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DEVELOPMENT DIGEST

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Beginning with this issue, the spelling "tonne" will be used to indicate metric tonnes (1000 kilograms), and "ton" will refer to traditional U.K.-U.S. tons (2000 lb or 2400 lb). Money values will be expressed in U.S. dollars unless otherwise specified.

URBAN-RURAL INTERFACE

TWO SCENES FROM COLOMBIA, ONE
OF DOWNTOWN BOGOTA AND ONE
FROM A VILLAGE.

Development Activities and Rural-Urban Migration

Richard E. Rhoda

[This study asks: Is it possible to "keep them down on the farm" by means of rural development activities? Most development activities have a mixture of features that make rural life more attractive or profitable, and others that are conducive to urban migration, with the latter probably more important in the long run.]

Increasing urbanization is one of the most pervasive processes in developing countries. According to a recent World Bank document, "Between 1975 and the year 2000 the cities of the developing countries will be expected to absorb 70 percent of the projected population increases--1.3 billion." Such projections give the impression of massive rural-urban migration flows and extreme problems of urban poverty and unemployment. Governments are particularly concerned; they often assume that the problems of urban poverty are a direct consequence of rapid urban growth. A recent survey of governments in 98 developing countries indicated that half considered present levels of metropolitan growth excessive. The governments tended to link urban poverty problems with rural-urban migration; about three-quarters of the surveyed countries were pursuing programs designed to reduce migration flows.

A relatively popular belief is that improvement of conditions in rural areas will reduce rural-urban migration and consequently relieve some of the growing problems of poverty in urban areas. Many rural development activities have been justified partly on the grounds that they will reduce urban migration. The proposition that development activities in rural areas will reduce rural-urban migration seems intuitively

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obvious: development will make rural areas more attractive, therefore, people will be less apt to leave. Development will increase rural incomes and employment, thus diminishing the major motivation for migration--namely, economic gain. At first glance the proposition appears to be consistent with both migration theory and empirical studies of rural-urban migration. On closer inspection, however, some of the migration and development literature suggests that development activities in rural areas may even increase rural-urban migration. The proposition which seems so intuitively obvious at first is actually a hypothesis in need of testing.

Thorough reviews of the migration and development literature indicate that little research has focused directly on this hypothesis for several reasons. First, the hypothesis seems so obvious that it may not have appeared worthy of investigation. Second, the separation of academic research and applied knowledge may have contributed to the neglect of this issue. Anthropologists working in rural areas could provide considerable information concerning the hypothesis, but they have generally selected culturally "pure" areas which were not contaminated by development activities. Other social scientists studying rural societies have tended to concentrate more on those who remained rather than those who migrated. On the other hand, there have been a great number of studies on rural outmigration, but unfortunately few of these focused on the relations between migration and development activities. Third, development agencies have seldom allocated resources for the evaluation of such social impacts of their projects as rural-urban migration. Lack of research on the hypothesis may also stem from the general absence of effective methodology for conducting social impact analyses.

The logic behind the belief that development activities in rural areas will reduce urban migration and therefore alleviate urban poverty is based upon some or all of the following propositions. 1) Migration is the primary cause of urban population growth and rapid increases in urban poverty. 2) The majority of those in urban slums and squatter settlements are migrants. 3) Most migrants are poor, or not as well-off as urban natives. 4) The flow of migrants into urban areas primarily originates in rural areas. 5) Migrants who are forced to leave rural areas due to rural poverty and unemployment usually move into urban areas. 6) Improvement of conditions in rural areas will reduce the flow of rural-urban migration. 7) Development activities in rural areas will improve rural conditions and therefore reduce rural-urban migration. Unfortunately, this set of propositions is not completely consistent with empirical evidence.

Empirical studies indicate that migration is not the main cause of urban population growth. Available data suggest that natural increase (the difference between births and deaths within urban areas)

accounts for almost 60 percent of the increase in urban populations. Another factor is natural increase in rural communities which pushes their population across arbitrary urban-rural classification borderlines, thus causing them to be reclassified as "urban." The city limits of urban areas are often expanded to encompass populations which were previously classified as "rural." Recent calculations based on United Nations data indicate that during the next decade rural-urban migration will account for somewhat less than 25 percent of the urban population growth in Latin America and less than 40 percent in Africa and developing countries of Asia.

Many recent studies have focused on migrants in slums and squatter settlements. These studies give many readers the impression that most of the residents of slums and squatter settlements are migrants, and that most migrants are poor. Reviews of available information, however, suggest that migrants are generally almost as well-off as urban natives. Though many migrants arrive relatively poor, a very sizeable proportion are quite successful; in fact, the socioeconomic distributions of migrants and nonmigrants tend to be quite similar. Empirical evidence suggests that migrants usually are a minority in urban slums and squatter settlements, even though such areas may have a higher percentage of migrants than the total city.

Another popular misconception concerns the origins and destinations of major migration flows. Many appear to assume that migrants in urban areas have come from rural areas, and that those who leave rural areas migrate to urban areas. Available evidence indicates that a very sizeable proportion of migrants to urban areas come from other urban areas, especially in highly urbanized Latin America. For example, less than 15% of migrants to Santiago and less than 25% of migrants to Bogota came from rural areas. Rural to rural migration is also important, particularly in the less urbanized areas of Africa and Asia. A well known example of rural to rural migration is the movement of rural labor into the cocoa and coffee producing areas of West Africa. Indeed, urban-to-rural migration is also significant in many areas. A study of migration in the highly urbanized country of Colombia indicates that over one-third of all migrants had moved to rural areas. In sum, the belief that development activities in rural areas will reduce urban migration and relieve urban poverty is based on propositions that need to be questioned in each case.

The overall purpose of this study is to investigate whether development activities in rural areas reduce or increase rural-urban migration. In this study, rural development activities are defined as actions by national or international agencies designed to increase production or improve quality of life in rural areas. Rural-urban migration is defined as residential relocation from a predominantly agricultural area to one in which a majority of employment is

non-agricultural. This does not distinguish between urban centers of different sizes, i.e. market towns and metropolitan areas, but an attempt is made throughout the paper to keep this difference in mind where pertinent. This study is based on analysis of the available published and unpublished literature which is relevant. Two major bodies of literature are screened: the migration literature, and the development literature pertaining to rural areas. It was recognized at the outset that a conclusive answer was unlikely because conditions vary so greatly between countries and between types of development activities.

A General Social Theory of Migration

Numerous theoretical models of migration have been developed. Those relevant to the purpose of this study can be grouped into social models and economic models. The different social models which are relevant can be incorporated into one general social theory of migration.

Perhaps the first attempt to develop a theory of migration was Ravenstein's presentation of "laws" of migration in the late nineteenth century, generalizations which largely have withstood the test of time. Working from the so-called "laws" and additional empirical generalizations, Everett S. Lee presented his theory of migration in 1966. He attempted to develop a truly general theory which explained internal and international migration in and between both developed and developing areas over a long period of history. Lee's conceptual framework is sufficiently broad to incorporate other social models relevant to our central hypothesis. The framework focuses on migration decision-making and presents four general factors which influence migration decisions: origin factors, destination factors, intervening obstacles, and personal factors.

Origin factors. There are factors which influence migration from the area where migrants originate. Some of the attractive factors tend to hold people in the area or "pull" in others, while unattractive factors may be thought of as "push" forces. Factors may influence the migration decisions of different people in different ways. For example, land reform may be perceived as a positive factor by tenant farmers, and decrease their propensity for migration; but land reform can increase the migration propensity of the larger landholders. Generally speaking, development activities in rural areas designed to increase production and improve the quality of life in rural areas should increase the attractiveness of rural areas and, consequently, reduce the propensity for out-migration of most rural people.

Destination factors. As with origins, destinations have attractive and repulsive forces which influence migration decisions: the so-called "pull" of urban areas often is discussed in conjunction with "push" forces in rural areas. However, it should be remembered that both origins and potential destinations contain "push" and "pull" factors. Another important point is that migration is not influenced directly by origin and destination characteristics, rather by the perceptions of these characteristics by migration decision-makers. While origin factors may be accurately perceived, this is not always the case for destination factors. Inaccurate perceptions of potential destinations, often based on lack of information, impose an element of risk for those who migrate.

Development activities that increase production levels in rural areas often lead to a shift from subsistence to commercial agriculture. With increased production, income, and commercialization, the rural demand for urban-produced consumer goods and for agricultural inputs tends to rise. Such increases in demand can generate additional economic activity and employment in urban areas, and this can act as a stimulus to rural-urban migration. In short, successful development in rural areas can increase the "pull" of urban areas and thus contribute to more rural-urban migration.

Intervening obstacles. The simple summation of the push and pull factors at origins and potential destinations does not in itself dictate migration decisions. Consideration must be given also to degrees of natural inertia, and to obstacles between origins and potential destinations. Distance is the most obvious obstacle; countless studies reveal the negative relationship between distance and migration. Both physical distance and socio-cultural distance are important. Physical distance affects the time and cost of initial moves, as well as visits to urban areas. Socio-cultural distance includes differences between origins and destinations with respect to language, degree of modernity, religion, values, and attitudes. Lack of information concerning opportunities and characteristics of potential destinations is related to socio-cultural distance. Physical barriers and enforced migration restrictions may also act as intervening obstacles to migration.

