a minimum amount of water in the surface soil to germinate the seed, and the fact that no rainfall beyond the maturity date will now be considered. Even though onset date remains the predictor - and guide to actions taken - it is now necessary to evaluate the results of those actions in terms of what would have occurred in the actual growing season of the crop. Accordingly, the horizontal axis of Figure 10 shows the date of germination rather than the date of onset. The rainy period duration for each of the three designated onset periods is capped by its respective cultivar maturity. Each onset period is represented by a different symbol. For example, the triangles in Figure 10 represent the nine years with June onset dates (1987 was in late May), but germination in five of these years was in July. Nevertheless, success means duration must be 50 days or longer, not 40 days as for the 70-day cultivars. Figure 10 shows no failures should have occurred in any of the three onset periods, and confirms the tentative decisions made previously based on the generalized rainfall behavior analysis.

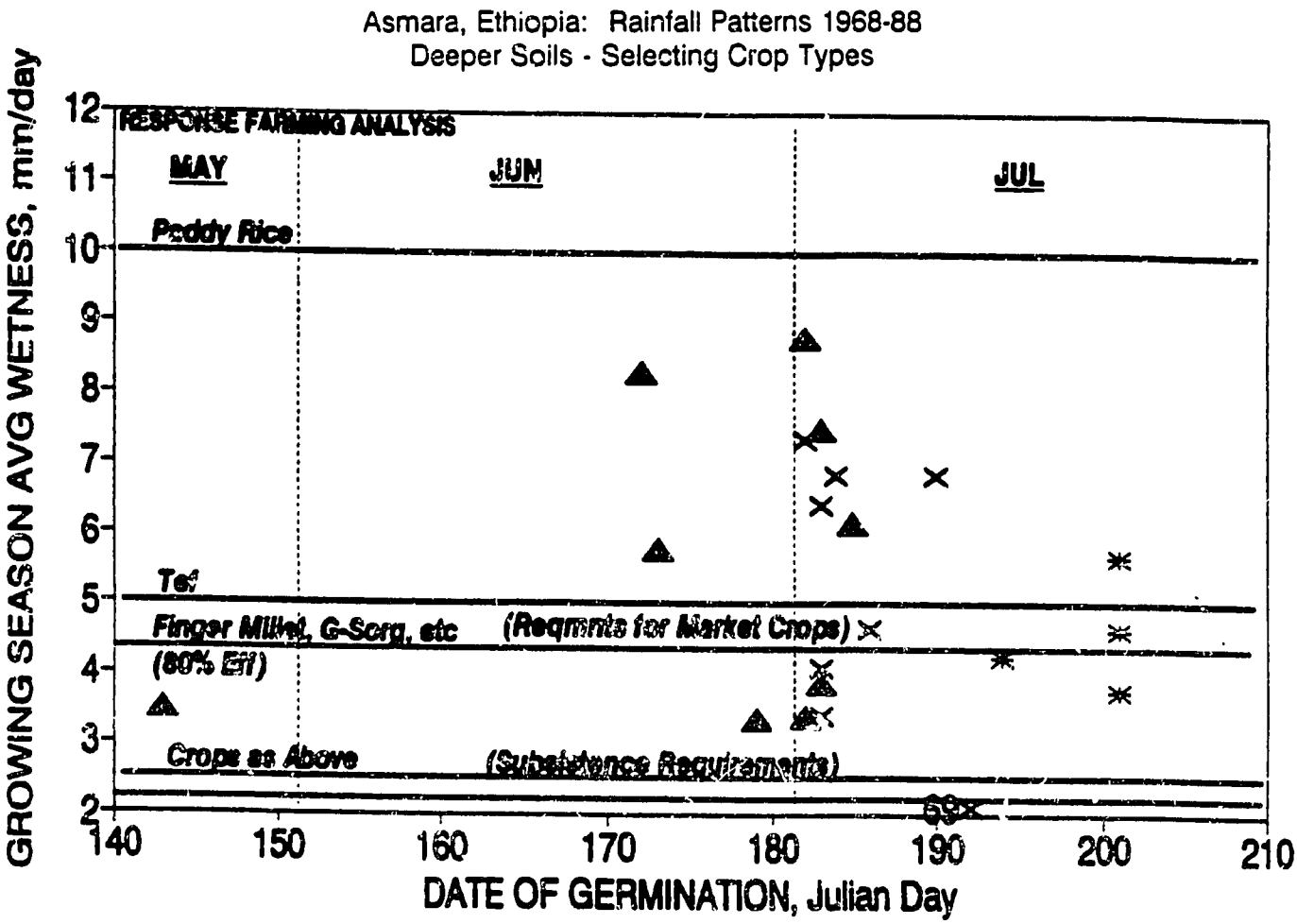

Figure 11

Figure 11 derives from the same analysis as Figure 10, but the vertical axis is changed to show the average daily wetness of the crop growing season, i.e. from germination to maturity. This figure is calculated by dividing total season water (soil water at germination plus rainfall before maturity) by the cultivar maturity. The assumption is that a 60-day cultivar has the same average daily water requirement as an 80-day cultivar of the same type of crop. Nevertheless, the same three symbols are used for the three onset periods as in Figure 10. This allows a closer examination of problems which may appear, and their sources. Horizontal lines are drawn across Figure 11, indicating average daily water requirements to reach either high (market) or low (subsistence) yield levels of example crops in the evaporative conditions experienced in Asmara. Actual requirements are somewhat lower than shown, the assumption being that season water supply as defined is 80% efficient. Average daily water requirements of most grain crops would resemble those of tef, a popular cereal grain in Ethiopia vaguely related to wheat. Grain sorghum and millets have average daily water requirements some 10% less than most other crops. Summarizing, 10 of the 21 years would have met water needs for normal crops, rising to 12 if grain sorghum and millets are included. Another 8 years would produce 40-90% of market yield. One year (1969) failed.

Asmara, Ethiopia: Rain for Crops 1968-88
Matching Cultivars and Rain on Shallow Soils

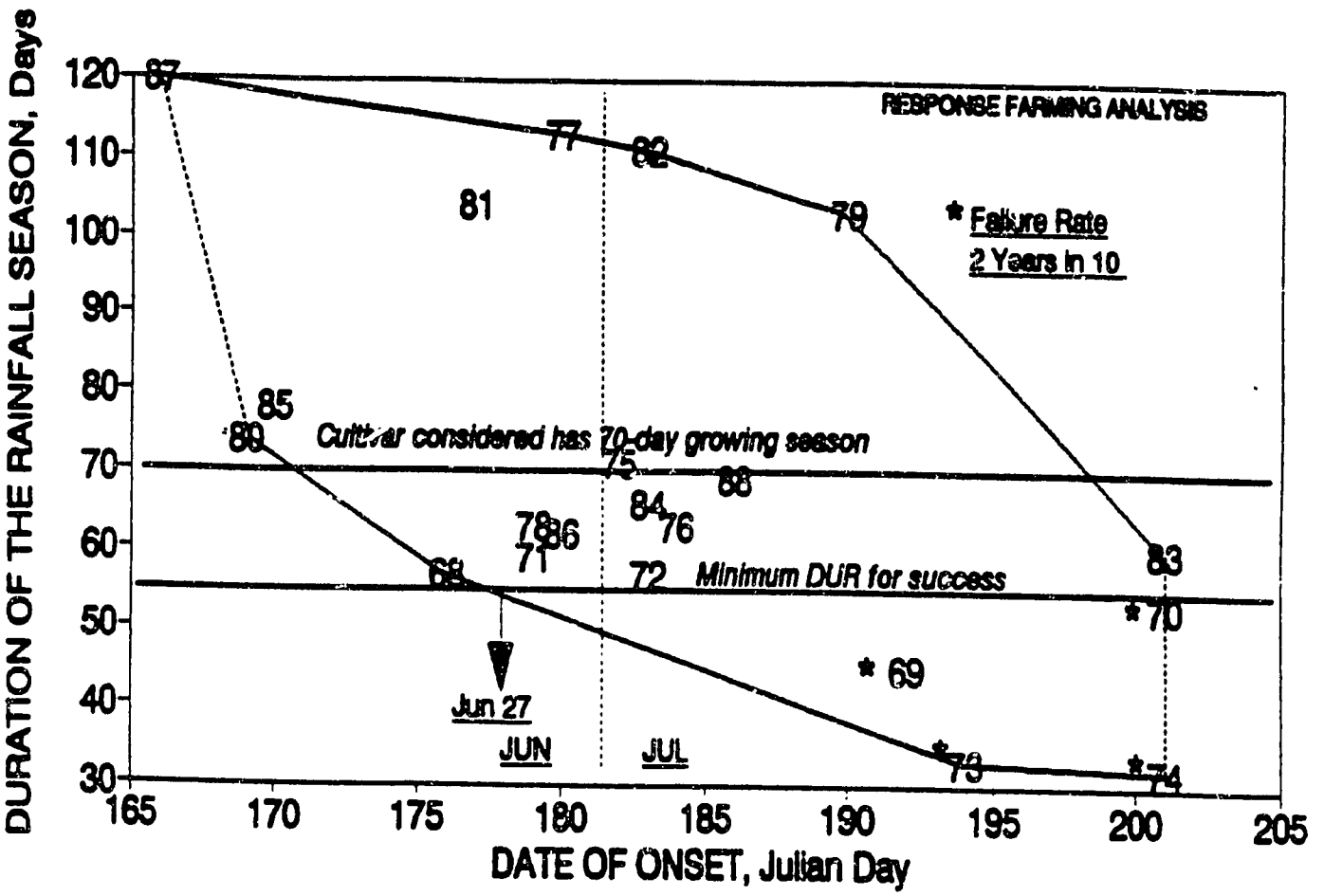

Figure 12

Figures 12, 13, 14 and 15 repeat the process for farmers on shallow soils with less water storage capacity. Figure 12, like Figure 8, evaluates expectations with 70-day cultivars, but demands a rainy period of at least 55 days rather than the 40 days on deeper soils. The overall failure rate found in Figure 12 is approximately 1 year in 5, but no failures actually occurred with June onset and the figure indicates only a very small risk in that period. The decision is to sow a 70-day cultivar in years with onset by June 30, as quickly as is feasible following confirmation of onset conditions having been met.

Asmara, Ethiopia: Rain for Crops 1968-88
Matching Cultivars and Rain on Shallow soils

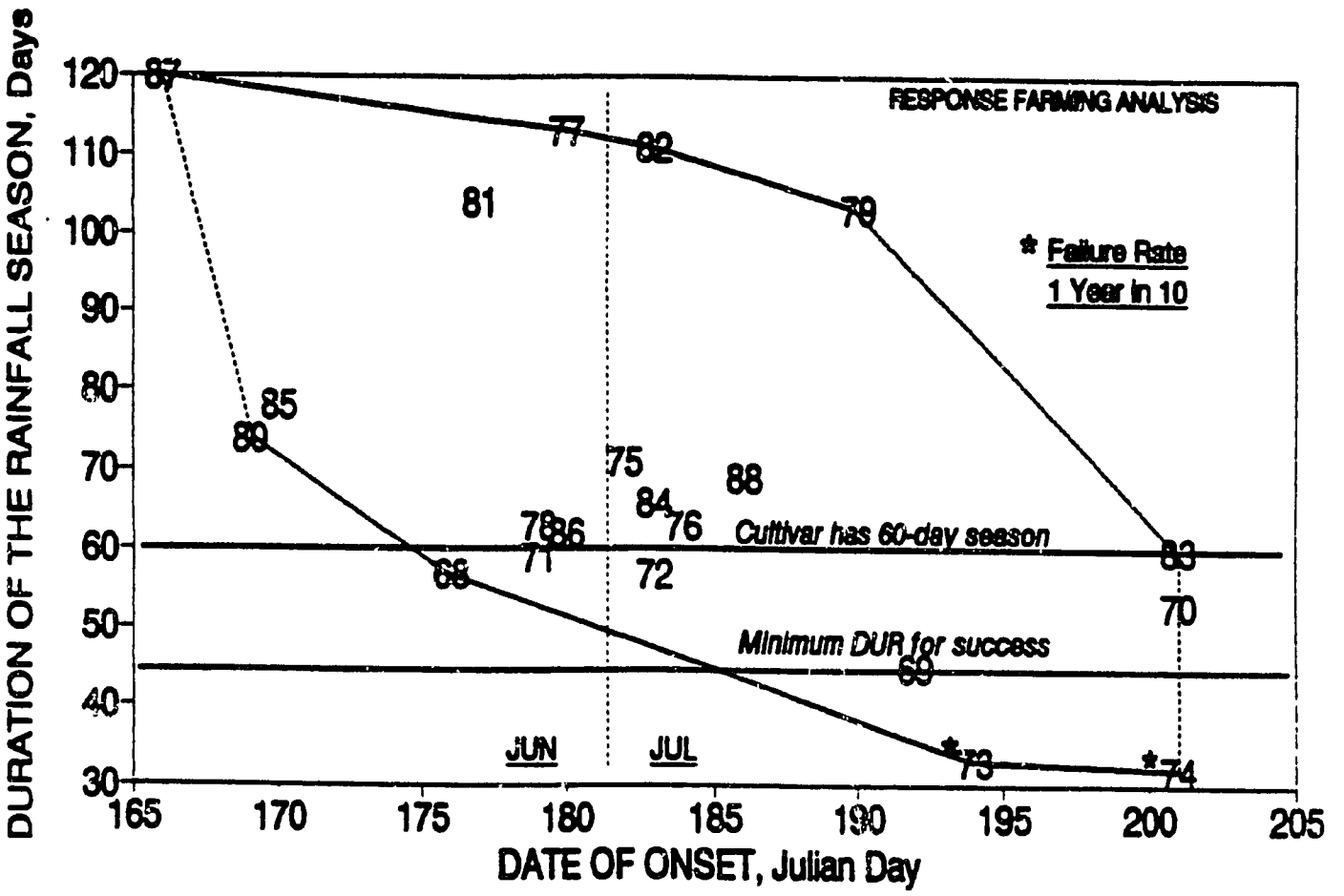

Figure 13

Figure 13 evaluates prospects for a 60-day cultivar on shallow soils, finding an overall failure rate of 1 year in 10. Assuming that shorter term cultivars are not available, the decision is that 60-day cultivars should be dryplanted on July 1 if no onset has occurred in June.

Asmara, Ethiopia: Rainfall Patterns 1968-88
Confirm Planting Times and Cultivar Maturities

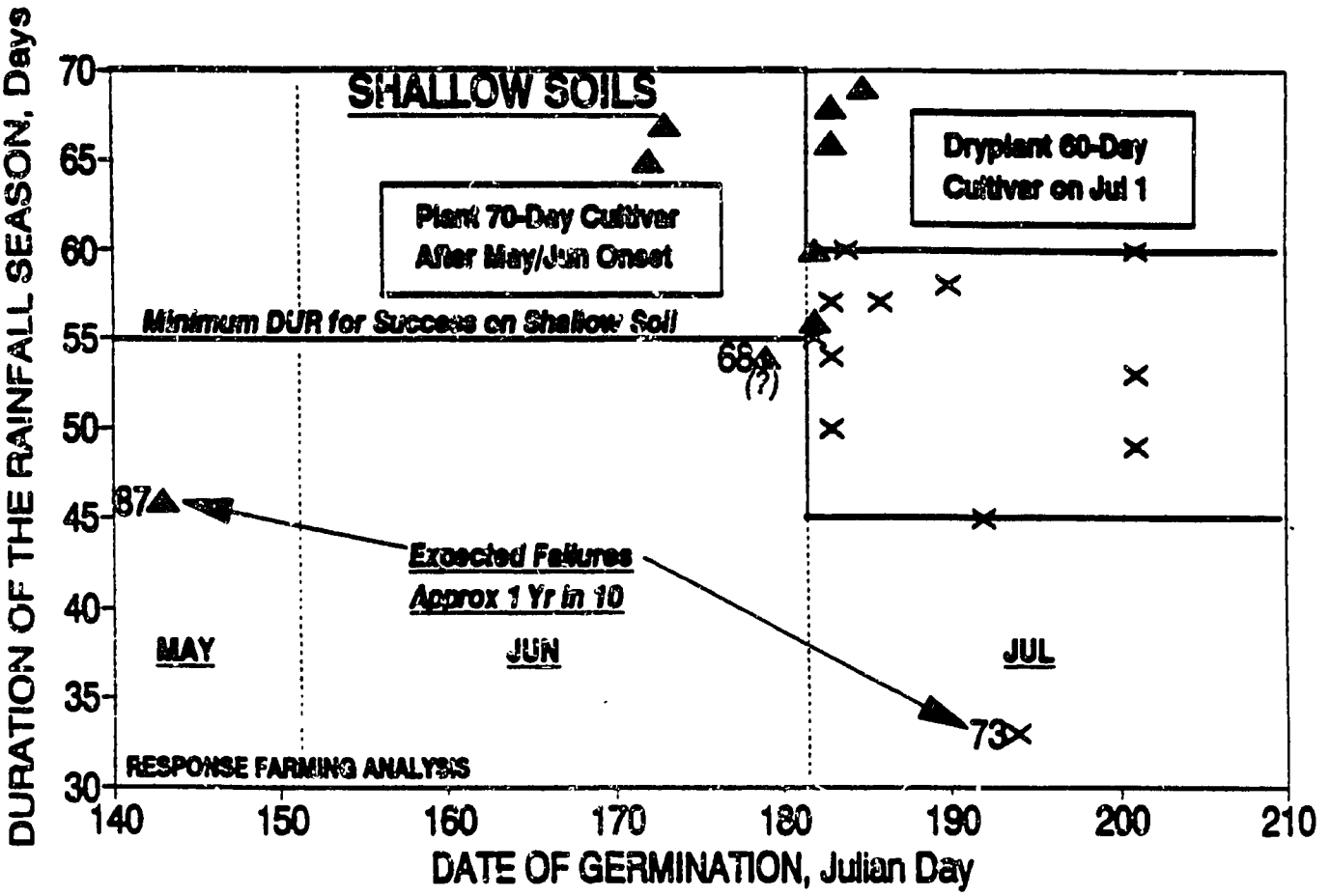

Figure 14

Figure 14 incorporates the foregoing planting and cultivar decisions and emulates the reality of rainfall serving the cropping season. The figure shows two years clearly would have failed from early cessation of rains, and a third which is questionable, being one day under the required period (1968). The failed years are 1973 and 1987, whereas Figure 13 suggests failure in 1973 and 1974. 1987 was a very unusual year with spectacular rains in May, virtually none in June or July, then normal big rains again in August. In the generalized rainfall analysis this results in a very early onset and a very long duration. But when allowable duration is capped by an 80-day cultivar, the August rains are excluded and early cessation for the planted crop occurs. On the other hand, 1974 appeared to have a duration of only 32 days in the generalized analysis, but met (barely) the 46 day requirement in the analysis for Figure 14 due to some further small rains before the maturity date - rains too small to be counted under the stiffer analytical requirements for ending the rainfall season totally. The final evaluation indicates an approximate 10% failure rate which is unavoidable on shallow soils. Very late onset gave warning for the 1973 failure, but 1987 gave no warning except for the rarity of massive May rains.

Asmara, Ethiopia: Rainfall Patterns 1968-88
Shallow Soils - Selecting Crop Types

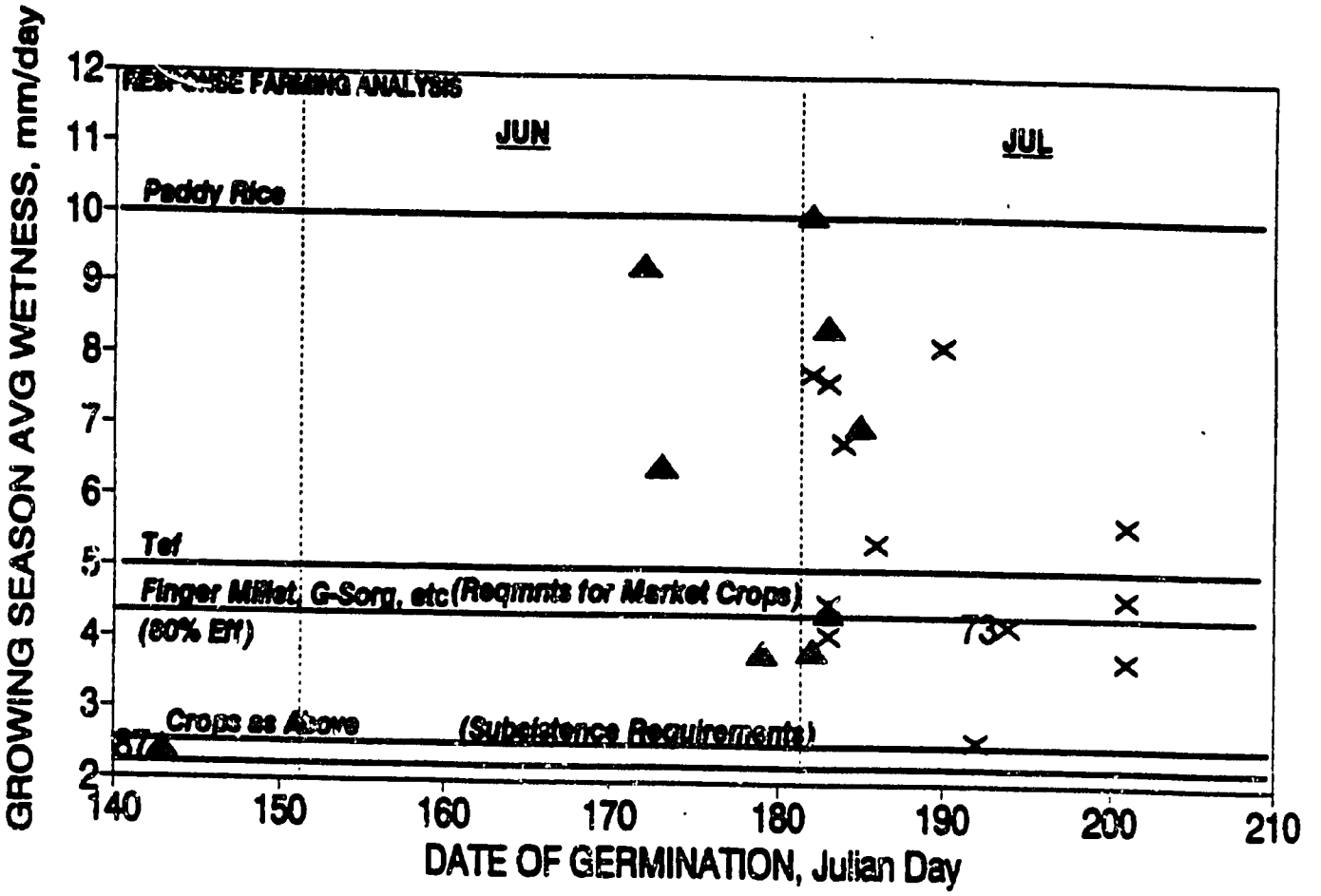

Figure 15

Figure 15 evaluates the adequacy of water supply, based as before on requirements expressed in terms of average daily water amounts. The years 1973 and 1987, already shown to be failures due to early rainfall cessation, are identified and included in this figure just for the sake of interest. Figure 15 shows that no additional years should have totally failed from lack of water, and only one year should have dropped all of the way to the subsistence level. Of the remaining 18 years, 11 had sufficient water for a market level yield of any normal crop, and when grain sorghum and millet are included, this rises to 14 years. The final 4 years could have produced fair crops in the range of 60-80% of maximum.

Appendix B

Working Group Reports from the Tucson Meeting

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Early Warning Group Report

Early Warning

Charles F. Hutchinson, Tim Frankenberger, Frank Reiley,
Richard Longhurst, William Rau, Simon Maxwell,
Gerry McKiernan, Gary Ilerts, Mark Lynham,
Brian D'Silva, Dan Goldstein, Greg Gottlieb, Mary Little

1. Introduction

Although an apparently straightforward topic, a good deal of discussion of early warning revolved around the fundamental nature of the famine mitigation effort. This shaped, in large part, the group's findings.

Substantive agreement on the early warning approach was reached fairly easily and is reported below as our major findings. However, a number of more basic issues arose during discussion that could not be resolved and which went considerably beyond the charge to our group. These are presented separately in the discussion section.

2. Findings

It was agreed that the early warning activity (ShortFEWS) should encompass four major tasks. They are listed below in their logical sequence.

2.1 Country Vulnerability Profile

Objective: to establish baseline vulnerability to food security emergencies. This would include considerations (1) of inherent susceptibility of a population to risk, (2) their current ability to cope with "shocks," such as drought, and (3) the proven resilience of the population to recover from shocks.

Data: as many as 20 types of data might be considered (from Borton and Shoham 1991), including historical rainfall, historical NDVI, general quality of available land, distance to markets, access to off-farm employment, etc. These would also include, however, reference information on livelihood systems, agroecological zones, land use, logistics, local institutions and their preparedness.

The vulnerability profiles can be generated, principally, through secondary sources, local institutions, or RA's, where needed.

Profiles would be geographically specific, and thus disaggregated or stratified by region/district and group (e.g. small farmers, large farmers, herders, urban poor, etc.), in the manner suggested by Maxwell in northern Sudan (1989).

2.2 Early Warning Alert

The actual early warning alert would come from FEWS in those countries where they operate. In fact, the Country Vulnerability Profile described above will complement FEWS efforts. Outside the FEWS region, a "minimum" data set would be monitored (rainfall, NDVI and selected commodity prices) in highly vulnerable areas, but ShortFEWS would continue to rely largely on alerts from national/NGO EWSs and cables from USAID missions. Where necessary, national capabilities would be strengthened.

Beyond the minimum data set, other indicators might emerge from the vulnerability profiles that will be routinely tracked.

2.3 Rapid Rural Appraisals/Assessment and Intervention Missions

The purpose of the Assessment and Intervention Mission (AIM) is (1) to verify and gauge the type and degree of emergency, (2) to establish intervention objectives, (3) to define mitigation strategies, (4) to initiate preparations for subsequent activities, (5) to identify mitigation projects (suggested by coping strategies and local experience), and (6) to suggest measures by which success can be determined. The AIM will be performed as soon as the alert is received and will be conducted by a multidisciplinary team that will include representatives of local institutions (e.g. NGOs).

The number and location of sampled villages will depend on (1) the location and nature of the target area, and (2) the types of indicators that have been identified during the preparation of the vulnerability profile. As already suggested, AIM must rely heavily on local institutions/individuals (e.g. NGOs), for information and guidance.

In conflict areas, whatever sources that might be available will be used (e.g. NGOs, local informants). It is understood that, in many cases, field missions may not be possible. Where a field mission can be mounted, however, that too will be utilized. In conflict areas, information needs will be somewhat different, for example consideration of factors that affect safety in the region.

In those areas where mitigation has been most successful, a number of projects were already planned and "on the shelf." Thus, preparedness will be given special attention.

2.4 Monitoring/Evaluation

After mitigations have been implemented, a smaller second mission will be conducted to perform a preliminary evaluation of the mitigation success.

3. Discussion

A consensus emerged among the group that two different but related questions are being explored in the OFDA project. First is viability of the ShortFEWS methodology: can it

be used to (1) identify populations at risk quickly and accurately, and (2) suggest likely avenues for mitigation efforts? The preceding section describes how the group saw such a job might be addressed and there was reasonable confidence within the group that the objectives of the early warning activity could be met by adopting such an approach.

The second and more fundamental question that was considered, however, is whether famine mitigation is itself a viable activity: is there actually a niche between short-term relief and long-term development that can be filled during times of emergency?

As suggested in FEWS matrix (attached), there is a continuum of activities devoted to the alleviation of conditions that lead to famine that vary in their objectives, duration, intensity, and most significantly for our purposes, the agencies which undertake them. This simple continuum can be summarized as follows:

Development ----------> Relief

The ends of the continuum are well-defined, both functionally and bureaucratically. OFDA, however, seeks to define mitigation as a niche between these two end points.

Mitigation efforts are directed toward minimizing both the impacts of the immediate emergency and the time that would be required to recover from it. To achieve this, farmers must be kept on the land and their productive assets (e.g. farm implements) should be retained so they are prepared for the next growing season. Because of this focus, development, mitigation and relief activities clearly overlap, but they are inextricably linked and, ideally, mutually supportive.

Discussion of the pending emergency in Sudan, however, gave the group a context within which to consider mitigation, and at least three constraints emerged. First, given the scale of the pending emergency in Sudan and the widely dispersed but intense level of effort it would require to mitigate, the budget allocated to the mitigation activity appears inadequate, at best.

Second, as currently defined, mitigation activities ultimately would be carried out by PVO/NGO groups. Again, as with budget, personnel available to perform the work are in limited supply. Moreover, as an emergency approaches, these same groups are likely to hard-pressed to prepare for relief efforts. Thus, to divert their energies to mitigation activities might very well dilute or even endanger relief efforts.

Finally, it was acknowledged that mitigation, in addition to falling between development and relief in a functional sense, also falls between the responsibilities of different agencies in a bureaucratic sense. This has caused problems already that will undoubtedly persist.

As a consequence of these discussions, the group was left with fundamental questions regarding mitigation. There was general agreement that the goals of the mitigation activity were valid and desirable. But, as would be expected at this early date, the means by which

they might be achieved were not yet clear. However, it was noted repeatedly that, successful mitigation efforts (e.g. Ethiopia) were based on projects that had already been designed and were taken, literally, "off-the-shelf." Thus, particularly in light of the budgetary, personnel and bureaucratic constraints under which mitigation must be conducted, preparedness will play a critical, if not key, role.