In general, development activities in rural areas tend to reduce intervening obstacles to rural-urban migration. Road and highway improvements, building of bridges, and improvements in transportation services facilitate movement. Development which increases rural incomes enables people to overcome obstacles to rural-urban migration more easily; often people do not migrate because they simply cannot afford it. Perhaps the impact that development has on the socio-cultural distances between rural and urban areas is more important than a reduction in physical distance. The most obvious example is

the development of formal education in rural areas which enables rural youth to acquire "modern" urban attitudes, aspirations, language skills, and accreditation in the form of school diplomas and certificates. Thus, formal education has reduced socio-cultural distance greatly and, therefore, resulted in considerable rural-urban migration. Development activities usually involve a shift from traditional systems to modern systems--for example, from subsistence to commercial agriculture, from fatalism to rational planning, from traditional to modern languages and belief systems, and from provincial to urbane interests and attitudes. These changes all tend to reduce socio-cultural distance between rural and urban areas. In summary, a direct impact of development activities in rural areas is the reduction of intervening obstacles to rural-urban migration, which is expected to increase migration.

Personal factors. Personal factors are important because, as mentioned earlier, it is the perceptions of origin and destination factors and intervening obstacles which are crucial to migration decisions. Perceptions of a factor can vary considerably from individual to individual, and different individuals are affected differently by the same factors. Generalizations can be made about types or classes of migration decision-makers (while most theories implicitly assume that migration decisions are made by potential migrants, evidence from developing countries suggests that family heads often make migration decisions for members of their clan).

Development activities in rural areas may have considerable effect on personal characteristics. Increases in individual landholdings are expected to reduce rural-urban migration. Growth of individual income can have either a positive or negative impact on migration depending on the specific situation. Factors which can result in greater propensity for migration include increased levels of education, aspiration, awareness of urban opportunities, and general level of modernization. It appears that the net impact of development activities on personal factors tends to increase propensities for rural-urban migration. However, these impacts are likely to vary considerably from place to place and from individual to individual.

Hypotheses. Lee hypothesized that a number of general propositions can be made which characterize migration in a wide variety of circumstances. He suggested that development activities which accelerate socio-economic change and stimulate progress are expected to increase the volume and rate of all types of migration, including rural-urban migration. Lee also presented hypotheses on the selectivity of migration. He suggested that migrants responding primarily to pull factors at urban destinations tend to be positively selected i.e., to come from more well-off groups in rural areas. On

the other hand, those who primarily respond to push factors at rural origins are likely to be negatively selected. Taking all migrants together, selectivity tends to be bimodal--i.e., migrants are more apt to be either relatively poor or relatively well-off. The pattern of bimodal selectivity suggests that development activities which increase equity in rural areas may on balance reduce migration. Lee hypothesizes that the degree of positive selection increases with the difficulty of intervening obstacles: thus, more well-off rural groups are more likely to make the difficult moves, either to distant metropolitan areas or during the early stages of urbanization when socio-cultural distances are great. Development activities which reduce intervening obstacles can lead to less selective migration, as poor rural residents find it easier to move to cities.

Conclusions. Though social theory of migration suggests that development activities in rural areas have both positive and negative impacts on rural-urban migration, the net impact is expected to be positive. The theory suggests one basic reason why development activities may reduce migration: successful development activities make rural areas more attractive in terms of economic activities and amenities; therefore, the desire of rural residents to migrate should be reduced. In contrast, three basic components of social theory of migration imply that development activities in rural areas will increase rural-urban migration. First, development activities result in greater rural-urban integration and the reduction of physical and, more importantly, socio-culture distance between rural and urban areas. Second, development activities are associated with a general modernization of the personal characteristics of rural populations, which tends to increase propensities for rural-urban migration. Third, the theory indicates that as societies progress or develop, migration volumes and rates increase.

Economic Models of Migration

Three economic models of migration are of particular interest concerning the question of the impacts on rural-urban migration of development activities in rural areas: (1) the individual benefit/cost approach, (2) the expected income model, and (3) the intersectoral linkage model. The well-known labor mobility models of Sir W. Arthur Lewis and Fei and Ranis are not relevant here because their assumption of a stagnant rural subsistence sector excludes the possibility of development in rural areas.

The Benefit/Cost Model. This model uses the concept of investment in human capital to focus on the costs and benefits of migration decisions. The model as developed by Sjaastad assumes that people will migrate when the benefits outweight the costs. Benefits of migration are the present value of potential income gains from the dif-

ference in income between origins and destinations. Nonmonetary benefits such as those arising from location preference are also included in the model. Costs of migration include moving expenses, opportunity costs of foregone earnings between jobs, and nonmonetary "psychic costs" such as the disutility of leaving one's home community and settling in an unfamiliar environment. The benefit/cost model is attractive because it recognizes the effect of the individual characteristics of potential migrants. Older people are less likely to move because differential income returns from migration accrue over a shorter remaining lifespan, and "psychic costs" may be greater. Educated youth tend to be more mobile because their origin-destination income differences are usually larger, and their greater awareness probably reduces the "psychic costs" of migration.

The model has a number of implications for the impact of development activities in rural areas. Development tends to reduce migration costs, and may either increase or decrease the benefits of migration. Development in rural areas reduces both the money costs of migration by improving transport and. more importantly, non-monetary or "psychic costs." Development in rural areas can increase the benefits of migration by preparing rural residents to more effectively participate in urban activities. Development is associated with improved occupational skills, higher levels of education, greater aspirations, and more modern attitudes; such changes enable rural residents to better exploit urban economic opportunities. Modernization of rural residents may also act to increase the nonmonetary benefits of migration --i.e., the appreciation of urban amenities, social opportunities, entertainment, etc. On the other hand, development activities also increase the benefits of not migrating. Development can increase rural income and employment as well as provide improved living conditions; such changes make rural areas more attractive places to live. In short, rural development activities tend to increase both the benefits of migration and those of nonmigration; the crucial question is whether or not it increases or decreases net benefits of migration. If development activities have equal impacts on the benefits of both migration and nonmigration, i.e., if there is no net change in benefits, then rural-urban migration should increase because the costs of migration are reduced.

Expected Income Model. This model was developed by Todaro in an attempt to explain a seemingly paradoxical situation of continued rural-urban migration in the face of rising unemployment in cities. The model is based on the idea that migration decisions depend upon perceptions of "expected" income. Expected income in rural areas is based on prevailing rural incomes and wages; in urban areas, expected income is a product of the (often high) urban sector minimum wages multiplied by the probability of gaining urban employment. According to the model, rural-urban migration will continue until this expected

urban income is equal to the expected (prevailing) rural income. The model has received considerable attention and refinement.

The model focuses attention on the selection of appropriate employment policies in urban areas, and it also has implications for development activities in rural areas. Todaro indicates that investment in rural amenities and efforts to reduce rural-urban income differentials will result in decreased rural-urban migration. Harris and Todaro point out that, while creation of urban jobs will reduce rural production through induced migration, job creation in rural areas will not reduce industrial output and, in theory, will induce urban-to-rural return migration. Thus, the expected income model implies that development activities in rural areas will reduce rural-urban migration flows. This model, and the economic perspective in general, appear to be the basis of the popularly held belief concerning the negative relationship between development in rural areas and rural-urban migration.

Intersectoral Linkages Models. This approach emphasizes that different sectors are interconnected by systems of backward and forward linkages. Through such linkages, development in rural areas influences economic activities in urban areas and vice versa. Agricultural development is associated with increased demand for farm inputs; this backward linkage results in the growth of such urban activities as production and distribution of farm implements and machinery, fertilizer, new seed varieties, credit, and agricultural information. Forward linkages include transport and storage of agricultural commodities, other agriprocessing activities, and the wholesaling, transport, and retailing of agricultural based products. Both rural and urban jobs are created by agricultural growth.

Final demand linkages resulting from increased rural incomes are also important. Rural-produced goods tend to be income inelastic. while urban goods and services are generally income elastic; as their incomes rise, rural customers are expected to spend an increasing proportion of added income on urban goods and services. While added rural income will generate some additional demand for rural goods, it will have a much greater impact on demand for urban goods and services. To meet this added demand, urban production will increase, resulting in employment generation in urban areas and induced rural-urban migration.

The distribution of income gains in rural areas can have important implications for migration. The poorest rural families are apt to spend most of their additional income on basic foodstuffs which have little or no linkages to the urban sector. On the other hand, more well-off rural residents are likely to spend almost all of their added income on goods and services from the urban sector. Therefore,

development activities which increase incomes of middle-level and more well-off farmers will have a stronger positive impact on rural-urban migration than activities which concentrate benefits on the poorest rural residents.

Intersectoral linkages have important implications for the pattern of rural-urban migration. Most of the urban employment induced by agriculture growth through backward (demand for farm inputs) and forward (agriprocessing, etc.) linkages will accrue to market towns and regional centers rather than big metropolitan cities. Consequently, backward and forward intersectoral linkages are likely to stimulate migration from rural areas to market towns and regional centers. Rural income growth also will increase the demand for consumer services in market towns and regional centers; the resulting employment generation will stimulate migration to these smaller urban cities. Employment generation induced by additional rural demand for urban products may accrue to primate cities (or even developed countries if products are imported), and thus stimulate migration to metropolitan areas; however, this depends on the particular industrial structure and consumer preferences.

Overall, the intersectoral linkage model suggests that rural-urban migration may be stimulated by development activities in rural areas which raise rural incomes. Most migrants will probably move to market towns and regional centers rather than into large primate cities. It should be noted that the definition of urban areas could affect the share of "urban" places of destination for migrants.

Overview of Theoretical Models

Different theoretical models are in conflict concerning the impact on rural-urban migration of development activities in rural areas. Some theories suggest that migration will be stimulated while others imply that it will be reduced. General social theory of migration focuses on social changes associated with development that provide rural residents with more urban orientations and skills, which then facilitate migration. The intersectoral linkage model also predicts accelerated migration as development-induced increases in rural income are spent on urban goods and services, leading to urban employment generation and rural-urban migration. On the other hand, the Todaro expected income approach suggests that migration will decrease because rural-urban income differentials decline as a result of development activities in rural areas. The Sjaastad benefit/cost migration model suggests an ambiguous impact on migration, as both net benefits and costs of migration may decrease with development in rural areas. In short, theoretical models do not provide a clear-cut answer concerning the migration impact of development activities in rural areas.