4. References

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Livestock Working Group Report

Famine Mitigation Activities for Livestock Production Systems

Harvey Blackburn, Dennis Child, Hudson Glimp,
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1. Introduction

Drought, famine and civil unrest are problems that impact the well-being of individuals and the food security of many local and national populations in Africa. Unfortunately, increasing population pressures multiply the impact and frequency of these recurring events. A holistic approach is required to address these problems and reduce their impact on people. All factors within the system, or impacting upon the system, must be considered to formulate appropriate mitigation activities. Each system component must be considered individually along with its interactions with other components to develop and initiate successful mitigation activities.

Livestock are an important component of most production systems in lesser developed countries. Most of their feed comes from rangeland, crop residues, or other lands associated with cropland. Because of this close linkage with the natural resource base, the management of livestock is a critical element contributing to the long-term stability of these production systems and the people supported by them.

Livestock and their products are utilized in extremely diverse ways and are important in providing many products for producers. In times of famine they can be an even more important source of food and can serve to add value to crop activities far beyond the economic benefit derived from cropping activities alone. Therefore, when livestock production is impacted, the economic growth of the region or country is also affected.

The famine mitigation activity proposed by OFDA provides not only a mechanism with which the impact of environmental or social turmoil can be countered, but it also provides a basis for lessening the economic impact of disasters. The end result is a sustained level of economic growth instead of oscillations in supply and demand for key commodities.

2. Mitigation and Livestock Issues

The principal issue surrounding the response of livestock sectors to drought and civil unrest is how to best manage the livestock resource before and during the disaster and to position the sector for a quick resumption of production. Why is this action critical? Many people in arid regions depend solely on livestock for their livelihood. During such disasters livestock productivity is reduced thereby lowering the protein and energy the human population has access to. Another way disaster impacts livestock is forcing their sale during a drought. Livestock sales at this time depress the market price resulting in the producer liquidating capital at a fraction of its value. Livestock or their products are also sold to

purchase grains or other commodities. Thus when a disaster impacts livestock performance other segments of the smallholder economy are impacted and the ability to purchase basic food staples is reduced.

To lessen or eliminate the influence of disaster, specifically drought, it is essential to understand how such events impact livestock. Drought impacts livestock exponentially. Initially the impact is a slow deterioration of forage quality and availability os precipitation decreases. As the lack of precipitation continues animals begin catabolizing body tissues to compensate for deficient diets. While animals are catabolizing body tissues productivity decreases in terms of body weight gain, milk production, reproduction and the ability to be used for traction. As forage reserves and body tissues are depleted mortality increases.

Although the loss of livestock, and therefore capital, is bad enough, the impact of the drought continues to persist long after the drought has ceased. Drought effects herds or flocks by eliminating or delaying a generation of animals from entering production. Therefore herd or flock productivity can be depressed for several years after the drought has occurred. In other words, a hole in production will continue to occur until the role of the affected generation is decreased. For example, it takes sheep or goats two years to recover from a one year drought (Blackburn and Cartwright 1987; Zessin 1991). As the length of drought increases recovery time for the flock or herd also increases in an exponential manner.

3. Constraints to Livestock Productivity

The constraints imposed upon livestock production during a drought and recovery from drought occur on an individual animal level, the herd or flock level, and production system level. On the animal level the nutritional limitation lowers productivity. As previously mentioned animals begin to catabolize body tissues and their performance is depressed. Along with loss of body weight comes a greater susceptibility to disease. The impact of the disease can manifest itself in terms of epidemics and turning normally chronic health problems into acute health problems (e.g., internal and external parasites).

Another type of constraint is the herd or flock structure, which can be manifested in two ways. Often producers keep excess males in the flock. This practice reduces the amount of forage available for productive females in times of drought. Although excess males are the first to be sold this is often too late, in terms of preserving forage and taking advantage of better prices. During drought reproduction rate is reduced if not stopped. This does not impact the producer immediately, however it can severely inhibit the herd or flock's recovery from drought. This topic becomes critical when two droughts occur in a short span of time and the herd has not recovered from the first drought. The lack of replacements then slows the rebuilding process which in turn limits the animal products which can be derived from affected herds.

Interfaced with animal and climatic variations is the production system livestock are raised in. Different production systems will have different constraints. For example, the situation an agro-pastoralist faces will be much different from the nomadic herder. Agro-

pastoralists could initially have greater access to forage reserves with which to supplement livestock, however after this reserve is depleted they do not have the mobility to graze their livestock elsewhere.

4. Proposed Interventions

Mitigation activities for the livestock component could be centered around the production systems identified by the livestock group. These production systems are:

- Nomadic
- Agro-pastoral
- Small holder/Sedentary

Within each of these production systems are a series of data needs. These include basic natural resources inventories, vegetation assessments, land resources available, determination of soil types, and the potential to reestablish different plant species. Animal data needed include: herd compositions, national inventories of animals and body condition of the animals. The type marketing information to evaluate: market absorption of extra offtake in drought situations and what is the status of the infrastructure to market livestock. An assessment of traditional coping strategies should be made to build interventions around. Because production systems, drought intensity, and animal status will change in different mitigation activities the group felt that the use of computer simulation models would be a useful tool for assessing the appropriateness of interventions before putting them into effect.

Nomadic Systems. Initial interventions for the nomadic system include a two-pronged effort: Planting shrubs which are palatable (to address long term range needs), this could be funded through food for work programs and would involve water development. And during the first signs of drought designate areas as forage reserves for the impending drought. Designation of the area would have to be based upon input from local groups. This means that community groups will have to be formulated. In this process predetermined numbers of animals will be planned for as a mechanism for inventory control.

Agro-pastoral Systems. The agro-pastoral area will also have two strategies. These will include inventory control and strategic supplementation with feeds not produced by the producer. This will create a need to determine which group of livestock need to receive the supplement. To address this problem computer simulations will be used to determine the most effective use of the supplement. Inventory control will be focused upon excess males and non-productive females.

Small Holder/Sedentary Systems. Sedentary production systems will have to be addressed on a different avenue. Here mitigation activities will be centered around integrating livestock and crop systems to maximum levels. This approach serves short- and long-term goals by planting crops or forages as a permanent renewable resource. It is critical in these situations that smallholders have strict control on animal numbers. Perhaps a key aspect of this will be to aid in their access to markets and formulation of co-ops to help develop technology transfer and economies of scale.

More detailed information about mitigation activities follows for each of the three production systems.

5. Agro-Pastoral Production Systems

5.1 Introduction

Increased human populations in Africa are resulting in increased livestock and livestock products. Livestock provide crucial goods including meat, milk, manure, traction, transport, skins, hides, and other products. At least 50% of the population in Africa is associated or directly involved with livestock.

Livestock are in most areas, the major form of wealth, savings, old age and health insurance and are important in ceremonies and religious activities. Livestock serve as the major "currency" of exchange, sales or barter.

Unfortunately, increases in population (and thus livestock numbers) are coming at the extreme expense of Africa's natural resources. As a result, in many portions of Africa the once highly productive grasslands are suffering from severe overgrazing. Soils are rapidly eroding, forage productivity is on the decline, water quantity is declining, and water quality is deteriorating.

These conditions have created man-made droughts (famine) in addition to natural or conflict-based famine. Therefore, famine mitigation (relief) strategies or interventions must be longer term in addition to immediate intervention activities.

5.2 Overview and Mitigation Possibilities

Generally, there are two basic approaches to the livestock: 1) managing the animals or 2) managing the natural resources (water, vegetation, soils). Managing the livestock is the most favorable approach during crisis (famine) while managing the natural resources is the option between famines (drought, etc.).

5.3 Management of Livestock

The semi-pastoralist and agro-pastoralist depend on cereal crops for a significant portion of their subsistence; along with oxen or family (tribal stock). In many cases, whole or portions of the family move with the herd or portions of the herd for periods of the year and then, return to their villages.

Among agro-pastoralists, livestock for household cash income is usually easier than for pastoralists because of access to markets. Since the agro-pastoralist location is mostly fixed, the use of oxen for transport of household goods and as traction animals means the oxen is more important to the agro-pastoralist. However, this creates great vulnerability to the agro-pastoralists during drought because of limited mobility and when they can no longer reap harvests, they cannot support traction transport animals.

5.4 Other Major Considerations and Factors in Mitigation

- Periodic vs. aperiodic migrations of livestock.
- Land ownership and tenure: crucial to famine preparation is the knowledge of the ownership of pastures and watering points. Security of these areas may mean the survival of the herd and/or the village.
- The best pastures and water may be the cause for conflict or ownership or use based on religious or cultural factors.

a) Options for Survival During Famine

Are there job opportunities away from herding during famine (farming, fishing, construction, trading, hunting, soldiering, etc.)?

b) Herd Size and Livestock Diversity

Diverse specie stocking and large herd size are generally the rule along with age and sex classes.

c) Famine Mitigation and Coping Strategies

- Locate and map existing pastures and water points.
- Establish grazing reserves of famine reserve pastures near villages for use during extreme conditions (introduced species).
- Mitigate ownership of water points to assure water sources during famine.
- Establish alternative work (job) agreements when famine occurs in villages, etc.
- During famine, cull the animals less suited for drought conditions such as switching from grazers to browsers.
- Pursue optimal marketing strategies.
- Encourage information and education activities.
- Meet with NGO's and listen to what they suggest.

d) Longer Term Mitigation and Coping Strategies (resource management aspects)

- Conduct resource inventories near villages to determine most suitable lands for pasture and cereal crop production.
- Inventory to secure watering points.
- Establish reserve pastures (grazing and crop).
- Encourage culling animal health and vaccination programs along with genetics.
- Establish reliable market system.
- Upgrade monitoring program for insect outbreaks.
- Establish grazing associations or focus groups that offer local leadership.
- Encourage radio communications for early warning and educational activities.
- Pursue alternative animal protein sources (feed supplements developed through time).

5.5 Summary

The diverse forms of seasonal grazing patterns; herd size, mixes of livestock, age classes and sexes; use and ownership of pastures and watering holes; in addition to alternative forms of labor, all are crucial to the ability of agro-pastoralists to survive through food shortages and their vulnerability to famine.

The goals of the famine mitigation activity and particularly short-term or long-term interventions should be to promote sustainable agricultural conditions and resource management while managing famine. Interventions that only promote increased animal production are bound to cause social conflicts and project failure.

6. Small Holder/Sedentary Farming Systems

Livestock are generally a small yet vital part of smallholder production systems. These may include cattle or donkeys as work animals or cattle for milk production. Sheep and goats appear to be increasingly popular, primarily because small animals fit the small farm. Dual purpose goats kept for both meat and milk should offer high potential in smallholder systems due to their higher and more frequent offtake, and their ability to utilize diverse feedstuffs. One of the important contributions of livestock is manure for fertilizer.

Production systems range from total confinement with feed carried to the animal, to staking animals to graze specific sites, to herding animals to graze fallow land or communal areas. Immediate needs are for better data on numbers and management of livestock enterprises within specific target areas.

Short-Term Interventions. The following are recommended for consideration, with priorities determined by local conditions, interest, and capabilities.

- Improve use of crop residues or wastes, and determine how to use forages from growing crops -- maize leaves from the lower part of the plant, sweet potato vines, etc.
- Identify "quick response" fodder crops that could be planted to produce harvestable feed within 45-50 days.
- Establish priorities for livestock inventory management. If possible, simulate and test the comparative efficiencies of priorities for destocking cattle vs. goats vs. sheep in smallholder farming systems.

Long-Term Interventions. Some short-term strategies may become apart of long-range plans. Long-range strategies must be low cost with a positive impact on the farming system.

- Develop borders, alleys and other "waste" lands for forage crop production for livestock. These may be leguminous trees such as Sesbania, Leucaena, or forage crops such as hybrid sorghums or Napier grass.
- Improve use of crops and crop residues for livestock.
- Develop efficient systems for the collection and use of manure.
- Improve animal production systems to increase productivity, offtake and marketing.

Water Resources Working Group Report

Water Resources

Bob Hall, Mark Henderson, Harvey Metz,
Joe Tabor, Lynn Uttal, Muluneh Yitayew

1. Introduction

During its meeting on the afternoon of May 22, 1991 the water resources working group discussed issues in water management under drought and famine conditions. In response to the assigned tasks the group developed general and specific recommendations for collecting information, selecting interventions, and implementing activities.

2. Information

2.1 Profile Data

In order to understand the regional characteristics of water resources and their management, the country profiles should include the following:

- Hydrogeologic data for targeted regions
- Climatological data, past and present
- Topographical data
- Regional farming systems research data
- Background on institutions, governmental and private, involved in water resources management and development
- Information on water resources development activities undertaken during the last five years, with specific hydrological information and capacity/yield data when available.

2.2 RRA Data

More specific information can be gathered by the rapid rural appraisal teams when they investigate the target areas for interventions. To gain a clear picture of current conditions, the following information is required:

- Main water points
    - Type
    - Condition
    - Yield
    - Number of users, quantity per user
    - Seasonal availability
    - Average distance from water point to end use
    - Transport system

- Watershed profile
  - Topography
  - Drainage patterns
  - Soil types
  - Vegetation cover
  - Percent under cultivation
  - Erosion rates
  - Existing surface water control structures
- Local water management practices and practitioners
- Local technical resources and capacity
- Local organizations involved in land use management and soil and water conservation

2.3 Interventions

Based on plenary sessions presentations the water working group listed the types of client groups, physical and demographic contexts, and water resources interventions most likely to be encountered in the five target countries.

- Client groups
  - Agriculturalists
  - Agro-pastoralists
  - Pastoralists

  Each group can be further characterized as:
  - Resident
  - Displaced in country
  - Refugee out of country
  - Resettled in new place
  - Returned to original place

- Contextual elements of importance
  - Physical:
    - Topography
    - Rainfall (frequency, current annual/average annual)
    - Hydrology (aquifer types, depths)
    - Access (physical and political constraints)

  - Demographic:
    - Population mix and stability
    - Labor availability
    - Water use patterns

- Organizational integrity
  - Security

- Technical areas of intervention
    - Hand dug wells
        - Repair and construction of wells
        - Pump repair and installation
    - Bore hole wells
        - Repair and construction of wells
        - Pump repair and installation
    - Soil and water conservation
        - Cultivation techniques/extension
        - Check dam construction
    - Waterharvesting
        - Zais construction and extension
        - Catchment construction and extension
        - Contour catchment construction and extension
        - Roof catchment and storage system construction
    - Reservoirs
        - Retention dam construction
        - Pond development

- Site-specific Interventions
    - Irrigated perimeter improvements
    - Spring development and capping
    - Sanitation facilities improvement or development

2.4 Matrix

The water working group next undertook the development of a matrix that would delineate the appropriate conditions, the necessary participants, and the required information and material inputs for the major intervention types.