Empirical Studies of Migration

A large number of empirical studies have been conducted of internal migration in developing countries and several reviews of these studies are available. This section discusses the motivations for migration, characteristics of migration origins, and characteristics of migrants.

Motivations for Migration. Most surveys indicate that migration is primarily motivated by economic considerations, whether in Africa, Asia, or Latin America. Economic factors are cited in surveys of both reasons for leaving an area and reasons for selecting a specific destination. Studies of out-migration generally indicate that economic "push" factors are most important, while in-migration studies suggest that economic "pull" factors are predominant. This difference could be attributable to the locational context of the survey, i.e., "Why did you leave here?" versus "Why did you come here?" Also, those surveyed at rural origins and those at urban destinations may be samples of two different migrant groups, because rural out-migrants are not the same as urban in-migrants. Economic "push" factors may be most important to some migrants while "pull" factors are the primary concern of others.

Empirical evidence suggests that major economic "push" factors include agricultural un- and under-employment, lack of land, and general rural poverty, while the most important economic "pull" factor is the perception of high wages from urban employment. "Push" and "pull" factors are closely interrelated; those who are "pushed" into migration are simultaneously "pulled" by the hope of finding something better elsewhere.

Though empirical studies have indicated that economic motivations are clearly the most important, a number of other motivations for migration are found. Studies in Latin America, Subsaharan Africa, and Asia suggest that some rural-urban migration is motivated by a desire for the educational opportunities offered in urban areas. Other motivations cited in the literature include marriage (especially for women), joining the family already at the destination, escape from rural violence or war, and desire for urban amenities. Very little empirical evidence supports the popular idea that rural-urban migration is motivated by "bright city lights" or urban entertainment. The noneconomic factors are generally secondary reasons for migration; in the majority of cases economic considerations are the primary motive.

Characteristics of Migration Origins. Relatively few empirical studies have investigated the relations between origin characteristics and rates of rural-urban migration, although numerous investiga-

tions have been made of general out-migration without distinguishing whether out-migrants went to urban or rural areas. These studies suggest that out-migration is associated with land availability and origin economic characteristics.

A number of empirical studies indicate that rural areas with high out-migration rates tend to have high population densities, or high ratios of labor to arable land. A positive correlation between out-migration and lack of land is generally found for rural areas in Africa, Asia, and Latin America, although a few studies indicate a negative correlation. Making causal inferences from these correlations, however, is a problem: lack of land may cause out-migration, but out-migration also causes changes in land availability. Distribution of available land is also a factor in migration; evidence from India and Latin America suggests a positive correlation between high rates of rural out-migration and unequal distribution of land.

A number of empirical studies investigate the relationship between levels of rural development and rates of out-migration, with inconclusive results. Much of the evidence from Asian countries suggests that rural areas with low income levels or low crop yields tend to have relatively high rates of rural out-migration. On the other hand, studies from Africa and Latin America reveal high rates of out-migration from rural areas with relatively high levels of income or education. Relationships between income level and out-migration can be misleading because the causal direction is ambiguous. Low or high per capita income in a rural area may be associated with factors which could cause increased out-migration. Alternatively, high rates of out-migration could cause increased per capita income (if the poorest left, or if remittances were substantial) or decreased income (if better-off residents migrated).

Studies of rural areas in India, Colombia, and New Hebrides indicate a positive correlation between high rates of rural out-migration and commercialization of agriculture. However, evidence from Turkey suggests a negative correlation. Care should be taken in interpreting these results, because farmers may have migrated temporarily in order to obtain the funds needed to invest in commercial agriculture. The large number of studies which indicate that distance inhibits migration would suggest that rural areas which are accessible to and well integrated with urban centers should exhibit high rates of rural-urban migration, and this expectation is supported by the few studies which have explicitly investigated this issue. On the other hand, villages on the outskirts of cities may have low rates of out-migration because their residents can commute to opportunities in cities.

Clearcut conclusions are difficult to obtain, partly because most studies of rural out-migration fail to distinguish between rural-rural migration and rural-urban migration. Empirical evidence suggests that rural-urban migration is positively correlated with rural accessibility to, and integration with, urban centers; however, this generalization is based on relatively few studies. Many empirical studies indicate that lack of land is associated with high rates of rural out-migration; whether or not these out-migrants go to urban areas is not clear.

Characteristics of Migrants. A large number of empirical studies have investigated the characteristics of rural-urban migrants. In almost all cases, studies reveal that migrants tend to have relatively high levels of education (by rural standards) and are most likely to be young (15 to 30 years). In Africa and Asia migrants are more apt to be male, while in Latin America and the Philippines females predominate. Though the evidence is mixed, it appears that rural-urban migrants are more likely than rural nonmigrants to have nonagricultural occupational skills. Rural-urban migrants are also more apt to have made previous visits to cities, have friends and relatives in cities, and be more aware of cities and the opportunities they provide. In short, there is considerable evidence to suggest that rural-urban migrants are generally more qualified for urban life than rural nonmigrants.

A number of studies indicate that migration to the city is positively correlated with family income level. This correlation appears to imply that as a rural family's income increases, it experiences higher rates of rural-urban migration; such an implication is in direct contradiction to the expected income theory of migration (assuming expected urban income remains unchanged). The causal link between income level and migration is ambiguous; successful migration and remittances may cause high migration groups to have relatively high incomes. Income is associated with other characteristics which promote rural-urban migration such as education and occupational skill levels, aspirations, information and awareness, self-efficacy, intelligence, and attitude toward development. It is these other factors which seem to be positively linked to migration rather than income per se. If income could be increased without influencing any of these other factors, then income growth might possibly slow rural-urban migration propensity; but it is doubtful that this could result from a development activity.

A number of empirical studies support Lee's theory that rural out-migration is bimodal, that out-migration rates are highest for those at the medium-low and medium-high levels of the rural income distribution. Those from medium-low income groups tend to move to nearby rural areas or perhaps small towns, while those from the

medium-high groups are more apt to move greater distances into larger urban areas. This type of migration flow (Figure 1) has been observed in countries of Africa, Asia, and Latin America. Better-off rural groups are more apt to migrate or send their educated youth to larger cities to take advantage of their higher education levels or modern skills. On the other hand, relatively poor groups can only afford to migrate short distances, and search for agricultural or unskilled work in nearby areas because they generally lack the education, skills, and information needed to compete in large cities. Moves to nearby small towns, however, could possibly lead to later migration to big cities after requisite urban skills, education levels, and information are acquired. The poorest of the poor are not expected to migrate because they lack funds for migration and are too preoccupied with survival. The middle-income rural residents might be less apt to migrate because they are fairly secure as farmers, sharecroppers, or petty entrepreneurs and they lack the urban skills which might motivate migration.

Summary. Empirical studies reveal a number of generalizations concerning internal migration in developing countries, several of which are relevant to the issue of the development impacts on rural-urban migration. Relevant generalizations are listed in Table 1. Each empirical generalization in the table has implications concerning development activities in rural areas shown on the right side of the table. The table suggests that many development activities may tend to stimulate additional rural-urban migration; however, the impacts of actual development projects will depend upon the type of development activity undertaken.