Intervention Option	Appropriate Conditions	Necessary Participants	Required Information/Material
1. **Hand dug well**	Accessible ground water Local labor Local well diggers	Local expertise NGO trainers transporters	Local well profile Hand tools Current practice Cement
2. **Bore holes**	Hand dug wells not sufficient or possible Available high tech equipment and expertise	Professional well diggers NGO trainers for mainten-ance program	Hydrological data Lots of money Pipes/pumps
3. **Soil/Water conservation structures**	Appropriate slope and soils Labor force	NGO/Gov. extension agents	Existing practice Simple levels
4. **Water** harvesting & catchments	Usually on crusty degraded soil - Hand labor intensive	NGO/Gov extension agents	Soil types Current practices
5. **Reservoirs**	Appropriate soils and topography Labor intensive Design expertise	NGO/gov engineer and construction supervisor	Topographical and rainfall data Watershed study Earth-moving equipment

3. Recommendations

From discussions of individual experiences the working group developed a number of recommendations regarding the design and implementation of interventions.

a. In agricultural communities rainy season is the most labor intensive time of year. All projects that require large amounts of labor should be implemented during the dry season. Training for skilled workers can occur just prior to the dry season. Wells are most effectively deepened at the end of the dry season when water tables are at seasonal lows.

b. Food/cash for work is often helpful in keeping available labor from leaving in search of work when projects are labor intensive. Initiation of activities should begin well before the dry season in order to encourage the labor force to stay in the area by assuring them sufficient food and income. All issues of compensation should be thoroughly discussed with participants. Community oversight and management of food/cash for work programs should be encouraged.

c. Whenever possible build on existing practices and experiences. Look to replicate projects that have already been proven effective.

d. Emphasize skill enhancement and local capacity building rather than inputs of external materials and expertise. Improving group organization improves each member's ability to overcome adverse circumstances. This is itself is an important mitigation strategy.

e. Promote local dissemination of improved practices to gain the multiplier effect. Training of trainers and other outreach strategies are important ways to achieve a broad impact.

f. Small scale interventions are usually lower risk than large scale interventions. They are also more adaptable to local structures and practices. Interventions that are easily replicated have the widest impact.

g. Try to identify catalytic elements that can have a large impact. These can be simple but hard to find tools like pulleys, pump parts, or tube levels. They can also be simple techniques like oral rehydration therapy or water purification. Such elements are usually simple, low cost, and replicable.

Seeds and Tools (Cereals) Working Group Report

Cereals Working Group Report

Richard Caldwell, Tim Finan, Mark Langworthy,
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1. Introduction

The Cereals met during the workshop, on the afternoon of May 22, 1991, with the above participants present. Participants of the Gardens group, also under the heading of Seeds and Tools, met briefly with the Cereals group to discuss the advantages and disadvantages of working jointly on group assignments. It was decided that each group would meet separately and then return to discuss their findings. As it turned out, however, each group considered their respective topics at length and did not have sufficient time to discuss common issues at the end.

The discussions were divided into 5 topical areas: areas of intervention, target populations, information needs, process, and workplan. Each are discussed below.

2. Areas of Intervention

The working group identified five general categories of interventions for areas where famine or severe food shortages are occurring. Each intervention was evaluated (briefly) according to the time frame required for implementation, its primary target group, and its potential impact in a relief setting.

These do not, by any means, represent the full complement of interventions that may be possible under the rubric of relief. Other interventions will undoubtedly be identified after country visits and subsequent to further literature search and query as to what activities are currently being implemented by PVOs, NGOs, and other organizations. During these first sessions on famine mitigation, the cereals working group focused its discussion on the ground rules (which we are all just now formulating) and did not have adequate time to reflect on and discuss all aspects of the interventions discussed below. A future session which focuses on technical interventions is recommended.

2.1 Seeds and Seed Stocks

It was noted early on in discussions that seed banks and seed stocks themselves are not interventions per se. Rather, they are necessary infrastructures which, if properly established, could facilitate and increase the impact of interventions which have a seed component. With this in mind, the group discussed activities related to seeds and seed supplies which should be studied as possible interventions.

2.1.1 Seed stocks and supplies

a. Local Seed/Input Distribution - Local distribution centers would be established to allow farmers to obtain (i) seedpaks of drought tolerant varieties and/or new species in periods of drought or impending famine, (ii) replacement seeds and other inputs following crop failures when households are likely to have consumed seed normally retained for planting, or (iii) seeds and other needed inputs for establishment of crop production in newly settled areas, or for reestablishment of returning displaced farmers. In famine years (or the following year if mitigation precedes harvest) these could also serve as distribution centers for replacement seed and other inputs. Distribution centers could be serviced through PVOs/NGOs or local government or private sector channels.

b. Seed Savings and Loans - Farmers could exchange seed at the end of the year for cash (seed would then be stocked and distributed in following year) or they could have storage bank hold seed over for them to the following year. 'Poor' varieties could be replaced with more appropriate (drought-tolerant) varieties. As a famine mitigation strategy, seeds of drought tolerant varieties could be made available.

c. In-country or Regional Seed Multiplication Centers - This is a longer-term activity that would require support of a donor or group of donors. However, OFDA's role could be to obtain relevant country data, suggest appropriate varieties, and support the conceptualization of such a center. This is needed before replacement seed programs can readily address the problems of drought-prone areas.

2.1.2 Information clearinghouse

Another potential intervention, which is really a preparedness activity but nonetheless would have a real impact on relief activities, is the creation of an information clearinghouse for technical areas. This clearinghouse would contain information on agroecological profiles (by country), cropping systems and practices, available seed sources and stocks, appropriate varieties for impacted regions, and networks for distribution. This would utilize a vulnerability assessment as a basis for evaluating what areas are most at risk and what combinations of available seed stocks would be most relevant in a relief effort (it would also have use for prioritizing 'development' activities).

Key elements of the information clearinghouse would include complete rainfall histories (daily data) of regions deemed to be at risk in each study area, complemented by detailed response farming (RF) analyses representing the major cropping systems in each designated region. These analyses would provide relief planners a sound basis for selecting crop types and varieties for specific agroecological zones, plus means to recognize when the 'planting window' has arrived in the current cropping season, and generalized guidance on important crop establishment decisions such as dry-planting versus waiting for full onset of the rains, intercropping versus monocropping, row and plant spacings to best utilize soil water, appropriate rates of fertilizer, options available for replanting, etc. The decisions taken at the

time of crop planting determine how effectively rainfall will be used throughout the growing season. Targeted RF advice could benefit even experienced farmers, and particularly so in drought years.

2.2 Grain Storage

Grain storage was recognized by the working group as an intervention having a high impact potential in the area of food security. Even in years of relatively abundant harvest, stored food losses are high and impact household level consumption as well as cash generating activities. (More literature relevant to grain storage will be included in the cereals bibliography.) Two areas were identified for intervention: training and provision of containers and other inputs.

2.2.1 Training

Training should be provided through village or community organizations on techniques to prevent loss at harvest and during storage.

2.2.2 Input provision

Provision of simple storage containers or storage supplies for households or communities could be an effective intervention activity. Storage should be tailored to the type of crop produced. Whether to focus at the household level or village or community level would depend on several social variables and should be decided from RRA information. Start-up money for local artisans to build storage units (e.g. 55-gallon drums can be used but require some modification) may be necessary or it could be made part of a FFW or CFW program.

2.3 Input Supply

2.3.1 AgPaks

AgPaks would be combinations of seeds, tools, and other inputs which would keep a cropping system functioning or revive agricultural activities in a particular area after famine needs have been taken care of by other relief activities. This intervention would target the rural poor who are struggling to keep their production systems active, people returning to their farms after being displaced, and resettled farmers. AgPak formulations would be tailored from all sources of available information, including a RRA designed to elicit needed information on cropping systems.

Reviving cropping systems through the provision of agricultural inputs, including seeds and tools, would present an opportunity to influence varieties grown. There would be particular occasions (e.g. - immediately after a civil conflict where large numbers are displaced) where the distribution of AgPaks could restore large areas of land to cropping.

2.3.2 Pest control

There are known integrated pest management techniques which are not labor intensive but which may have significant impact on yield losses. In addition, circumstances may call for specific control measures against massive pest attacks, such as recent outbreaks of locusts and grasshoppers in many areas of Africa. Pest control interventions would be keyed to accurate and timely information of current season cropping activities and would rely on FEWS input.

2.3.3 Tools

Tool and implement use needs to be evaluated in drought-affected areas to 1) determine replacement needs and 2) modify existing implements to make them more efficient.

2.3.4 Animal traction

Two possible interventions would be providing replacement draught animals to farmers who have lost their animals and providing supplemental feed for animals used in cropping activities.

2.4 Information and Advice

Immediate intervention activities, particularly selection and distribution of seeds of appropriate crop types/varieties, may be guided by represented analyses carried out as a preparedness measure for each country, region (at risk) and major cropping system (see information clearinghouse above).

Localized analyses - blanketing severely impacted areas - can follow in a matter of days, utilizing the clearinghouse data bank and crop-specific analytical procedures developed for the earlier representative analyses. In collaboration with local level agronomists, detailed guidelines for all crop establishment practices can be rapidly generated and disseminated to farmers through local channels, community organizations, government extension services, NGOs/PVOs, mass media, etc.

2.5 Use of Local Markets

Information centers set up in local markets to provide extension-level advise, information on what the upcoming cropping cycle may be like in terms of expected rainfall or pest infestation, and seed samples for small scale demonstrations of new crops and varieties. These market information centers could easily double as distribution centers for seed and other inputs during times of crisis.

2.6 Cropping System Improvement

FFW/CFW programs could target individual farmers, helping them with field improvements (contouring, bunding, etc.). This could be done in the off-season following drought year, or implemented during a year when crops are failing.

Complemented by other technical areas of intervention, such as water and soil conservation activities

3. Information Needs

a. Characterize agro-ecological zones, agricultural systems, farm sizes, affected populations, crop schedules, crops planted, water management practices, etc.

b. Survey available seed varieties, seed sources, and distribution system in-country.

c. Collect adequate climate data in order to develop country-level reports based on RF methods. This information will allow us to determine how rainfall can best be used.

d. Determine local organizations (village councils, community groups, etc.) available to work with, their structure and function, and their ability to assist with information phases and interventions.

e. Determine NGOs, PVOs, and others who have worked in the region on seed distribution, food aid, or other famine related activities.

f. Determine extent and capability of national extension service.

g. Map existing markets, including relevant information such as schedules, area served, and number of participants.

h. Survey private sector involvement in seed distribution, sales, tool supplies, etc.

4. Process

The working group briefly discussed the activities which would be required before interventions could be fully designed and activities pilot-tested in the field. Although the discussion was far from complete, the following activities were identified as being crucial to the process of developing effective interventions in crops and cropping systems.

a. In-country workshops to elicit information and feedback from in-country resources, including appropriate government organization, farmers and farmer groups, private sector individuals, PVOs, and NGOs.

b. Initial appraisal - Institutional exams and information gathering

c. Systematic RRA or system-level survey

d. Prepare a country manual
- Agroecological regimes which highlight drought-prone areas, cropping cycles, tools in use
- List of NGOs and other organizations active in the country
- Institutional responsibilities and capabilities of extension, crop protection, etc.
- List of seed varieties available, their applicability to agroecological zones
- Description of markets, marketing patterns, etc.
- Description of cropping systems, crop-livestock interactions, strategies, relative importance of livestock
- Production data, data on farm size
- Off-farm employment
- Storage practices

5. Workplans

The working group ended the session by discussing possible workplans related to crop and cropping system interventions. It was noted that the brief meeting which this report documents barely scratches the surface of crop and cropping systems interventions and that much more 'brainstorming' is required. The group recommends an additional meeting once more background information and bibliographic references are made available. The following outline summarizes the working group discussion on workplans.

5.1 Stage 1 - Concept Paper

Prepare draft concept paper(s):

a. Meet as a technical group to further formulate intervention strategies.

b. Review relevant workshop guidelines, issues papers, and bibliography.

c. Contact individuals and organizations to obtain additional information.

d. Prepare draft concept paper; include the following:
- description of intervention
- target population
- areas that intervention would apply
- human, financial, and physical resource needs
- institutional ties necessary
- relative costs and benefits of alternative methods
- scheduling

e. Distribute among potential team members for review and comment

f. Revise draft concept paper.

5.2 Stage 2

5.2.1 Pre-departure activities

a. Complement existing bibliography with reference to specific interventions and to specific countries.

b. Develop the concept papers regarding each intervention alternative

c. Compilation of secondary materials prior to rapid rural appraisal

5.2.2 Initial in-country activities

a. Establish counterpart ties - government agencies (Extension service, agricultural research center, crop protection service, etc.), NGOs, and other relevant institutional contacts. Explain terms of reference of mission.

b. Obtain data, literature, relevant records, and other information identified as needed in concept papers.

c. Prioritize areas of intervention with local contacts, determine regions to test pilot activities.

d. Develop preliminary implementation plan, including goals and objectives, roles and responsibilities, inputs (human, financial, and physical resources), schedules.

5.2.3 Rapid rural appraisals

a. Based on sites identified, visit target region. Make local contacts with local govt offices, NGOs, village leaders, farmer organizations, etc.

b. Visit villages in pilot areas, use RRA to develop local cropping systems profiles, socio-economic constraints, household decision-making patterns, seed acquisition and storage methods, etc.

c. Determine market structure, network, access to inputs and services

d. Refinement of implementation plan to account for site characteristics and constraints (includes making institutional arrangements)

5.2.4 Outputs

a. Implementation Plan for specific intervention(s)

b. Country Famine Mitigation Handbook (draft)

c. MOU's with appropriate agencies and groups

d. Evaluation and Monitoring Plan

e. Pilot-testing budget (draft)

f. Schedule of follow-on activities

5.3 Stage 3

a. Prepare field workplan (modified from implementation plan of Stage II) with institutional counterparts

b. Organize logistical requirements: personnel, travel, commodities, vehicles

c. Finalize contract with implementing agency

d. Site-supervision

e. Review/update monitoring indicators

Seeds and Tools (Gardens) Working Group Report

Seeds and Tools/Gardens

Dennis Magnello, Daniela Soleri,
David A. Cleveland, Jim Worstell

1. Introduction

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Soil Amendments
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Team members decided to divide up the topics which we felt were necessary to cover. Rather than integrating and standardizing the results, we decided to leave each section as written by the individual author(s). Given the evolving nature of the project, we felt that this would provide a range of approaches for future development.

2. Soil Amendments

Dennis Magnello

Animal manures, leaf mold and other organic materials such as plant and fish residues and crop and animal by-products can be used as soil conditioners and fertilizers.

The addition of organic materials conditions the soil by regulating the water-holding capacity and water infiltration rate and drainage of the soil, improving the tilth and increasing the nutrient-holding capacity (cation exchange capacity or CEC) of the soil. In addition, organic fertilizers slowly release variable amounts of essential primary-, secondary- and micro-nutrients for crop uptake.

Examples of organic fertilizers and the amounts of primary nutrients, nitrogen (N), phosphate (P2O5) and potash (K2O) they contain (expressed as percentage of N, P, and K of the dry weight of the material:

Cow and sheep manure	2-1-1 (2% N, 1% P, 1% K)
Poultry manure	5-3-1
Blood meal (dried blood)	12-2-0.5
Hoof and horn meal	12-2-0
Fish meal	8-5-2
Bone meal	3-20-0
Wood ashes	0-0-5
Cottonseed meal	6-2-1

These materials, if collected or obtained locally at low cost, may be used liberally to supply plant nutrients and provide long-term soil improvement. Crop residues may also be dug directly into the ground or composted for later use. Soils too acidic for proper plant growth (Ph less than 6.0) benefit from the application of lime ($CaCO_3$), wood ash or bonemeal. Alkaline soils (Ph above 7.0) may require the addition of sulfur or other acidifying materials although many plants will tolerate a Ph up to 7.6.

Where organic fertilizers are unavailable, synthetic or manufactured fertilizers can be used to supply nutrients to plants, although they do not account for any improvement to soil. Synthetic fertilizers may be particularly useful where garden sites are temporary and long-term soil improvement is not a consideration. They may also be used in conjunction with organic fertilizers. The use of these fertilizers must be carefully calculated as excessive amounts may burn plants and cause harmful salt buildup in the soil.

3. Pest Control

Dennis Magnello

In many instances, insect pests and plant diseases can be largely controlled by cultural methods such as crop rotation, garden sanitation, crop variety selection (choosing resistant varieties) and interplanting. Proper attention to routine cultural practices of watering, weeding, fertilizing, plant spacing, mulching, etc. also contribute to reduced crop damage from pests.

Naturally occurring predatory insects and mites will also control some insect and other pests.

The use of synthetic chemical pesticides should be avoided when possible for the following reasons:

1) Synthetic pesticides pose human health and environmental risks.
2) Many chemical pesticides available in developing countries have been banned in the United States and other countries because of associated health risks and demonstrated environmental damage.
3) The risk of improper application of pesticides is likely to be high among populations where literacy is low and label directions cannot be easily reviewed.
4) The application of many chemical pesticides requires a lengthy waiting period from application time to harvest (from a few days to up to several weeks).
5) The cost of application.

Where pest problems cannot be controlled by cultural practices, other natural controls can be used if available. These include bacterial and botanical controls.

Bacterial control such as Bacillus thuringiensis is highly effective against most lepidoptera larvae (moth and butterfly caterpillars) while being harmless to other insects and

animals. It is marketed under a number of trade names including Dipel, Thuricide and Caterpillar Attack. Other strains of B. thuringiensis have been developed to control Colorado potato beetle and other insect pests.

Botanical insecticides are natural pesticides derived from plant sources. Rotenone and pyrethrum are botanical insecticides which control a wide range of pests. While botanical insecticides are quite toxic initially, they decompose rapidly, do not leave toxic residues on food (waiting time from application to harvest is one day), and are not considered a threat to the environment.

Pests may also be controlled with sprays made from dilutions of certain soaps and extracts of allium species (onion and garlic) and cayenne pepper.

4. Land Tenure and Vegetable Gardens

Dennis Magnello

Gardens may be established on any privately owned provided soil conditions are adequate, some water is available and the crops can be afforded protection from wild and domestic animals.

Collectively owned land or leased land may also be used. Collective or community gardens offer some advantages:

1) The amount of fencing (for protection from animals) needed per square area is less.
2) The garden could be located near a community-owned water source.
3) Community gardens provide opportunities for social interaction and sharing of gardening techniques.
4) Community gardens serve as demonstration models.
5) Supplies can be collected or purchased in bulk for the entire garden.

Community gardens are generally most effectively managed by dividing the garden into plots, each plot being maintained by an individual or family.

Public land at hospitals, schools, etc., may be used for gardening. Gardens should be located near a water source if possible, such as a well, dam, river or lake. Gardens located near the gardeners' living area offer more incentive for regular tending.

Where land is unavailable, crops may be grown in clay, wood, metal or other containers filled with well-draining soil.

5. Water Conservation in Dryland Gardens

Daniela Soleri and David A. Cleveland

Minimizing water losses is essential for dryland garden management. Water is lost from dryland gardens in four ways; evaporation, transpiration, runoff and deep percolation.

5.1 Evaporation

Hot, dry conditions encourage evaporation of water from the garden soil surface. The longer the water remains on or near the surface the more is lost through evaporation. Heavy soils slow infiltration rates and soil amendments such as organic matter and sand improve soil structure, hastening water infiltration. Vertical "mulches" can be made using garden by-products such as maize, sorghum or sunflower stalks, or just sand, arranged in a vertical row or column in the garden bed. These create pathways in the soil through which irrigation water can travel quickly down to the root zone.

Another simple and effective method for reducing evaporation is the use of surface mulches to shade the soil and capture some of the water evaporating from it. Compost, leaf litter, pulled weeds and other kinds of organic matter make good surface mulches which also improve soil structure and fertility as they decompose.

5.2 Transpiration

Transpiration is the loss of water vapor from the plant and it is an essential part of photosynthesis. However, high temperatures, sunshine and drying winds result in excess transpiration rates beyond those required by the plant for maintenance and harvest production. This stress-induced transpiration can be reduced by using shades, windbreaks and mulches made from locally available materials such as palm fronds, or maize stalks. In Egypt for example, young tender seedlings are protected from drying winds and wind-borne sand by careful placement of maize or wheat stalks just upwind of the seedlings.

Mixed plantings combining garden crops of different forms and lifecycles reduce both evaporation and transpiration. Larger plants in these mixtures such as fruit trees, sorghum or sunflowers provide shade and protection from winds while squash vines and other rambling plants spread out over the soil and act as living mulches. Close plant spacing, made possible in rich, well-watered, garden soils also shades the soil surface.

5.3 Runoff

Water from direct rainfall or irrigation may reach the garden but if not contained it will run off out of the growing area, never reaching the root zone of garden crops. Planting in sunken beds or depressions is a long tradition in many regions and is an effective way to contain and concentrate water in the growing area. This allows time for the water to infiltrate and reach the root zone where garden plants can use it. Sunken beds capture rainwater and are not washed away should a sudden heavy rainfall occur.

Containers act as sunken beds, holding the water in place so that it sinks down into the root zone. This is why it is important to only fill containers about 2/3 to 3/4 full of soil, thus leaving enough room for adding sufficient water to wet the whole soil profile.

5.4 Deep Percolation

Water in the garden which moves down quickly, through the root zone and beyond is lost to garden crops. Deep percolation is a problem in areas where the soil is very sandy with a low water holding capacity, or if too much water is being applied to the garden. Limited deep percolation is desirable to wash salts out of the root zone. The water holding capacity of sandy soils can be improved by adding organic matter. Over-watering can be avoided by using a pole to test the depth of soil wetting. The pole will move down with ease through wet soil but then slows or stops when reaching dry soil. For good root development of annual crops the soil should be wet to about 45 cm below the surface, depending on the soil and the specific crop. Much deeper than this for these crops is probably a waste of water. Trees may need much deeper watering.

6. Nondomesticated Food Plants

Daniela Soleri and David A. Cleveland

Nondomesticated food plants may be wild, weedy, or protected annuals or perennials which are sources of food, especially important between crop harvests, or when crops fail. They are considered a part of gardens because of their role in the household food system as secondary sources of food or income.

There are five ways in which famine mitigation efforts can support the potential contribution of nondomesticated food plants.

6.1 Recognition

Public education at all levels from national policymakers to rural households can give recognition to the value of these foods. Appreciation of their potential nutritional contributions should be incorporated into natural resource management, forestry, and agriculture policy. An example of this is the FAO's new traditional crops program and their publications which inventory many indigenous, nondomesticated food plants and describe their nutritional and economic value.

6.2 Protection

Valuable nondomestic food plants can be lost through changing agricultural practices such as the use of herbicides in and around fields, through deforestation and desertification, and any other ways in which their habitats are destroyed. Local people's identification of important nondomesticated food plants and their habitats is an essential first step for protecting this resource. Inventories of these plants, their seasonality, preferred habitats and

edible parts should be made and distributed to those working on projects in the area so that these plants are given special attention and protection.

6.3 Incorporation into Garden Programs

In areas where nondomesticated food sources have already been lost, crops grown in gardens may provide a viable substitute for the leaves, fruits, flowers, seeds, and roots which were once gathered. However, in areas where these plants are still present, garden projects which are promoted without attention to the local situation can have a negative effect. These projects may encourage consumption of garden crops like cabbage which are less nutritious than the dark green leaves which were traditionally gathered. Neglecting these important traditional food sources may mean that the plants will no longer be protected and could be more easily lost.

Garden programs should always take into account information gathered in the inventory described above. Protection and encouragement of these plants should be considered part of the responsibility of garden programs, and garden crop selection should compliment, not replace the role of nondomesticated plant foods in local diets. These programs may also include propagation of these plants.

6.4 Propagation

Propagating nondomesticated food plants, both perennials and annuals, is a way to ensure that those plants will be available. Seed saving, simple vegetative propagation techniques, and small nurseries are all ways to help local multiplication efforts. Some of these could be supported through work in food for work or cash for work programs. Any programs in reforestation, agriculture, or erosion control should consider use of these plants as part of their efforts.

6.5 Nutrition Education

Nutrition education about nondomesticated food plants can be effective in two ways. First, along with efforts for recognition at all levels, it can improve the prestige of these foods. Often with "modernization" of diets these traditional and famine foods have come to be seen as being bad and having low status. Secondly, education can support ways of harvesting and processing these foods so that they retain the greatest nutritional value. For example, encouraging shorter cooking times, lower temperatures, consuming vitamin-rich cooking water, and shade instead of sun-drying.

7. Food Storage

Jim Worstell

This and the following two sections assume Walker's (1989) definition of famine onset. He defines the beginning of famine as the adoption of abnormal nonsustainable survival techniques which eat into the resource and capital base which the victim would normally try to preserve. The interventions below focus on the time band just before famine relief is necessary.)

"In truth, all societies subject to the danger of famine have always been forced to organize themselves around their grain reserves." Sigaut (1988)

Since the earliest days of the Famine Early Warning System, changes in food stores--especially grain--have been seen as crucial early warning indicator (May 1986). McCorkle (1987) has made the most thorough analysis of pre-famine adaptive strategies involving stored foodgrain.

Her analysis (along with all the most well-known models of adaptive responses to famine[1]) notes the depletion of food stored at the household level as a crucial event early in the onset of famine. If this depletion could be delayed, the onset of famine could be delayed or even averted. As long as any food remains in storage, insuring the preservation of a larger percentage of that food is one sure way of mitigating famine. Even just a scant percentage more stored food available could help break the self-perpetuating cycle of having food in least supply during the season of greatest energy need--planting season--resulting in few crops planted and harvested, less in storage when planting season comes around again.

In the developing world food losses in storage routinely amount to as much as 50% of the total harvest[2]. Zones of famine-prone areas with adequate storage facilities have been shown to suffer less severe seasonal undernutrition (Sharman 1970).

Smallholders are often very sensitive to food storage problems (Downing, Gitu and Kamau 1989). Food shortages are often blamed by smallholders on inadequate storage facilities (Messer 1989). Wicker granaries are blamed by many villages for allowing a large proportion of grain to rot during the rainy season and allowing rats and mice to get in during the dry season. Their adaptive strategy is to sell their grain at harvest and buy foodgrain back later to avoid self-storage losses.

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1 Corbett (1988), Watts (1988), Glantz (1987) and Cutler (1985).

2 Accepted estimates of annual loss of fruits and vegetables is 30-50%. Annual loss of grains is at a minimum 10% (Robinson, 1983 and National Academy of Sciences, 1978). Available country figures include central storage losses in Sudan of 14% for millets, 27% for groundnuts and 20% for sorghum (FAO, 1977).

One basic technique is crucial to both an RRA detection of food storage constraints and intervention to mitigate affects of food storage losses on famine: inspection to detect biological heating due to wet grain and fungal, bacterial or insect infestation. Cleaning to remove infested portions and redrying are the crucial follow-up activities. A traditional method is simply to shuffle or shovel the grain around periodically following removal of any seriously infested heads or portions. Interventions involving hiring villagers to inspect food stores will reinforce indigenous knowledge and protect food resources. These interventions can be instituted at any stage in the onset of famine[3].

Store it dry and keep it dry

"...[M]oisture may be the most important factor determining whether, and to what extent, grain will be liable to deterioration during storage." (National Academy of Sciences 1978)

One reason moisture control is so crucial is because it is so weather-dependent. Open sided cribs allow grain to dry when humidity is low, but permits grain to take up moisture during wet weather. Ventilation is extremely beneficial in dry weather for maintaining quality of grain in storage. But in the rainy season, storage sealed against humid air is needed.

Cool air holds less moisture and decreases biological respiration resulting in fewer storage losses. Some traditional systems of grain storage have involved moving grain to higher altitudes for storage. But of the two bywords of good storage, cool and dry, often the only one open to intervention is dryness. However, the fact that deterioration of grain in storage is much less pronounced in cool, dry weather than in hot, humid weather must be taken into account in implementing food storage interventions--especially in extremely bimodal climates.

Drying

A key to drying is pace. The pace of drying must not be so slow that fungi and insect infestations can build up, but not so rapid the food goes "into case" with the surface drying sealing moisture in inner layers.

Methods of on-farm and village level grain drying and storage are detailed by Lindblad and Druben (1976), including: a pit oil barrel dryer, an improved maize drying and storage crib, a simple batch-type rice dryer, and a number of simple solar dryers. The African Rural Storage Center has also developed improved grain drying cribs built from locally available materials.

Once grain is dry enough, sealing in impervious containers, if available, will result in sustained, secure grain storage. Underground pit stores are traditional methods for storing

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[3] These are examples of **conserving** food already in storage. Sigaut (1988) proposes a three-fold classification for food storage interventions, also including: **preparation** of products before storage and **preservation** or protection against specific storage problems.

large amounts of grain. They can be cost-effective methods for obtaining conditions where grain is cool, dry and sealed from insect and fungal infestation. Inspection opportunities are reduced, however, so grain must be well-dried and free of infestation before storage.

Keeping the food dry will eliminate nearly all fungal and bacterial infestation problems. Regular inspection to insure grain stays dry may be sufficient to preserve nearly all grain of species such as teff (Eragrostis abyssinica) with minuscule grains and a hard seed coat. However, nearly all other tropical stored foods are much more susceptible to insects than teff.

Preservation against insects

Keeping grain dry will decrease insect problems, but will not remove the problem. Traditional strategies include mixing smaller seed, sand, ashes, limestone and dried animal dung to fill spaces between grains to reduce breeding areas for insects and to abrade insect cuticles leading to desiccation. Ash of Boscia spp. has been reported as being especially useful with millet. Millet stored on the head, in bulk with the addition of Boscia ash, is reported to keep for up to 5-7 years (National Academy of Sciences 1978). In many traditional societies, ground-up leaves of Andropogon and Combretum are used to repel insects and even rodents. Powdered sun-dried guava and eucalyptus leaves are toxic to Sitophilus weevils according to recent research done in Egypt (Sharaby 1989).

Sigaut (1988) reports the traditional use of weevils' attraction to moisture. Small nests of damp straw are placed beside the grain, weevils move into the grain overnight. The next day the straw is collected and burned. Fires under storage cribs can serve to dry foodgrains and as a fumigant. Burning chaff mixed with pepper has been reported as an effective traditional fumigant.