Figure 1

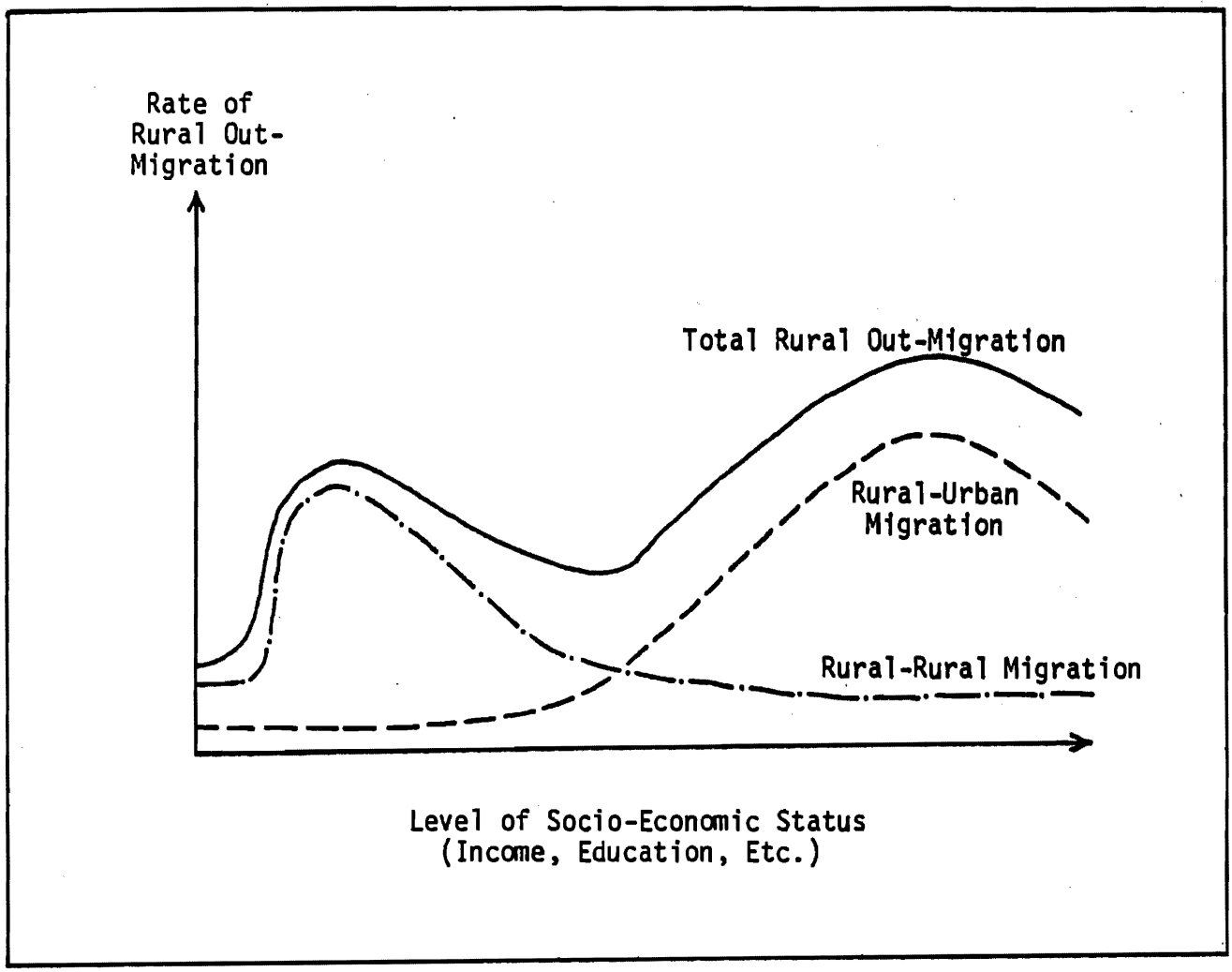

Figure 1. Idealized relationship between rate of rural out-migration and level of individual or family socio-economic status. Source: Author, based on argument and evidence provided by Lipton (1978).

Table 1. Implications of Empirical Studies Concerning Migration Impacts of Development Activities in Rural Areas

Empirical Generalization	Implications for Development Activities
1. Positive correlation between rural out-migration and high population density.	Development activities which reduce population growth or increase cultivatable land should, in the long run, reduce rural-urban migration.
2. Positive correlation between rural-out-migration and unequitable land distribution.	Activities which distribute land more equitably will probably reduce rural-rural & rural-small town migration, and may reduce rural-city migration.[a]
3. Positive correlation between rural-urban migration and access to cities.	Activities which increase rural access to cities will probably stimulate rural-urban migration.
4. Positive correlation between rural-urban migration and rural-urban integration & commercialization of agriculture.	Activities which increase rural-urban integration and commercialization of agriculture may stimulate rural-urban migration.[a]
5. Positive correlation between rural-urban migration and level of formal education.	Activities which raise levels of formal education will almost always stimulate rural-urban migration.
6. Positive correlation between rural-city migration and occupational skill level.	Activities which raise skill levels may stimulate rural-city migration.
7. Unclear, assumed mixed impact on rural-urban migration of development-induced rural income growth.	Activities which raise rural incomes may either increase, decrease, or have no net effect on rates of rural-urban migration.[a]

[a] Activities which distribute land more equitably, increase commercialization of agriculture, and raise rural incomes will probably induce growth of urban production and employment through intersectoral linkages. Most of the induced growth will probably accrue to market towns and regional centers; consequently, these urban centers are expected to experience increased in-migration as a result of the development activities.

Migration Implications of Specified Rural Development Activities

Different types of development have different implications for migration. Each activity has a set of associated impacts, some of which may accelerate migration while others tend to slow rural-urban movement. Because of these counteracting impacts, it is not easy to make broad beneralizations. The influence of an actual development project on migration depends in large measure on specific characteristics of the project and of the area into which it is introduced. With this caveat in mind, the following tentative generalizations are offered:

1. Land reform is expected to have a moderate slowing impact on rural-urban migration because it normally increases labor utilization in rural areas.

2. Land rent ceilings and tenancy controls may lead to tenant evictions and thus may stimulate rural outmigration and possibly contribute to rural-urban migration.

3. Rural resettlement schemes provide opportunities for varying numbers of people; their ability to have a negative impact on rural outmigration depends on the numbers affected and the success of the schemes in retaining settlers.

4. The Green Revolution (promotion of high-yield seeds, fertilizer, etc.) in the absence of tractorization tends to be labor absorbing and therefore may reduce rural outmigration. Rapid increases in production of grains for the market tend to stimulate the growth in market towns and regional centers of agriprocessing, supply of farm outputs, and consumer goods and services. Therefore, through these intersectoral linkages, the Green Revolution may stimulate migration into market towns and regional centers, particularly in the long run.

5. Tractors and related forms of mechanization usually displace labor and thus stimulate rural outmigration and may contribute to rural-urban migration.

6. Irrigation projects increase the demand for agricultural labor and therefore tend to slow rural outmigration and may reduce rural-urban migration.

7. Increased credit and extension services could increase rural output and employment, especially if they reach small farmers, which could slow outmigration. More often the chief beneficiaries are the larger landowners, and this may provide a weak stimulus to rural-urban migration in the long run.

8. Off-farm employment and rural enterprise development tend to generate economic opportunities in small towns. Such activities stimulate rural to small town migration and may retard rural to big city migration in the short un. However, in the long run, migration to large cities may accelerate because small centers often act as a staging ground for rural migrants on their way to large cities.

9. Rural public works projects provide attractive employment opportunities, and therefore have a strong negative impact on rural-urban migration. After project completion the impact may shift to a moderate stimulus to rural-urban migration because public works programs can provide rural workers with the occupational skills and experience needed to gain urban employment.

10. Rural roads projects generate considerable employment during construction; thus they may have a strong slowing impact on rural-urban migration in the very short run. However, upon completion, the improved roads increase rural-urban integration and thus may stimulate rural-urban migration.

11. Rural electrification also increases urban-rural integration and thus may accelerate rural-urban migration. However, electricity can stimulate rural economic activity thus retarding migration. The net impact is probably a weak slowing of migration.

12. Development of rural education may keep some youth and even their families from moving to towns where schools are better. However, formal education provides youth with skills that are far more applicable in cities than in rural areas; consequently, development of formal education provides a very strong stimulus to rural-urban migration. This is perhaps the strongest generalization that can be made concerning the impact of rural development activities on migration.

13. Family planning programs which reduce fertility and population pressure on land have a moderate slowing impact on rural-urban migration in the long run.

14. Development of improved rural health services has a mixed and relatively weak impact on rural-urban migration.

15. Most of the expenditures for the rural-oriented activities of international development agencies are made in large, often capital, cities for such items as salaries, office overhead, farm equipment and supplies, and travel. The direct and multiplier impacts of these expenditures generate considerable em-

Again, it must be remembered that these generalizations are tentative at best; actual migration impacts of specific development activities can only be assessed with any degree of confidence on a case by case basis.

Conclusions

The results of this investigation suggest that past development activities in rural areas, taken as a whole, have not resulted in any appreciable reduction in rural-urban migration. In fact the evidence appears to suggest that rural-urban migration probably has on balance been stimulated by previous development projects in rural areas. It is doubtful that future projects will be much different from past projects in this respect. In almost all cases, development activities in rural areas cannot be justified on the grounds that they slow rural-urban migration. This is one of the most definite and important conclusions of the present study. There are reasons for believing that existing rural-urban migration flows will not be reduced no matter what types of development activities are undertaken in rural areas. Most such development activities tend to have a mixture of positive and negative impacts on migration, and many of them appear to have a net positive impact on rural-urban migration. While a few types of activity may slow rural-urban migration in the short run, their long run impacts are generally mixed or perhaps even stimulative.

It appears that making changes in urban areas is the most promising approach to influencing rural-urban migration. Suggested changes for reducing urban immigration include urban wage restraint, elimination of urban minimum wage, removal of subsidies to urban industries, and easing of food price ceilings and urban food subsidies. These changes might reduce urban migration; however, they are very unpopular politically and, therefore, have little chance of being implemented. It seems more practical to remove some of the more obvious subsidies enjoyed by urban areas, while accepting the inevitability of rural-urban migration and dealing with development and poverty problems where they presently exist and are expected to be in the future. But even though rural-urban migration seems inevitable, it might be possible to influence the pattern of migration by promoting development activities which stimulate employment generation in regional centers or small cities. Such activities might be more effective in reducing migration to primate cities than development activities in rural areas.

[Extracted from a monograph published by the Office of Urban Development, U.S. Agency for International Development, Washington, D.C., March 1979.]

Urban Bias and Food Policy in Poor Countries

Michael Lipton

[Policies affecting food supplies tend to reflect urban influence and interests rather than rural interests in most developing countries. This has a negative impact on food supplies, especially on foods available to low-income consumers.]

By 1950 the less-developed countries (LDCs) of Africa, Asia and Latin America had about regained pre-war levels of real income per person. In the next 25 years these levels rose on average by over 75% in real terms--almost certainly more than in the previous 25 centuries. Yet, such improvements have done little to raise the nutritional levels of the poorest 30% of the people of most such countries. Typically, one of the 920 million persons in the poorer half of the populations of India, China, Indonesia, Bangladesh, Nigeria and Brazil spends 55-80% of any extra income on food. The less poor half of these countries' populations, however, spend a much smaller share of extra income on food--typically 20-35%--and most of this goes to vary the diet and simplify cooking, not to provide extra calories. Moreover, a larger proportion of poor than of less-poor people is dependent on agriculture in LDCs. Stagnation in the incomes of poor people in LDCs, combined with enrichment of less poor people, is therefore almost certain to be matched by (a) very slow, if any, growth in calories consumed per person in those countries, and (b) much faster growth in the production of non-food and non-agricultural commodities.

This is just what has happened. Despite local successes--like Sonora in Mexico and the Indian Punjab --food output per person in the developing world is not

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World as a whole. But these extra imports have done little for the poor and hungry, for four reasons. First, the proportion of food provided by imports is small in most poor LDCs (only 3-5% of world output of rice, the main Asian staple is usually traded). Second, food imports seldom durably or substantially alleviate the condition of the hungry in LDCs: of the Third World's poor, over 80% live in rural areas, and are unlikely to have access to imported food. Third, many of the rural poor are involved in food production, and hence lose if imports cut food prices; this decrease in ability to buy food may offset nutritional gains to those who get the imported food. Fourth, worsening income distribution in LDCs has shifted their patterns of demand, and hence of both outputs and imports, away from "poor men's foods," such as millet, towards such costly calorie sources as meat, milk, fruit and vegetables--a shift accentuated by government policy.

It is not surprising, then, that--according to aggregate FAO data--the poorer half of the people in India, Bangladesh, Indonesia, Nigeria or Brazil probably get no more food now than in 1934-38, although their countries' real income per head is some 40-80% higher. Direct tests via diet surveys or food balance sheets--while often methodologically dubious--on the whole support this alarming conclusion.

Urban Bias

Causes of "growth-with-hunger." The sorts of decision that have led to growth-with-hunger in many LDCs are gradually becoming understood. First, growth requires the diversion of resources away from making consumer goods towards investment in the broadest sense--towards paying teachers and doctors as well as building factories and dams.

Second, and much more important, too few of the resources diverted from consumption have been used for agricultural production. In the 22 LDCs with available data, barely 20% of investments in 1950-65 reached the agricultural sector. (FAO, State of Food and Agriculture 1978, recorded little change.) Yet it typically engages 70% of population to make 45% of output. This neglect of agricultural investment is not due to its low returns; even in 1960-65, before the "green revolution," it was typically associated with about three times as much extra output as investment elsewhere in the economy.

Third, urban pressures have caused even this inadequate agricultural investment to be misdirected. It has gone to huge dams (enriching urban contractors and often providing urban electricity) instead of to higher-yielding minor irrigation. It has too often favored export crops and "rich men's foods," with scant regard for calorie output per acre or per unit of investment. Above all, it has supported the big farm that supplies outputs for urban users, although the small farm that feeds the rural poor and has easy access to family labor makes more efficient use of land, fertilizer, water, and other inputs, and hence produces more output from them.

Fourth, a whole array of policies, from price incentives and import licensing to the allocation of administrators and doctors, has persuaded people to transfer efforts and resources from rural to urban areas, from agriculture to industry.

Why urban bias? It is gradually becoming possible to interpret and compare these policies across LDCs, and to show that they cannot be substantially justified by any success in accelerating industrialization. Less easy--but necessary, if one is to illuminate the consequences for food policy--is to explain how they have come to be normal in so many LDCs. The shared errors of a hundred or so governments cannot sensibly be attributed to evil, or ignorance. Most LDCs have nationalist governments; many are democratic, or have "populist" overtones, or leaders who advocate (at least verbally) some form of socialism or egalitarianism. Yet almost all LDCs--the few exceptions, including Taiwan and South Korea as well as Cuba and China, make a fascinating group--have been permeated by urban bias: by the tendency of public authorities and private persons to allocate, and their disposition to justify proportions of developmental or welfare-generating resources for large urban areas, in excess of any reasonable norm of either efficiency or well-being. How is this possible?

The answer is hinted at by comparing the political and economic structure of today's LDCs with that of "Now Rich Countries" (NRCs) at a comparably early stage in accelerated growth. There are nine NRCs and 64 LDCs for which ratios of non-agricultural to agricultural income-per-person in early modern development are available. All but two NRCs showed a lower ratio than do 63 of the 64 LDCs; and two-thirds of the LDCs show a higher ratio than did any of the nine NRCs. Typical ratios for NRCs in early development range from 1.3-1 to 2-1. For Asian and Latin American LDCs today, ratios run from 3-1 to 5-1; and for Africa today, from 4-1 to 8-1. These disparities result from, and (since wealth breeds power) cause, inequalities in political "clout" between the rural sector and the urban sector, dependent as they are on agriculture and industry-cum-commerce respectively.

The NRCs in early development were actually more urbanized, but less prone to under-represent rural interests, than are LDCs today. In Britain in 1811, only 35% of people lived off agriculture; yet the farm interest was strong enough to secure protection for agriculture right through its critical innovative period, ending with the Corn Law abolition in 1846. In much of today's Third World, some 60-80% of people live off agriculture; however, an urban-industrializing ideology, good communications, and the power given to urban groups by their leadership in the anti-colonial movement, have enabled these groups to seize much more power than did their NRC predecessors; and it is industry that is protected by tariffs or otherwise, while agricultural prices are deliberately held down. It is not only that in today's LDCs the townspeople, though proportionately fewer than in the NRCs,

are stronger, but that the rural masses are on the whole more dispersed, less organized, less literate, and thus--if successful--more easily "bought off" by the urban interest, than were their counterparts in NRCs. Such resources as do go to agriculture are steered by urban interests toward bigger farmers who--though less efficient than small ones--are likelier to sell their output to cities, to reinvest their savings there, and to underpin the political status quo. Conventional coups, even revolutions, seldom help the rural poor much; rather they redistribute power towards previously disaffected urban groups.

This is an overcompressed and hence oversimplified account (details appear in M. Lipton, Why Poor People Stay Poor, Harvard and Temple Smith, 1977), but it is necessary for an understanding of the determinants of LDCs' food policies, to which I now turn. A population's nutritional condition is determined by the amounts and composition of the country's food outputs and of net food imports, and by their distribution both among persons (between the undernourished and the overfed) and over time (between lean and good years and seasons). These amounts, distributions and compositions in turn depend partly on nature, discovery and preference, but partly on three types of policies. The first type affects food output (and net imports) directly, e.g., via incentives to agriculture as a whole, to particular crops, or to exports or imports of food. The second type affects the amount, composition, and distribution of agricultural inputs. The third type affects the conversion efficiency of such inputs into food and other outputs. The rest of this paper will indicate how each type of policy has been affected by urban bias, with consequent damage to nutrition.

Policies Directly Affecting Food Availability

Most LDC governments have been more concerned that food availabilities shall support industrialization without strain upon the balance of payments or the price level, than that they shall suffice to feed people properly. This may seem a harsh judgement; it owes its truth not to political wickedness but to advisory amorality and urban pressure; but true it is. Evidence is provided by two of the commonest approaches to food planning in poor countries: the drive to self-sufficiency, and "income-elasticity planning." The first impedes any increase in total food availability; the second ensures that food supplies are structured to please the greedy, not to feed the needy.

Self-sufficiency planning. Most big countries seek self-sufficiency in food. As a general aim this may seem hard to fault. The economist may argue that free trade could enable some LDCs to eat more if they produced non-food and traded it for food, or that imported farm inputs can be costly; but great reliance on food imports can be terribly risky, and I am not defending the pure free trade position. It is the manner in which "self-sufficiency" is usually estimated that is at fault.

Typically, the planners first arrive at some average of foodgrain intake per person. Next they work out how much extra output of the nation's main food crops is needed to replace imports and supply that intake entirely from domestic production. Finally, they seek to provide the farm investments and inputs judged necessary to replace imports at the required level.

The procedure has many faults. It emphasizes the main domestic crop, often at the cost of cheaper ways of producing calories; thus Sri Lanka's drive towards "self-sufficiency in rice" in 1965-70, apart from being only partially successful, obscured the high caloric returns to investment in manioc production, and confirmed the long-standing neglect of that crop. Even in foreign-exchange terms, it can produce odd results; part of Sri Lanka's "success" in cutting rice imports was achieved at the cost of a huge bill for imported wheat flour. Above all, the thrust towards a static "self-sufficiency"--in a single food crop or even in total calories--at once fixes average nutritional standards at initial levels, and does nothing (or, as in the manioc-rice case, less than nothing) to get more calories to the undernourished.

For example, in 1972/3, the planners in Bangladesh decided on the following aim: five years later, in 1977/78, the country should supply its own "foodgrain requirements" of the late 1960s and early 1970s (about 15 oz. per person per day), instead of importing some 10-15% of those "requirements" as had been typical of these years. That may sound sensible, but food is the very last import, nutritionally speaking, that extra food output in Bangladesh should replace. For consider the following implications of a target of "self-sufficiency" at the meager levels of 1972/73: to set as the standard a level of grain consumption per person which (given that grain provides some three quarters of all calories) is insufficient even as an average; to do nothing, therefore, for the poorer 50% of the people of Bangladesh, who eat perhaps 65-75% of that inadequate average; to use domestic rice to <u>replace</u> (instead of to supplement) imported wheat, creating serious transport problems for food deficit areas in or near ports that must instead be serviced from (often remote) domestic rice-surplus regions; and possibly (by shifting from imported wheat to home-grown rice) to reduce protein absorption per lb. of grain.

The best one can say for a "push to self-sufficiency," as against a food drive that <u>supplements</u> imported calorie sources, is that it may increase food prices to farmers, thus encouraging further domestic food output later, and providing incomes to farmworkers and subsistence families. But there are other, less nutritionally damaging ways to do this than to perpetuate inadequate and maldistributed availabilities of total foodstuffs. Indeed, many LDCs seeking "self-sufficiency" in this way have at the same time done much to force producers' food prices down--by as much as two-thirds of their real value in Pakistan in the early 1960s! Probably, therefore, a

decision to use extra domestic output of calories to replace food imports, rather than to improve nutrition, is motivated by a wish not to keep up prices for poor farmers, but to free foreign exchange to buy the imports needed as inputs for investment and current production in heavy industry, transport and urban construction.