Foregoing threshing until just before use is a key traditional method of reducing food storage losses. In sheaves, many millet species are more protected from biological heating and weevils. A traditional elaboration is to pound ears of millet directly into the granary, often of wickerwork on stilts, so that the granary is filled with a tightly packed mixture of pounded ears.

Such biological and cultural controls as the above are dependent for their success on alteration of the ecology of a particular species. The techniques are thus highly location-specific, providing another essential reason for understanding local adaptive strategies.

Rodent, bird control and theft

In examining losses to rats and mice, the Centre for Overseas Pest Research noted:

"the single one fact which emerges most clearly from the survey is the widespread ignorance of the magnitude of the rodent problem, and of means to control it." (Hopf et al. 1976)

An intervention which has become widespread is baffles fitted to traditional storage structures. Farmer resistance to use of baffles has occurred in many areas. This may

indicate the need for need centralized community storage to overcome this traditional reluctance. Widespread resistance to rodenticides in the developing world makes structural impediments the most promising rodent control for any storage structure. Bounties for rat tails is one intervention which has worked for NGOs in Sudan.

Bird losses can be especially crucial with millets and sorghum when left in the field to dry and when dried on roofs. Interventions which keep grain away from birds can be a valuable post-harvest loss reducer. If field bird losses are a problem, finger millet (Eleusine coracana) has far fewer losses than other millets and sorghum.

Many villagers store less grain than they could because of fear of theft, according to several researchers (Messer 1989; Sigaut 1988). Interventions such as locks, in combination with sealed containers, may be useful to increase farmers' willingness to store more grain.

Legumes: special considerations

Grain legumes have much higher storage losses than cereals. Much of this is due to their tendency toward field infestation by insects (especially bruchid beetles). Eggs are laid on the maturing pods and though only a small percentage of the harvest is infested, the nucleus is provided for severe losses in storage. Losses are reported as high as 50%. Interventions with populations which rely of legumes should focus on reduction of insect infestation. Reducing moisture levels of grain, filling intergranular spaces with millet, sand or ash and frequent inspection have been the most successful interventions. A variety of locally available terpenes and oils (including lemon and groundnut oils) have been shown to have insecticidal properties when applied to grain legumes Sigaut (1988).

Traditional varieties' resistance

Successful traditional storage methods may be disrupted if other varieties are introduced with different grain characteristics. Traditional varieties often have a harder endosperm and reduced seed moisture content and are, thus, less prone to insect and pathogen attack. Introducing other varieties may well require changes in traditional drying and storage methods.

Root crops

Most storage problems in root crops are related to the physical characteristics of the crops. Roots and tubers are living, actively metabolizing organs that continue to respire and transpire at much higher rates than grains. Unlike the food grains, they are high in moisture content and are essentially perishable commodities susceptible to mechanical damage, physiological breakdown and attack by fungi and bacteria. Traditional practices recognize this fact and leave cassava in the ground until needed. This method reduces mechanical damage (which hastens infestation), maintains dormancy and provides cool storage. However, quality declines when such storage is prolonged. Once harvested, the roots are either used immediately or processed into dried products with longer storage life. If not used immediately or processed, root crops should be stored in conditions which either reduce

respiration (by cool storage) or allowed for it (by good air circulation). Substantial cassava deterioration can occur in a matter of days.

The most useful food storage intervention for cassava is improved processing. Significant improvement is possible in the many traditional methods of making chips, flour and granular meal from cassava. The particular interventions will depend on local methods of processing.

Curing has been used to enhance the storage life of sweet potatoes, yams and potatoes. The process involves subjecting the tubers to relatively high temperatures (25-40 C) and humidities (80-85%). For this process to work, storage must then be in significantly lower humidity and temperature.

Reburial with various techniques has been successful with a number of tuber species and the success ascribed to curing (Ingram and Humphries 1972).

Weaning and Infant foods

Recent research indicates processing of locally available grains can produce weaning foods suitable for famine mitigation interventions. Work at Addis Ababa University has successfully produced various weaning foods based on indigenous Ethiopian beans (Ashenafi and Busse 1991). Other work has established a successful sorghum-cowpea infant formula for milk supplement (Nout 1991).

Sub-populations and food storage

Food storage with refugees is often easier to effect than with other populations, especially if food is distributed daily. Distributing impervious, sealable containers may provide long-term, sustainable interventions.

Nomads' capacity for food storage is limited so processing which reduces food weight is key. Their herds are their food stores. Interventions to improve herd health and survival will be key to food availability.

Gender effects on food storage

Individual household food sufficiency is often best predicted by management skills of female household heads. The care and skill of women in storing, rationing and distributing food often determines whether the household's children are seasonally or permanently malnourished (Messer 1989). Pre-famine mitigation attempts may best target women in the intervention area of food storage.

Social relations between population groups

Pastoralists often have links with other groups to provide food in famine. Pastoralists such as the Tuareg in the Sahel and the Baggara and Zaghawa in Sudan have each been

reported[4] to have reciprocal links with farmers involving providing manure for certain farmers by resting their cattle on fallow millet fields. The nomads in return receive grain from the farmers during times of scarcity[5]. Food storage interventions focused on these farmers may then be a means of mitigating the severity of famine on pastoralists who cannot carry large amounts of stored food.

Some pastoralists are becoming more amenable to planting crops. Walker (1989) cites Ethiopian researchers Abate and Gedamu who contend that many Afar putting their faith in combining agriculture with their traditional animal husbandry or "standing on two legs" to use the Afar phase. If this trend continues, interventions requiring a more sedentary lifestyle may be increasingly applicable to these populations.

Training and experts

Since food storage is intimately involved with traditional habits and desires: a final note on any training of villagers undertaken in food storage. Time and again expatriate NGOs have noted that the best project officers and "self-help" group leaders come from those who still live in rural environments. As Peter Walker (1988) of Action Aid notes,

"[Sudanese University graduates and city dwellers] found it difficult to relate to, and share, the aspirations of those they were supposed to be in partnership with. . . . These urban 'enlightened' men saw development as a process of rejecting their traditional values and way of life in favor of an urban, educated existence.

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4 e.g., Colson (1979), Francke and Chasin (1980), Messer (1989) and Teitelbaum (1977).

5 This interaction reflects a wider consideration particularly relevant to food storage interventions. Even more than many intervention areas, all food storage techniques must be viewed as part of the harvesting-threshing-storage-distribution system and successful changes in one component can be made only with attention to possible debilitating repercussions elsewhere in the system.

8. Seeds

Jim Worstell

Seed represents the most compact and easily transportable of all inputs which might be useful in mitigating famine. If initial assessments indicate that a pre-famine area is experiencing seed deficits, seed interventions can be extremely cost effective.

An early assessment crucial to determining seed interventions is the viability of present seed stocks. If seed retain normal viability--easily determined by paper towel germination tests, maintaining that quality will be a key intervention.

Seed storage

Many of the interventions noted above for grain storage are also applicable in seed storage. The principles are the same--chiefly, keep it cool and keep it dry. But, seed are a bit trickier than grain--especially in the drying process.

One perspective seems to be consistent among several successful NGO seed program managers. They stress to farmer groups that seed are living organisms. Seed are in a dormant state but the germ is highly perishable. Interventions in grain storage can provide farmer groups with the basic principles needed in seed storage, except that seed stores must preserve life in addition to food value. If this perspective can be transferred to managers, seed interventions are much more effective.

Drying

Unless harvest falls during a period with no rainfall and relative humidities lower than 60 percent, the moisture level of seed will need to be reduced to insure seed viability. If seed moisture remains above 14-16%, seed germination rates decline rapidly due to biological heating even if infestations are absent. Each species must be considered separately. At 19% moisture, most seed have a storage life of days (Douglas 1980). Interventions based on detection and modification of high seed moisture content are the most basic of seed interventions.

However, even at 14% moisture, temperatures of 20-25 C will reduce survival for most seed to only a few weeks. Some vegetable species lose viability in weeks unless stored below 15 C. If these types are to be used, costly central storage may be required.

Drying of seed must be done much more carefully than grain drying. Slower drying and insuring that seed are not overdried are fundamental. Where seed are dried in the sun, indoor drying interventions will usually significantly increase germination rates.

Household storage

Provision of impervious, sealable containers with proper training in seed storage has been a successful intervention at the household level. Household storage makes seed most readily available at planting time, but also makes seed available for eating during famine conditions. The intervention of buying seed from families with the agreement that they can buy it back on credit at planting time has been used by some NGOs.

Community seed-banks

The one consistency across several communities in one famine mitigation study was that improved community seed storage is crucial. Seed storage in these drought-afflicted communities of Northern Kenya was in the office of the chief or other local offices (Downing, Gitu, and Kamau 1989). Interventions to provide alternative storage areas would be eagerly welcomed by these communities. They already have community-wide seed storage, they are just lacking facilities to keep the seed at high quality levels. The principles governing successful storage facilities have been discussed under grain storage.

Regional/national seed-banks

The more centralized seed storage becomes, the more likely one bad decision will diminish seed availability for an entire region. Centralized storage can also create problems in achieving timely distribution.

Advantages of centralized storage include efficiencies of scale and better trained people at the regional or national level. Douglas (1980) and a number of other publications are excellent sources for useful information on establishing national seed storage. Whether regional or national seed storage has a high probability of success depends on governmental efficiency and stability. Only a local appraisal at the time of famine mitigation can provide the needed assessment.

Extra-country seed storage

Though encountering many of the problems mentioned above (especially propounded in distribution), storing seed of crucial varieties outside the country may be an intervention appropriate for international PVOs working with private seed companies. However, once a crucial variety is known to be in short supply inside the country, the best strategy is to import the variety and move it into local storage as soon as possible.

Selection and availability

In the drought situations preceding famines, a primary adaptive strategy of farmers is adjustment of the mix of species and varieties used in their fields and gardens. Watts (1987) reported that over 70% of farmers used polyvarietal crop substitution of drought-resistant millets and sorghums to mitigate the effect of drought. In his northern Nigeria study area, farmers often had a subtle knowledge of crop types (particularly millets) in relation to

moisture tolerances, pedological requirements and maturation rates. As is typical of manual cultivators in drought-prone areas, these Hausa farmers respond to rainfall patterns by altering the species and varieties they plant.

For these farmers to be successful in overcoming drought in their famine-prone situations, a wide variety of seeds must be available. A key famine mitigation objective is to determine the seed varieties farmers know are most useful in drought situations, identify existing stocks of those varieties and make sure that those stocks are preserved and available to farmers at planting time.

Varieties

Often the principal traditional famine mitigation strategy is switching to short-season varieties. The best intervention is providing high quality stock of farmer-tested varieties. Preferably these varieties will be self-pollinating landraces adapted to similar climatic and cultural conditions. Often maize, though it is less drought resistant, is used during times of food scarcity because it quickly matures to the point where the grain is palatable. Though sorghum and millets are known by farmers to have higher average yield and be more drought resistant, their looser heads do not produce edible products as quickly as maize.

The increased use of maize as a local strategy for adapting to drought is a decades-long trend which is exacerbating drought-related problems. According to Downing (1989), "Maize has become the dominant food crop in much of the semiarid areas, replacing such traditional drought-resistant crops as sorghum and millet, and increasing the sensitivity of agricultural production to climatic variations." Maize, in addition to being less drought resistant, is also heat sensitive due to the separation of male and female flowers (often a meter apart) and the long female silks through which pollen must travel.

In many areas, however, shorter season millets and sorghum are very much in demand. Farmers in many study areas have been eager to experiment with short season varieties (e.g., Colson 1979). In many areas, investigating new lines is a matter of course to smallholders. When asked why they had planted a variety, "'for experiment' was never seen as an odd answer" to the Sahelian farmers studied by Richards (1986).

Capitalizing on this penchant for experimentation by distributing packets of pure, but genetically diverse, short season seed to farmers may be the best means of increasing smallholders' resistance to famine.

Early maturity is one of many traits which confers drought-resistance. Early maturity enables the crop to escape drought; other types of drought-resistance are known as drought tolerance. These include maintaining water uptake, reducing transpiration, desiccation tolerance, enhanced osmoregulation, continued root growth while rest of plant is dormant and profuse branching or tillering to make up for portions of a stand lost to drought. Varieties to be included in seed interventions should possess traits which have been shown to condition drought tolerance in that species. For example, profuse branching has been shown to be especially important in Sudanese cowpea varieties (Muleba et al. 1991).

Cooking and processing quality

One consideration is often given short shrift in choice of new varieties to promulgate to farmers: cooking and processing qualities. Examples of nonacceptance of high yielding varieties due to bad taste are legion. Other important processing qualities are ease of threshing, cooking time, palatability when served cold, nutritional composition of secondary parts. Richards (1986) found that varieties which tasted good when cold were especially valued by women since this saved cooking time during busy seasons.

In refugee camps, drought resistant seed are less an immediate need. However, assuming seed of these species will be saved for later use, the same characters noted above should be present.

Storage considerations

Whenever a variety new to an area is being considered, keeping quality should be examined. Many new varieties have been selected solely for high yield and store very poorly. Traditional varieties in locally made stores often suffer minimal losses (Gibbon and Pain 1985).

Germplasm preservation

Famine mitigation has a special responsibility in seed interventions because the chief centers of diversity for many food crops are in Africa. In fact, Ethiopia was the origin of cultivated sorghum and yearly new biotypes are reported from the highlands. The guinea and caudatum sorghums both have centers of diversity along the Ethiopia-Sudan border. Any famine mitigation interventions should not result in long-term degradation of these invaluable resources. Wherever possible, preservation of unusual types should be facilitated during seed selection and storage.

Considerations at the species level

Famine mitigation interventions should give special attention to provision of grain legume seed. Grain legumes not only are a valuable source of easily transportable and readily storable protein, but they usually have a short maturity period (lending drought-tolerance), they grow vigorously in a wide range of environments on poor soils without nitrogen fertilization and, furthermore, they are nutritionally complementary to the starchy staples in the diets of most rural households (Collinson 1987).

A species of early millet, Digitaria exilis, is widely used in famine-prone West African countries (where it is known as hungry rice) and may be a useful species in other areas. D. exilis does have a reported drawback of losing seed viability in storage after two years.

Seed for soil improvement

Fallow dynamics are well know to farmers and "planted fallows" are an often easily accepted intervention when rainfall is adequate. Richards (1986) found two nitrogen-fixing, water-efficient cover crop species (Pueraria phaseoloides and Calapogonium mucuonides) to be especially well-accepted.

Multiplication

On-farm

The On-farm Seed Multiplication Project has provided a wealth of information on seed multiplication by village-level farmer groups in West Africa. These case studies, available from Winrock International, are the starting point for on-farm intervention efforts. These studies and many others, note that farmers often have the basics skills related to rouging and plot isolation needed for seed multiplication. The basic lack is adequate storage, techniques for insect control in storage and good quality seed to begin multiplication of new or lost varieties.