Such planning prevents increases in food availability. More home output of food just means that the planners permit fewer food imports. Other pieces of planning have similar effects: the measures, almost Third-world-wide, to keep food cheap for urban consumers discourage its production at home. Underinvestment in agriculture does not help either; and the human under-endowment of rural areas--their relative lack of teachers and doctors, engineers and administrators--indirectly reduces food output, both by removing some of the relevant skills and by rendering the countryside unattractive to the successful farmer.

Income-elasticity planning. Another centerpiece of urban-biased food planning--the income-elasticity method--damages, not the output and availability of food, but the ability of poor people to afford the food that is available. It does this in four ways: by biasing the structure of food output towards items consumed by the urban rich; by raising the price of poor men's foods; by making the distribution of income more unequal; and by helping food processers to dispose of what is most profitable in disregard of nutritional need.

The income-elasticity of demand for a commodity is the percentage increase in the amount of it consumed when there is a 1% increase in the total income in the community consuming it. Planners using the income-elasticity method, and seeking to project requirements of a foodstuff five years hence, first look at recent surveys of consumption of that foodstuff by people in various income groups; then estimate how many people will be in each income group five years hence, taking account of likely rises in income and of population increase; and finally--assuming that income-elasticities of demand, among and within groups, stay the same--use the above information to estimate total demand for each foodstuff. Production policy, and (where imports are controlled) trade policy, are then geared to meet the calculated pattern of demand. Since urban and rural food consumption patterns differ, it is a common refinement to use separate survey data for urban and rural income groups, and to estimate separately the size of such groups and hence their food demand at the end of the plan period.

If the hidden assumptions of this approach are acceptable, there is nothing (or at least nothing insuperable) wrong with it technically. But, since the approach instructs the planner to provide for food demands and to ignore food needs, the assumptions have to be questioned--not technically but morally. There has to be something wrong with a program that instructs us that because income per person has

grown, we should then cut back on production in the kinds of foodstuffs eaten by the poor and hungry. In poor countries it is usually the non-hungry whose incomes grow fastest; rich people's incomes, urban income per head, and urban populations usually outpace, respectively, poor people's incomes, rural income per head, and rural populations.

The wrongness is sometimes obscured by the superficial attractions of some inappropriate foods in demand by people with money to spend. This applies to the wasteful and antinutritional responses of tastes to urban advertising--for example tastes for white bread, highly-polished rice, soft drinks, or "hygenic" beers replacing nutritious local brews. Also usually inappropriate, if more subtly so, are meat and dairy products as protein sources, and fruit and leafy vegetables as vitamin sources: such costly "ideal" foods appeal to pure or westernized nutritionists, but not to the purses of the hungry.

The damage is done in four ways. Most simply, planning that encourages the farmer to devote more resources--especially land--to rich men's foods, leaves fewer resources for poor men's foods. This is both inequitable and calorically inefficient when lands that might grow cereals or pulses are diverted to meat or milk animals (normally producing only 15-25% of the calories per acre). Similar effects occur more subtly when marginal lands, finely poised economically between producing plenty of "low-grade" calories for the poor or fewer "high-grade" calories for the rich, are shifted from maize to wheat, or from millet to rice, by policies catering excessively to the food preferences of urban people enjoying rising incomes. Income growth and urbanization can induce such shifts; but while hunger lasts, government policy should discourage them.

Second, the accompanying shifts make poor men's foods dearer, and rich men's food cheaper. Land diverted from foodgrains to feedgrains; maize and pulses diverted from poor people to feed cattle for meat and milk production; research into fruit and milk-cows or even, where people are very poor, into wheat and rice rather than millet--all this, by cutting the supply of poor men's foods and rendering them relatively scarce, increases their prices. The corresponding relative price reduction in the nutrients of the better-fed is scant compensation. There is, to be sure, some farmer reaction towards growing "poor men's foods" as their price rises; but this reaction is kept weak by the poverty of their buyers, and by government emphasis on areas producing other foods in policies affecting research, water development, and fertilizer supply.

Third, the resultant worsening of income distribution means that many poor people--notably deficit farmers and landless laborers who grow and eat millet or maize in the semi-arid regions of Africa and Asia--have fewer prospects of correcting their nutritional

deficiences. Not only do the extra millet or maize, over and above on-farm production, needed by these people to make good their deficits, become scarcer and more costly, but such consumers become poorer in real terms, and less able to buy other sorts of food.

Fourth, the tendency of urban-biased, capital-intensive, pro-industrial development policies to raise chiefly the incomes of the urban rich would in any case mean more demand--and hence more production and import of rich men's foods; but some of the effect would be felt as price rises for those foods which could discourage some consumption of them. However, planners wishing to accelerate a shift toward "modern" agriculture can cause most or all the effect to be felt as higher production (and imports) at the expense of the supply of poor men's foods. "Consumers' sovereignty" under unequal, urban-biased growth is bad enough; helped by planners, it is worse; and the effects can be further augmented by highly organized industrial firms. The increasingly organized food industry will process and advertise what is profitable, and that is only too likely to mean packaging, prepared baby-foods, highly polished rice, and similar status-conferring and often nutritionally harmful devices. Planners concerned with the relief of hunger should resist such currents, not give them "income-elastic" support.

Planning against hunger. Is there any alternative to these urban-oriented approaches to planning food availability--to the drive towards a static self-sufficiency, and to the determination to supply at the going price whatever is demanded out of extra incomes? The commonsense alternative, surely, is first to identify the numbers and types of people in nutritional need and the size of their deficiencies; then to select the cheapest methods of producing or importing what is needed to make good those deficiencies, and of distributing the extra food or the power to buy it to the people suffering them; and finally to implement these methods, beginning with the most cost-effective that is politically feasible, and continuing down the scale of cost-effectiveness until almost all undernutrition has been abolished.

This picture of nutrition programming needs refinement: but, by giving sufficient priority (say 15% of allocable resources) to making calories securely available to the hungry, almost any LDC could eliminate 90% of its undernutrition in ten years, within its existing political framework. It is the self-defeating quest for instant industrialization pushed on the Third World from East and West alike, and its convenience to powerful urban groups (government, intellectuals, and organized labor, as well as business), that have pushed aside the abolition of hunger as the main task for planners of food availability. It is a task not only feasible technically and economically and desirable morally, but also highly practicable politically. Urban bias in food policy is not a law of political nature.

Policies Affecting Inputs Into Food Production

In considering the search for the cheapest methods to obtain the missing calories and to get them to the hungry, I have taken up the volume and structure of farm output. Equally affected by urban bias is policy affecting farm inputs: their total, their composition, how many and which ones reach poor farmers, and how many and which go to produce food.

Curtailed inputs into food production. To stress investment in industry, housing and roads--and hence to cut back on investment in irrigation, drainage and farm implements--is to reduce total available farm inputs from such sources. Farmers may well find that inadequate infrastructural investment in rural areas makes the purchase of other current inputs unprofitable or risky. Extra water is often necessary to justify major extra inputs of nitrogenous fertilizer, for example, and control of drainage and erosion is essential if a farmer is to retain, on his own land, the benefit of fertilizers or pesticides that he has bought.

Private persons are often not encouraged to make good the gaps in public provision of farm inputs. Institutional credit is heavily concentrated on urban activities; and a farmer seeking to buy an improved plough with private credit must compete with heavy consumer demands that force interest rates up. Subsidization of scarce farm inputs misdirects them to the bigger, more powerful farmer, who alone has the influence to get them. Thus, if the policy is "subsidy plus scarcity" the small farmer probably gets fewer inputs than before. Finally the underpricing of farm outputs, and the protection and overpricing of industrial outputs, is a standing deterrent to the use or provision of farm (as against industrial) inputs.

Input structure. The type of farm inputs fostered by policy makers in ways beneficial to powerful urban groups has also retarded the abilities of poor rural people to afford enough food, and of scarce rural land to supply it. Given the amount of public and private spending on agriculture, it has been allocated excessively to the subsidized provision of inputs which do little for poor people's nutrition, but much for urban contractors and urban requirements of marketed rural raw materials.

Thus, large-scale tractorization in many poor countries--highlighted by the ILO World Employment Program's reports on Kenya and Sri Lanka--has spread far beyond areas of seasonal labor shortage. Such shortages can be met by several other methods more likely to create income for poor workers, not rich tractor-owners. Such methods, indeed, are widely adopted where tractorization is not artificially encouraged as by subsidy. In most cases--Northern Mexico and the Indian and Pakistani Punjab are exceptions--tractorization in LDCs has done little to raise output (Binswanger, Economic Tractorization in

South Asia, ADC, New York, 1978) but has worsened rural unemployment and hence undernutrition, and has encouraged large-scale farming to "save labor" (i.e., create unemployment), even though smaller units tend to grow more grain per acre (for recent evidence see R.A. Berry and W.R. Cline, Agrarian Structure and Productivity in Developing Countries, Johns Hopkins, 1979) and are more likely to feed it to hungry people. Meanwhile the foreign exchange devoted to importing tractors has been unavailable for the job-creating fertilizers needed to raise food output. The energy crisis, given the fuel needs of tractors, has sharpened these contradictions, and others. If oil shortages cause a rethinking of the capital-intensive, big-farm strategy, small farmers and low income consumers may yet be grateful for them.

Who gets inputs? The planner who is seeking to support industrialization with farm surpluses will not be eager to see scarce inputs going to small farmers who consume the outputs themselves. And we have seen how the planners' choices of types of input, and of credit policy, hamper small farmers in getting inputs. Why is it nutritionally desirable that they should? First, since they have more labor per acre, and since the farm family controls it and keeps the total returns from most of it, they apply more effort per unit of inputs, and hence grow more from them. Second, subsistence farmers are likelier to grow extra food from extra inputs than are large farmers. Third, being poor, they are more likely to be hungry, so that extra food (or extra income) improves their nutrition.

How inputs are used. The final issue, on which urban bias has historically reduced the impact of farm inputs on food output, is the allocation of those inputs among uses. If governments seek only to cater for growth in demand (especially among the less-poor) they will discourage farmers from applying water or fertilizers to poor men's foods. Moreover, research has characteristically stressed improved inputs, notably seeds, for commercial export crops. This colonial tradition, based partly on the reliance of governments upon revenue from export taxes and marketing boards, persisted well after independence in most LDCs, and helps explain delays in their "green revolution" in wheat and rice. Even today, research and extension, and fertilizer use, per acre of tea or cotton have typically been pushed far nearer to their economic optimum than for rice and wheat, let alone millets and manioc.

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Regional Planning to Strengthen the Contribution of Urban Centers to Rural Development

Eric Chetwynd, Jr.

[Regional planning for towns and cities has recently been given a new emphasis on its services to rural growth. This article describes some projects in which this kind of planning is developed.]

The approach to regional development known as the "spatial systems approach" was widely accepted by the mid-1970s. Its view of the economic growth process as moving downward through an urban hierarchy from the biggest cities to smaller cities, towns and villages has been described as follows:

"Economic growth and development are initiated and reach their highest levels at a few centers which offer advantages for industrial location and have a high capacity to generate and adopt innovations. Growth impulses, in the form of market demands for goods and development-inducing innovations, diffuse from these centers to the rest of the space economy through a hierarchy of urban industrial centers, and through a network of smaller central places which serve as marketing and service centers for the rural population. Diffusion from these centers into surrounding rural hinterlands occurs in a wave-like process which is subject to considerable distance and time delay." (1974 Paper by AID's Office of Urban Development)

The principal weakness of this model, as observed in practice, is that the beneficial impacts that flow from the few privileged centers at the top of the urban hierarchy often are limited to their immediate contiguous areas and do not penetrate sig-

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nificantly into the rural hinterlands. Without a well-developed system of intermediate cities, towns and smaller centers to form an integrated marketing and distribution system, the rural farmer who is not within commuting distance of a major center must depend upon the village for all his supplies and for marketing and other basic services. Yet, since the level of transportation and other services is very low in most villages, a large proportion of rural families are excluded from the mainstream, and often even from the marginal benefits, of the national or regional development process.

As a first step in addressing this problem, the Office of Urban Development sponsored a study which produced the basic guidelines for the projects which are the subject of this paper. The resulting monograph was published by Praeger in 1978 as Urbanization and Rural Development: A Spatial Policy for Equitable Growth. Originally it was called Urban Functions in Rural Development. The study explores the inequities in the spatial distribution of services in developing countries, examines the various approaches to this problem in theory and in practice, and evaluates the programs of international development agencies in this context and finds them deficient. The study then attempts to explain how urban services and facilities can be strengthened to support rural development. It sets out an operational strategy for integrating urban and rural development, in which the starting point is an assessment of the gaps, weaknesses, and deficient linkages in the capabilities of a regional system of cities, market towns, and service centers to serve surrounding rural areas.

Some Definitions

Hierarchy of centers. The following terms are used in AID's regional planning programs. A hierarchy of urban centers--service centers, market towns and regional centers--serves a rural region and binds it together. At the bottom of the hierarchy, and normally in closest proximity to the farms and villages in any given region, are the service centers. Following the general pattern of regional population density, they offer the most fundamental types of services not available on the farms or in the villages. These services will include at least some combination of periodic markets, storage facilities, some permanent vending stalls, perhaps some basic agricultural processing facilities such as mills and presses, a primary school, a dispensary, and the lowest level of central or regional government representation. Service centers are accessible through one or more farm-to-market roads or trails, and normally will have some kind of road link with the next higher order center which is the market town.

Market towns are more complex than service centers. They offer a wider range of services to a more extensive service and exchange area that may include up to six or more service centers. In addition

to permanent markets or large and frequent periodic markets, the market town can include small manufacturing and processing plants, farm supply and servicing centers, banks and agricultural credit services, blacksmiths, clinics, secondary and vocational schools, subregional government services or installations and basic recreational facilities such as bars, cafes, and sports fields. Market towns usually will have a decent road connection with the highest order of centers at the regional level, the so called regional centers.

There may be only one or as many as several regional centers in a region, depending on its size, population, and level of development. Regional centers tend to be major sources of employment, offering large, complex markets, specialty stores and specialization in a whole range of productive, commercial and professional services. Hospitals and higher education facilities normally are found in regional centers and there can be a variety of cultural and entertainment services. Regional offices of the government are located at this level. Regional centers are usually linked to the capital and other major cities by all-weather roads, and sometimes rail and air service, and they can be linked with international markets and communications networks.

These characterizations are intended to represent a kind of normative model. Obviously the combination and nature of services in any actual town or city will vary with its size, age and location, the nature of the local rural economy and other related factors.

"Urban functions" in rural development. To support growth in its rural hinterland, an urban center must: a.) be accessible to the farmers; b.) have transport and communications links to the higher centers; and c.) provide (directly or indirectly) the following services: (1) marketing, storage, and refrigeration of rural produced goods; (2) agricultural processing; (3) agricultural credit; (4) merchandising of agricultural inputs and machinery; (5) services for farm equipment; (6) sources of technical information and advice; (7) health, education, and administrative services; and (8) cultural and recreational services.

Urban Functions in the Bicol River Basin

The Bicol River Basin is one of seven major river basins in the Philippines around which the Philippine government is building its regional development strategy and program. Located in Southern Luzon, it encompasses two provinces totalling 706,000 hectares and has a system of about 120 service centers, market towns and regional centers. The Bicol Basin was selected for the first or demonstration regional development (integrated rural development) program because, while it holds considerable promise as an agricultural region and

its people are noted for their industriousness, its population of nearly 2.0 million has one of the lowest average incomes in the country. The region sustains an annual battering by typhoons and floods, and its people wage a constant struggle to overcome the effects of the tidal backwash which often accompanies typhoon flooding and leaves thousands of acres of farmland salinated.

The Bicol River Basin Development Program (BRBDP) was started in the early 1970s as an integrated rural development program designed to alter the fortunes of this economically depressed region. Of necessity, the program contained a heavy flood control and irrigation component and was most comprehensive in its other aspects as well. It was a multi-faceted program intended to deal with all of the significant elements of agricultural and rural development from agricultural credit, cooperatives, and extension services to marketing and transportation. One major deficiency in the program was its lack of a spatial orientation. It lacked a strategy for dealing with the role of urban centers and their connecting linkages in the physical organization and economic integration of the region.

A project agreement was signed in June of 1975 which made available an AID grant of $250,000 to assist the Bicol River Basin Council in "reorient(ing) urban development in the Bicol River Basin in the context of its rural agricultural character, such that its urban centers directly complement and support the planned integrated development of the Basin area." A multidisciplinary Philippine project team was assembled, headed by an urban and regional planner. The team was set up as a staff within the BRBDP and had formal consultative contracts with the University of the Philippines and the Center for Policy and Development Studies at Naga in the Bicol River Basin.

The project was to develop a process that would facilitate application of the "urban functions in rural development" approach not only in Bicol but elsewhere in the Philippines, and in other countries. Because it was the first field application, the selection and use of analytical methodologies in the Bicol project were characterized by trial and error. A number of approaches were found to be inappropriate for the conditions and data base in the Philippines and had to be altered or rejected outright. Basically, the steps followed were:

a. Socio-economic, demographic and physical profiles of the municipalities (similar to counties) to serve as an inventory for comparative analysis and baseline data.

b. Analysis of the existing hierarchy of settlements to determine centrality (relative importance) of

centers, the relative complexity of their functions, and the ranking of settlements. This analysis was attempted through a series of three methods, each of which was found to be an improvement on the last, namely:

(1) A Guttman scale analysis of built-up complexity based on municipality profiles;

(2) Calculation of weighted centrality by assigning predetermined weights to different functions; and

(3) A scalogram analysis for the 120 most important population centers (or built-up areas) in the basin. The scalogram proved to be an extremely useful graphic inventory and display of the presence or absence of key functions in a regional hierarchy of centers (see illustration in Figure 1).

c. Threshold analysis to determine approximately what population size is needed to support a given level of services.

d. Linkage analysis (including mapping and overlays) to determine the extent or lack of physical and economic integration among centers, and between centers and their hinterlands. Separate analyses were done for:

(1) Transportation and physical linkages;
(2) Economic and market linkages;
(3) Service linkages;
(4) Social linkages; and
(5) Administrative, political and government linkages.