Vegetatively propagated species

The main reason cassava is not used more often as a hunger breaker is due to the lack of shoots to plant when the first rains come (Watts 1987). A useful famine mitigation strategy would be to support nurseries of cassava in areas such as southern Mozambique where cassava use is established and valued.

Distribution

Two key problems in seed distribution systems are quality control and transportation bottlenecks. Both can be avoided with interventions focusing on skilled local seed storage.

Quality control can be approached on a national level by either market control or pre-market control. Market control allows any seed to be sold as long as it is truthfully labeled as to germination, weed seeds, etc. Pre-marketing control requires that all seed must be certified by a government agency before sale. Intervention at a policy level to encourage market control will make more seed of more varieties available.

Transportation bottlenecks are often the bane of any famine mitigation or relief activities. Save the Children in the 1984-1985 in Ethiopia successfully made road construction the primary food for work activity. However, this topic cannot be seen as solely seed intervention. The resilience of input supply networks must be a topic for early assessment in famine mitigation reconnaissance surveys.

Breakdown in a national seed supply chain means seed is not available or arrives too late. Often late seed must still be paid for--especially if purchased on credit from a government agency or parastatal. On-farm seed multiplication efforts, combined with village

and women's group communal storage facilities has created a resilient distribution system in Gambia for Save the Children. This should be closely examined for possible replication in other famine-prone areas.

Legumes

No legume seed should be distributed without the appropriate Rhizobia unless the planting sites can be shown to contain effectively cross-inoculating native strains.

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Appendix C

Country Status Reports

Country Summary: Angola

M. Henderson

Angola is rich in agricultural and natural resources. In the mid-seventies it was the world's second largest coffee producer, exported maize, and produced sufficient cassava, sorghum and millet to meet domestic consumption requirements. The country's resources include diamonds, iron ore, oil, and rich fishing areas along the coast. Its cultural diversity includes five major ethnic groups and the legacy of Portuguese colonialization. The Portuguese built Angola's infrastructure--railroads, roads, telecommunications--but systematically limited the Angolans' access to education and technical training.

The Angolans started agitating for independence in 1961 and by 1975 the quest became an internal struggle between three major political parties (MPLA, FNLA and UNITA). The MPLA set up its government in Luanda and was supported by the Soviet Union and Cuba; UNITA took over southern Angola, with support from South Africa and the USA. Civil warfare lasted until the two political parties signed a cease-fire agreement in May 1991. The accord calls for free elections in 1992, disbanding their military forces, and cooperation to rebuild the country.

Sixteen years of civil warfare has devastated Angola's economy. The national transportation and marketing networks do not function, export crop production is nil, and subsistence crop production has dropped by about 75%. The amount of land cultivated has decreased by 25% during the past ten years.

Livestock production has decreased due to disease, lack of water, lack of pasture and sales to neighboring countries. Recurrent drought since 1986 has exacerbated the problems of agricultural production. The OFDA reported that approximately two million Angolans were at risk of famine and a 50% food shortage existed in two-thirds of the country in July 1991.

The West developed Angola's oil industry during the country's sixteen-year civil war. The oil industry generated 42% of Angola's GDP and 90% of the nation's export earnings in 1989; it has been the basis of Angola's economic survival during an era of warfare. But guerrilla warfare has made rural areas unsafe, displaced the rural population, decimated the national herds and destroyed rural infrastructure, including the water and health care systems. The breakdown of the transportation and marketing systems leaves farmers without the inputs necessary for agricultural production, without the means of marketing their produce, and thus without the incentives to produce surpluses. As a result there is insufficient food for the refugee populations concentrated in urban centers. The drastic decline in agricultural production has left Angola dependent on food imports and food aid: about half of its total food requirements are imported.

Small-farmer production has changed little since independence in 1975. A farming household typically cultivates 1.5 to 2.5 hectares with subsistence crops (maize, cassava, sorghum, millet, beans, squash). Rotation, intercropping and fallowing are used to maintain

soil fertility. Production is based on manual labor; short-handled hoes, machetes and axes are the common tools. The farmers usually keep a few head of livestock (goats, sheep, cattle, pigs). These subsistence farmers now produce most of Angola's food crops and account for more than 80% of national agricultural production. Livestock production (cattle, goats) is concentrated in the south and suffers from lack of veterinary care and water supplies.

A number of NGOs and UN agencies are working in Angola. The NGOs include CARE, Africare, Catholic Relief Services and World Vision. Their programs are concentrated on providing food relief and medical care, building potable water systems, restoring small-farmer agricultural production, tracing missing persons and relocating the displaced population.

Country Summary: Ethiopia

S. Maxwell

Ethiopia has a large population (48 million) and a high level of food insecurity. Sixty percent of the population is food insecure. Urban poverty is a growing problem. The factors that contribute to the country's food insecurity are slow economic growth, rapid population growth and resource degradation. The situation is exacerbated by civil war, drought, incoming refugees and Ethiopia's terms of trade in the international market. The recent drop in coffee prices was a blow to the country's economy.

Ethiopia has been called the Bangladesh of Africa. One-quarter of the poorest people in Africa are in Ethiopia; 11% of its population is directly affected by famine. Half of the food insecure population are rural, resource-poor small-farmers in the Ethiopian highlands. The high ratio of people to arable land typically allows a small-farmer only half a hectare of land. Agricultural production generally is labor intensive; for example, 400 days of labor are required to produce one ton of tef, which is a profitable crop.

The government's ten-year economic plan placed too much emphasis on food self-sufficiency. Development, mitigation and disaster activities need to be incorporated into future plans. India's program of emergency codes may be a model that can be transferred to Ethiopia. This program identifies on-site indicators of impending famine and monitors them, in order to implement cash/food-for-work programs when necessary. The Ethiopian government also needs to form interministerial committees for famine mitigation, because famine crosscuts numerous social and economic sectors. The governmental Relief and Rehabilitation Committee that presently is responsible for famine mitigation is an extra-ministerial committee.

Numerous activities could be implemented in Ethiopia to mitigate famine. Regional food security reserves of 5-10,000 metric tons of staple grains could be set up. Other activities include: cash/food-for-work programs, for public works; cattle camps, to stabilize sale prices and repurchases; water supply programs; subsidized retail outlets to sell grains at stable prices; seed banks; and food distribution systems. Macro-level programs include tax holidays, innovation risk insurance for farmers, urban work programs, market development and food entitlements.

Famine mitigation requires a long-term commitment. Previous experience in Ethiopia indicates that cash/food-for-work public works programs are viable means of development. Appropriate programs must be developed so that they can be implemented quickly when the need arises. Previous famine mitigation work in the country has been oriented toward farmers. This has excluded the livestock owners, herders and nomads who also are famine-prone from mitigation activities.

Food-for-work programs currently are handled by the Soil and Water Department in the Ministry of Agriculture. NGOs manage these programs in disaster-prone areas. Overall,

Ethiopia is partitioned into areas where the NGOs work and areas where the government works. There are 70 NGOs in Ethiopia; 50 are foreign agencies and 20 are national agencies. The NGOs work mainly in the areas of health care, constructing wells, providing education and building centers for orphans. ILCA works with livestock production.

Country Summary: Mozambique

M. Langworthy and T. Finan

Continuous war and insecurity have had serious impacts on Mozambique's food and marketing systems. The marketing and transportation networks have been totally disrupted by warfare; most roads and rural areas are unsafe. Insecurity has reduced the area of cultivated land to only 15% of the nation's farmland and half of the rural population has left their villages or fled the country altogether. Agricultural production is concentrated in the secure areas around the larger provincial towns and the few secure pockets in rural areas. Guerrilla warfare prevents the farmers from keeping livestock and storing their crops, so any surpluses are quickly sold.

The macro-level effects of the war are serious. There are 15 million displaced people in Mozambique; 6 million are crowded into the more secure provincial towns and dependent on foreign assistance. Income levels are low: the estimation is $100 per capita. Eighty percent of government revenues are invested in the military, so little is left for other sectors. Export earnings have dropped due to decreased production of Mozambique's major export crops (copra, cashews, cotton, tea). Centralized government control of the market system has not been beneficial. Funds are needed to provide the essentials for a functional market systems such as trucks and storage facilities. The structural adjustment program has liberalized markets and favored merchants, but little benefitted farmers. Mozambique depends on food aid for 85% of its food supplies; only 15% is produced domestically. Its national budget is dependent on foreign aid. Policy and technology interventions obviously are needed to remedy this situation.

Recent political changes in Mozambique have transferred land from state farms to private farmers. Most farms are 1-3 hectares in size. Agricultural production is based on a 2-3 year cycle of slash and burn cultivation. Access to inputs is limited and the technology is rudimentary: the farmers do not use animal traction, and neither manure their fields nor use fertilizer. Lack of seeds and tools constrain the farmers' production. The major food crops are maize, pigeon peas, squash, cassava and beans; the cash crops are tea, cotton, and peanuts. Sorghum is grown in the drier areas in the south. There are two production cycles in the agricultural year so the potential to produce short-season crops exists. The hungry season is from January/February to August Warfare and insecurity isolates farmers from markets, prevents horizontal integration, and limits production to the subsistence level.

Country Summary: Sudan

G. Gottlieb

Drought has affected Sudan, from northern Kordofan to Darfur and in the conflict zone of southern Kordofan. Problems in Darfur are compounded by conflict between Arab tribes and the Fur. The first reports of drought in the Red Sea hills and death from famine recently arrived. There are one million refugees in Khartoum that have been displaced from the south. The SPLA controls the area 200 kilometers south of Damazin that includes southern Kordofan, the area south of Nyala, the east bank of the White Nile, and has garrisons in the towns of Abyei, Malaki and Wau. Their presence restricts access to the southern area although a team is there now assessing the food security situation. The FAO reported a need for 240,000 metric tons of food in the south, of which only 40,000 could be delivered, and the need for one million metric tons in the north. Juba still is controlled by the northern government forces and a million metric tons of food per month is being airlifted into the area.

Several NGOs are carrying out relief operations in Sudan. CARE is headquartered in El Obeid, Save the Children is in El Fasher; OXFAM is in the Red Sea hills; World Vision, Catholic Relief Services, the UN's World Food Program and Sudan Council of Churches are working in the south. Operation Lifeline Sudan should channel food relief supplies across military boundaries but it does not always function: one transshipment sat in Muglad for a year and the grain was stolen. The Lifeline program obviously is difficult to operate.

Civil war has been going on in Sudan for twenty-five years and there are no prospects of peace in the near future. Warfare has devastated the economy: the inflation rate is 360% and the rate of currency exchange in the black market is about forty times the official rate. Government employees earn 700-800 pounds per month and 90 kilograms of sorghum, a staple grain, costs 240 pounds. The Sudanese government lacks the will, the personnel and the infrastructure to help its own people. The government has interfered with the NGOs' relief activities--confiscated their fuel supplies, seized their vehicles--and limited their effectiveness. NGO personnel must be registered and their travel is restricted. The government refused to allow feeding centers to be opened in Kosti and stopped the International Committee of the Red Cross' operations. Thus both short- and long-term relief interventions are difficult in Sudan.

OFDA has received proposals for relief work from some NGOs that have been working in Sudan. CARE proposed to operate cash/food-for-work programs in Kordofan; Save the Children proposed to operate a health care program. There are other proposals to support clean water and garden projects. According to OFDA, it was difficult to implement relief operations in September/November 1990. As a result, OFDA decided that it would not support both relief and mitigation activities. Recently, however, OFDA has decided it will use more resources to support NGO mitigation activities, and enhance current mitigation projects, rather than support additional relief activities. CARE's proposed cash/food-for-work project is the preferred type of project. Collaborating with the SPLA is a delicate matter; the relationship between OFDA and the SPLA recently has been difficult, as food relief supplies

have been given to soldiers. OFDA's current work in Sudan is in cooperation with the SPLA that holds territory south of the Juba Mountains.

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Appendix D

Working Group Reports from the Berkeley Springs Meeting

Working Group A Report

Charles Hutchinson, Rapporteur

Our task was to define the various "typical" types of scenarios that might be encountered by those groups charged with the design and implementation of famine mitigation interventions. The intent was to provide a framework around which strategy papers on specific interventions might be structured.

1. Target Matrix

It had been agreed that the scenarios would be constructed within an n-dimensional matrix. We understood our charge to be the definition of the axes that would define the matrix as well as divisions along them. The purpose of the matrix was to help define the nature of the target.

As a point of departure, in the Tucson workshop, the seeds and tools working group had defined a four-dimensional matrix, however one of these (technical intervention) was actually determined by the matrix rather than an axis. The resulting three-dimensional matrix was as follows:

- Stage of famine
  - Adaptation (changes in diet; labor migration)
  - Sale of assets (farm implements; land)
  - Outmigration

- Socioeconomic group (after FEWS)
  - Refugees
  - Urban poor
  - Rural poor (landless)
  - Agropastoralists/pastoralists
  - Farmers
  - Rural artisans, merchants
  - Urban salaried workers

- Social/political level of intervention
  - Family
  - Village
  - District
  - Province
  - National and International

For each technical area, a range of interventions could be defined for each cell of the matrix. Overlayed on this matrix was the consideration of access, largely, but not exclusively, determined by the existence and nature of conflict. Each of these have there own peculiar characteristics:

- Accessible
  - outside conflict zone
  - government held
  - rebel held

- Inaccessible
  - geographically isolated
  - government held
  - rebel held

- Uncertain (transition zone)
  - edge of conflict (controlled by neither side)
  - general anarchy

As discussion progressed, we felt that these considerations adequately defined the target matrix for the purpose of developing strategies within the different technical areas. However, initial discussion -- provoked by the food/cash-for-work team -- was focused more on the practical considerations of how strategy papers might be used in the formulation of specific projects by field personnel who might have limited experience in (1) any technical area, and (2) famine mitigation. Thus, the bulk of the session was devoted to describing the general outline that might be adopted for strategy paper preparation.

2. Strategy Paper Outline

It was understood that the strategy paper would serve as a working outline for the development of mitigation interventions. At the end of the activity, after field testing, strategy papers would form the basis for mitigation guidelines that can be used by national or NGO groups who might wish to undertake mitigation as part of their relief and development activities.

As noted above, in developing the strategy paper outline it was assumed that the ultimate users might have neither technical expertise of experience with famines. However, for the purposes of designing strategy, we also felt it would be useful to state clearly our operating assumptions as to the nature of various productive enterprises, social and institutional mechanisms, and how they change during the course of a famine. From such a base it would not only be possible to explain the functioning of complex systems to a newcomer but to identify more easily where our understanding of these systems is flawed. Thus, it would be possible to refine responses over the course of the activity. The outline is as follows:

I. General Principles. A summary of the basic principles and goals of the technical area. For example, in considering livestock: (1) livestock serve several different functions in a household (food, traction, and capital asset); (2) herds are composed of a mix of animals (cattle, sheep, goats, camels), that meet these different needs; (3) they exploit different parts of the ecosystem (grazing and browsing); and (4) they have different water, nutritional, and health requirements.

II. Responses to Famine. A description of how patterns of resource utilization change as a famine proceeds and the implications these changes have on mitigation. For example, at the onset of a drought, herders may begin to migrate to other less-affected areas to exploit range resources there. As the drought deepens, small animals may be sold first and, if conditions worsen, larger animals in poor condition may be sold or exchanged for smaller animals to increase liquidity and mobility of the remaining resources. Also, as pointed out, some interventions (e.g. urea blocks) may have unforeseen adverse impacts (increase in diarrhea, dehydration and animal death).

III. Economic, Social and Political Considerations. A general description of the consequences that accompany changes in preferred production systems. For example, in the case of livestock, early migration to agricultural areas for social contracts are already in-place may disrupt agricultural production leading to ethnic conflict. If the migration crosses international boundaries, the possibilities for major disruption are amplified. Or, the culling of herds will usually distort local animal and cereal markets, and the changing herd composition will change the demands placed on rangeland resources. Finally, the number of animals in an area may not change in net, but their ownership will. Thus, herders may continue to manage the same animals but as paid laborers for the new owners rather than independent operators as they did before the emergency.

IV. Strategic Recommendations A description of sets of interventions considered in terms of the matrix described above. However, given the range of possible interventions, we suggest that they be organized further according to the following categories:

- Technical
- Market
- Policy

In addition to this "tutorial" structure of the strategy papers, it was suggested that three short briefing papers (5 pp.) be prepared for general distribution to all members of the activity team and to all potential participating agencies. This would cover:

- The Famine Process
- Market Interventions
- Conflict Situations

Working Group "B" Notes

Tim Frankenberger
Rapporteur

The major task of Group B was similar to that assigned to Group A: provide a framework around which strategy papers on specific famine mitigation interventions might be structured.

The group began by discussing the different types of scenarios during which famine mitigation activities might be implemented. These included:

1) Drought-induced food shortages

2) Famine occurring inside a rebel-held area that is accessible (e.g., Tigre)

3) Famine in transition zones that are inaccessible or volatile

4) Famine in govt-held zones outside of conflict areas (e.g., Sudan)

5) Food shortages that result from floods (Bangladesh)

After discussing the contexts in which famines occur, the group then discussed the conditions in which vulnerable groups may be found. These conditions were grouped into stages that were likely to occur before the famine, during the famine, and after the famine. Many of these stages correspond to the coping strategies commonly employed by households as conditions worsen through time.

Once the context and conditions that characterize famine-prone areas were discussed, the group then discussed the various types of vulnerable groups found in these areas. Similar to Group A, Group B identified the major groups as being agropastoralists/pastoralists, farmers, landless farmers, rural artisans/merchants, refugees, and urban poor.

Following these discussions, Group B then developed a matrix that incorporated all of these elements. This matrix was later modified by OFDA and the University of Arizona, and is presented here.

Famine Mitigation Matrix

Levels of Vulnerability	Coping Strategies	Strategy Determinants		Objectives	Interventions
Stage 1 Slightly Vulnerable	Maintaining preferred production strategies, maintaining and accumulating assets	Groups	Constraints/ Opportunities	Develop productive and reserve capacities, monitor development situation	Continue technical and natural resource development activities, adaptive skill enhancement
Stage 2 Moderately Vulnerable	Maintaining preferred production strategies, drawing down on assets, reducing food consumed, gathering wild foods, sale of goats and sheep, changes in cropping systems, interhousehold loans	Landless Farmers Landed Farmers Agro-pastoralist Pastoralist Peri-urban Rural Artisans/ Merchants Refugees	*Access* Constrained Non-constrained *Organizational Level* National Regional District Community	Stabilize entitlement	Initiate public works, market intervention (e.g. release food price stabilization stock, community grain banks)
Stage 3 Highly Vulnerable	Depleting assets and altering preferred production strategies, costly coping measures, (e.g. selling firewood, farming marginal land, borrowing at high interest rates)	Subgroups	*Conflict Scenario* Conflict Zones Transition Zones Rebel-held Areas Government-held Areas No Conflict	Enhance productive asset conservation, health maintenance, relief preparation, natural resource conservation	Expand public works, market interventions, preposition relief assets, health interventions
Stage 4 Extremely Vulnerable or at Risk	Liquidating means of production and abandoning preferred production strategies, seeking non-traditional sources of income/employment/production, morbidity and mortality increasing	Female Heads of Households Pregnant and Lactating Women Children Under 5 Years of Age Elderly	*Nature of Emergency* Flood Drought Pest Market		Distribute food relief and seedpacks
Stage 5 Famine	Migrating to relief centers, coping strategies exhausted			Contain migration	Expand relief activities, adaptive skill enhancement
Stage 6 Recovery	Repatriation			Re-establish assets, decrease vulnerability to future emergencies	Maintain relief action and adaptive skill enhancement, resource stabilization

OFDA/University of Arizona, 1991
Adapted from FEWS/PRAGMA, 1991

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Appendix E

FEWS Matrix

Matrix of Vulnerability, FEWS Project
May 6, 1991

LEVEL OF VULNERABILITY	CONDITIONS OF VULNERABILITY	TYPICAL COPING STRATEGIES AND/OR BEHAVIORS	INTERVENTIONS TO CONSIDER	TYPOLOGY OF INTERVENTIONS	TYPE OF EARLY WARNING SURVEILLANCE REQUIRED
Famine	Destitute	Coping Strategies Exhausted	Emergency Relief (food, shelter, medicine, etc.)	RELIEF	Monitoring Access to Relief
Extremely Vulnerable or At-Risk	Liquidating Means of Production and Abandoning Preferred Production Strategy	Assets/resources/wealth: liquidating "production" resources (e.g., sale of planting seed, hoes, oxen, land, prime breeding animals, whole herds) Production Strategy: Seeking non traditional sources of income/employment/production that preclude continuing with preferred/usual ones (e.g., migration of breadwinners or whole families)	Nutrition, Income and Asset Support (food relief, seed packs, etc.)	RELIEF and/or MITIGATION	Intensive Community/Household /Individual Assessment (on-site surveys, assessments, etc. to measure specific needs and resources, and define the type of response needed)
Highly Vulnerable	Depleting Assets and Disrupting Preferred Production Strategy	Assets/resources/wealth: liquidating the more important investment, but not yet "production," assets (e.g., sale of cattle, sale of bicycle, sale of possessions such as jewelry). Production Strategy: coping measures being used have a significantly costly or disruptive character to the usual/preferred household and individual lifestyles, to the environment, etc (e.g., time consuming wage labor, selling firewood, farming marginal land, labor migration of young adults, borrowing from merchants at high interest rates)	Income and Asset Support (Food-for-Work, Cash-for Work, etc.)	MITIGATION and/or RELIEF	"Rapid" Population/Area Appraisals (deepening information/database about specific populations and areas through site visits, etc.)
Moderately Vulnerable	Drawing down Assets and Maintaining Preferred Production Strategy	Assets/resources/wealth: coping measures include drawing down or liquidating less important assets, husbanding resources, minimizing rate of expenditure of wealth, unseasonal "belt-tightening" (e.g., drawing down food stores, reducing amount of food consumed, gathering of wild food, sale of goats or sheep). Production Strategy: only minor stress related change in overall production/income strategy (e.g., minor changes in cropping/planting practices, inter-household transfers and loans, etc)	Asset Support (release food price stabilization stocks, sell animal fodder at "social prices", community grain bank etc.)	MITIGATION and/or DEVELOPMENT	Targeted Population/Area Monitoring (broadening information base on specific questions/issues, but still not allocating many extra monitoring resources to that effort)
Slightly Vulnerable	Maintaining/Accumulating Assets and Maintaining Preferred Production Strategy	Assets/resources/wealth: either accumulating additional assets/resources/wealth or only minimal net change (normal "belt tightening" or seasonal variations in) assets/resources/wealth over a season/year i.e., coping to minimize risk Production Strategy: any changes in production strategy are largely volitional for perceived gain, and not stress related	Developmental Actions	DEVELOPMENT	Regular Collection of Information (collecting only information/data that comes at little marginal cost in time or money)

Appendix F

Famine Mitigation Activity Workshop Agendas

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Famine Mitigation Activity
Workshop Summary

May 21-24, 1991, Tucson, Arizona

Workshop Agenda

The original schedule developed for the workshop was, for the most part, adhered to, although a number of adjustments were made due to time constraints and in response to issues that evolved over the course of the workshop. Overall, the participants were pleased with the process followed and results obtained, understanding that this was a first step down a long, but potentially rewarding and certainly important, road.

May 20: - Workshop participants arrive.

May 21:
- Welcome and introductions.
- OFDA Opening Remarks: Mary Little, OFDA
- Review of Workshop Goals and Objectives.
- Coping Strategies Overview: Timothy Frankenberger
- Status Reports on Component Areas
  - Early Warning Systems: Charles Hutchinson
  - Rapid Assessment: Simon Maxwell and Richard Longhurst
  - Seeds and Tools (Cereals/Staples): Richard Caldwell
  - Seeds and Tools (Gardens): Daniela Soleri
  - Seeds and Tools (Seedbanks): David Cleveland
  - Livestock: Peter Warshall
  - Water Resources: Joseph Tabor
  - Cash for Work/Cash Transfers: Daniel Goldstein
  - Conflict Modifications: Robert Hall

May 22:
- Review Component Goals and Objectives
- Component Teams Prioritize promising intervention areas.
- Component Teams review background information and identify additional information needs for Activities Development, Assessments, and Country Profiles.

May 23:
- Review Target Country background information.
  - Mozambique: Tim Finan and Mark Langworthy
  - Angola: Mark Henderson
  - Sudan: Greg Gottlieb
  - Ethiopia: Simon Maxwell
- Summary of Workshop Accomplishments
- Review Issues Resolved and To Be Resolved
- Workshop Evaluation

May 24: - Workshop Participants Depart.

On the first day of the workshop papers were presented which provided overviews of the various component areas followed by discussions of the issues raised. These discussions served as a springboard for the following days' activities. During the second day, small groups were formed for each component area during which the various component teams further discussed the major issues involved, identified promising approaches, priority intervention areas, and action plans in pursuit of Activity Guidelines development. The technical component teams were generally more goal oriented than the Early Warning and Rapid Assessment Team, which became quite involved in the theoretical aspects as well as methodological issues revolving around the depth of background information needed to be obtained for Country profiles. The third day started with presentations and discussions of overviews of Sudan, Ethiopia, Mozambique, and Angola. These were followed by a short review of the issues and ideas discussed by the Early Warning and Rapid Assessment Team and led into a discussion of the logistical impediments to working in the target countries. After a break for lunch, the final plenary session was conducted at the Arizona-Sonora Desert Museum in which major issues, resolved and yet to be resolved, were discussed. Suggestions for further Activity development were then provided by the participants. This was followed by a brief summary of workshop accomplishments and next steps to be pursued in the implementation of this Activity. We concluded by having the participants provide an evaluation of the Workshop.

Issues

Develop functional definition of "Mitigation" as related to relief rather than ongoing development activities.

Limiting target countries to those engaged in ongoing civil conflict situations needs to be carefully reconsidered in light of administrative and logistical barriers that these scenarios present.

A ninety-day timeframe for implementation of mitigation interventions may severely limit the range of interventions that could be developed.

It is important that the existing body of documents and experience be reviewed, summarized, and lessons learned be synthesized to determine best options for development, testing, and guidelines development.

Timelines for activities need to be revised based on results of the workshop. Greater emphasis and resources need to be devoted to the initial review described above than previously envisioned.

The purpose and content of Activity Guidelines needs to be more clearly defined.

Famine Mitigation Activity
Workshop Summary

July 31 - August 2, 1991, Berkeley Springs, West Virginia

Workshop Agenda

The original schedule developed for the workshop was adjusted due to time constraints and in response to issues that evolved over the course of the workshop.

July 31:
- Workshop participants depart from Washington for Berkeley Springs.
- Welcome and Introductions: Richard Record, Famine Mitigation Activity
- Opening Remarks: Dayton Maxwell, OFDA
- Summary of Results of Tucson Workshop: Richard Record
- Update on Current Status of Famine Mitigation Activity: Richard Record
- Reports on Discussion of Issues:
  - Food/Cash for Work: Judy Bryson, Independent Consultant
  - Activity Implementation in Conflict Areas: Jeffery Clark, Independent Consultant

August 1:
- Directors Overview: Andrew Natsios, OFDA
- Tucson Component Team Reports:
  - Seeds and Tools: Jim Worstell, Independent Consultant
  - Early Warning Systems: Chuck Hutchinson, University of Arizona
  - Rapid Assessment: Tim Frankenberger, University of Arizona
  - Livestock: Dennis Phillippi, Soil Conservation Service/USDA
  - Water Resources: Lynn Utall, Independent Consultant
- Small Group Review and Discussion of Timeframes and Outputs.

August 2:
- Discussion of Status Matrices and Conflict Scenarios.
- Small Group Discussion of Strategy Papers Contents and Format.
- Workshop participants return to Washington and depart.

Issues

Initial discussions focused on establishing standardized terminology and definitions in line with response agencies current usage and understanding.

Appropriateness of food or cash inputs as interventions are determined by stage of famine development, access to affected locations, and logistics capabilities.

Primary target countries should be reduced from five target countries to three: Angola, Ethiopia, and Sudan. These three provide a broad range of conflict scenarios.

Understanding military strategies in terms of how mitigation activities may be viewed or used to combatants' advantage is an important consideration in activity design. Additionally,

principles of military strategy may be applicable to identification and design of appropriate interventions and their implementation (suggests possible overview provided by civilian military strategist).

Market interventions can be significant mitigation activities and need to be included as a first round component area for development.

Interventions should be "catalytic," serving as a starting point and not as an end product in themselves. An example would be providing localized training in improved grain storage techniques that could be applied to traditional structures, rather than provision of complete grain storage containers.

Projected timeline was viewed, overall, as ambitious, but do-able. Timeframes for stages were found to be minimal for production of quality outputs.

Strategy Papers for each component area should be presented as Drafts during an Orientation Workshop for field representatives and revised based on participant experiences and input.

Target Country participants for an Orientation Workshop should prepare and present a review of their experiences, capabilities, and strategies in famine mitigation.

A matrix should be developed for use by emergency managers to show them where they are in a developing food crisis, what strategies are appropriate for each stage of a developing crisis, and present a range of intervention options which could be employed under different access scenarios.

Five operational environment scenarios were presented and discussed:

1. Drought induced food shortages where access to vulnerable areas is not a constraint.
2. Food shortages in rebel held areas where access may or may not be a constraint.
3. Food shortages in transition zones (areas between combatants) where access is constrained by both parties.
4. Food shortages in non-conflict zones where access is not a constraint, but where resources are diverted to support conflict.
5. Flood induced food shortages where access is likely to be a constraint and markets and production are or may be impacted.

In some component areas, a number of potential interventions have already been developed and tested; a small group of experts may be able to develop these into Activity Guidelines quickly for rapid deployment and testing.

Need to reestablish who the audience for these guidelines is; in the field implementors, or OFDA. These audiences are not mutually exclusive, but do have different requirements.

Appendix G

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