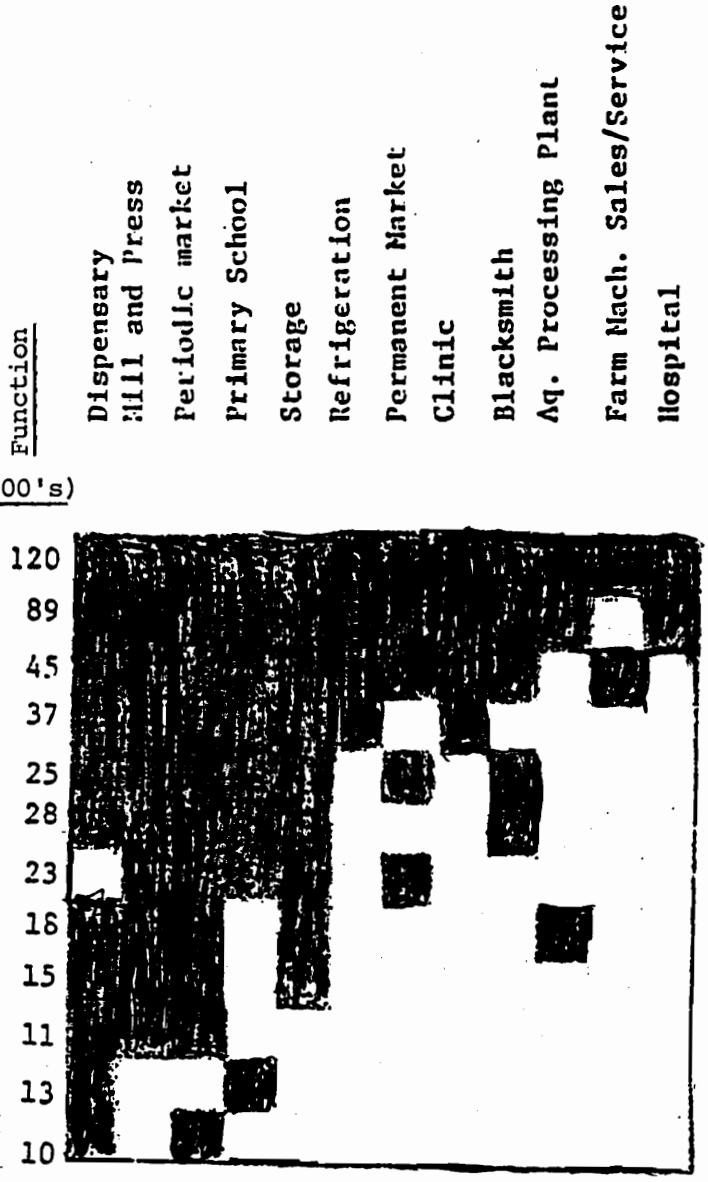
Findings and recommendations. The findings of the analysis contain a number of surprises and have significant implications for this and other river basin development schemes. It was found that:

a. The Basin is not a cohesive economic region as assumed, but rather a collection of six micro regions with little or no economic interaction among them.

b. The present boundaries of the Basin, based on purely hydrographic considerations, are not realistic from an economic development standpoint.

Figure 1

Abridged Example of Scalogram



To Construct a scalogram:

- List functions in order of frequency of occurence across horizontal axis.
- List towns on vertical axis ranked by population size.
- Fill in cells of matrix to indicate presence of service.
- Reorder ranking of towns so that greatest number of blank cells appear to right of imaginary diagonal.

Read chart to identify thresholds for services, service gaps and existence of higher order services at middle and lower levels of the hierarchy.

c. Transport links between centers and their hinterland regions are woefully deficient.

d. There is a paucity of markets and market towns within the hierarchy, leaving all areas seriously under-serviced except for a narrow axial strip between the major centers at opposite ends of the region.

These findings led the team to recommend a number of actions:

a. Developing a more complete transport net, focusing particularly on the grave deficiencies in the farm-to-market road system.

b. Fostering the development of many incipient, poorly endowed centers away from the more prosperous axial strip in the Basin; these centers were pinpointed through the analysis.

c. Developing minimum packages of investments to bring the three major types of centers in the Basin hierarchy up to some minimal standard.

The extent to which these recommendations have been actually implemented is not known as of this writing; we have been informed that they have stimulated and influenced the pattern of private and commercial investments in the Basin.

In addition to these findings and recommendations that were derived from the analysis, the exercise produced a number of useful outputs. These included a statistical compendium and bibliography of data sources, analytical maps, the scalogram, a core of trained professionals, a body of literature, and an increased awareness in the Philippines of the concepts and methods involved. The approaches used now are taught in the universities, and are being applied by the Philippine government in planning for development of the remaining major river basins.

Lessons from Bicol. First, the project was data intensive and extensive; if anything, it erred on the side of collecting too much data. This was understandable since the Bicol project was the first of its kind. However, in future projects there should be far greater selectivity in data collection. For example, it would be useful to ask about each set of data collected: how will this help indicate gaps and weaknesses in the urban functions supporting rural development in the region?

A second lesson is that the Bicol analysis did not get down to identifying specific projects to be undertaken. This has since been corrected. It is now accepted that the ultimate objective of these analyses is the identification of a portfolio of projects, screened for economic feasibility and relative priority, and presented in the context of a plan or strategy for strengthening urban functions in the rural development of the region. This, of course, requires more time and resources than were alloted to the Bicol project.

Finally, even though the Bicol project did provide for participation of local and other government authorities, it did not have any input from the farmers, who are the intended beneficiaries of the project. The involvement of the local rural or "target" population in the decision process becomes especially important when the program calls for the identification of specific projects. The location, nature and mix of projects such as farm to market roads, improved market, storage and processing facilities, and agricultural credit services, to name a few, are of critical importance to the farmers.

Other Projects

There were two companion projects to the Bicol activity which followed and in which we were able to incorporate the Bicol experience. These were projects in Upper Volta (involving two separate regions) and Bolivia (where the project is beginning in one region but could spread to six). In both projects, the end product is to be a portfolio of projects and a planning framework for the region covered.

Upper Volta project. Obviously, sub-Saharan, landlocked Upper Volta is drastically different from the tropical, archipelagic Philippines. The hierarchies of centers in the two Upper Volta regions --the Eastern and mid-West regions--are far less complex than the system of centers in the Bicol River Basin. For example, in the Eastern Region, the largest center is Fada N'Gourma with a population of roughly 14,000. Fada is like a large village. It contains a very modest market, a prefecture headquarters, regional offices of several ministries, a hospital, a secondary school, a bank and a technical training center for artisans, mechanics and craftsmen. It does not have central electricity, piped water or paved streets. This is the capital and largest city in a region of almost 50,000 square kilometers and a population of some 400,000. The mid-Western region is half the size of the Eastern region but has twice its population. The largest city is Kondougou with a population of more than 40,000. As the third largest city in the entire country, it bears the physical characteristics of a city. It has a host of functions

and services and an impressive market which services a wide area. In a scalogram analysis of the regional hierarchy of centers, Kondougou was found to have 37 functions. The next largest towns in the mid-West Region, Reo (15,000) and Yako (10,000), had 12 and 10 functions respectively. Seventy-eight percent of the centers in the region had 2 or fewer functions.

It is easy to see why the project team rejected complex quantitative analyses in Upper Volta. A single scalogram and common knowledge of the two regions were used to identify the most important places. From a total of 1326 population centers, the 20 most important centers in each region were selected for intensive analyses. A descriptive profile of each of these selected centers was prepared based on field visits, interviews and a marketing study to determine the nature of local markets and the extent of their geographic coverage.

As of this writing the Voltaic project team is still preparing the final report and regional project portfolios. However, the American consultant to the project has completed his report and the findings are instructive in their considerable variance from the Philippine findings. The findings and recommendations basically were as follows:

a. There is little point in expanding the volume of services in the two regions--although additional services plainly are needed--when the first order of priority should be the repair and maintenance of existing services which presently are in deplorable condition. These services include markets, roads, culverts, schools and dispensaries.

b. A service outreach dimension should be added to existing services. This could be accomplished by providing bicycles or mobiletts to nurses, agricultural extension workers and others whose service outreach could be extended by using simple means of mobility. Similarly, the outreach of schools and rural training centers could be expanded by providing dormitory facilities in the towns in which they are located.

c. More responsibility should be given to the local level. The services system in Upper Volta is highly centralized, and the considerable capabilities at the local level represent opportunities foregone.

d. In this same context, local communities should be encouraged to levy taxes (e.g., user taxes) so that existing services can be refurbished, maintained and extended.

To initiate implementation of these recommendations the contractor has proposed that a modest demonstration program be started to restore and repair basic services in a small number of centers. These centers should be selected on the basis of both their relative importance in the region and the willingness of the local population to undertake self-taxation to continue maintenance of the services. Decisions on what projects should be undertaken should be a product of local initiative.

These recommendations obviously reflect an extremely resource-poor situation in which the main resource that really can be counted on is the people. The official final report, still in preparation, is expected to pinpoint locations in the two regions for specific follow-on activities, focussing as much on linkages up and down the urban hierarchy, like transport and marketing, as on specific town-based services. It also is expected to articulate a strategy for the spatial development of the Eastern and mid-Western regions.

The Bolivia project. The initial site for the Bolivia project is the Department of Potosi, a large, mostly highland region in Bolivia with a population of about 660,000. Much of the land area in the Department is high up in the southern altiplano region of the Andes between 12,000 and 14,000 feet in altitude, and in the high Andean valleys. Potosi is a poor region, with low per capita incomes and a poor agricultural base. It was mining, not agriculture, that originally attracted large numbers to the area. Several hundred years ago Potosi City, capital of the Department with a present population of 80,000, was the silver capital of the world and was the largest city in the Western hemisphere.

A workshop was held in Potosi in January of 1980 which introduced material from the Bicol and Upper Volta projects to all who might be interested or involved in the project. The intended final products of the project go beyond what was proposed for the Upper Volta project. The principal ones are:

a. Formulation of an Investment Framework: translation of the spatial analysis into an investment strategy which identifies projects and programs that will be needed to solve major development problems, to strengthen and articulate the regional spatial structure, and to integrate urban and rural areas within the Department.

b. Identification of Projects: formulation of "investment packages" for different locations within the Department, and combination of the investment packages into a priority-ranked and appropriately sequenced investment budget for the development of the Department over the next five years.

The project also calls for an evaluation system for monitoring implementation and impact and creation of a continuous planning process for spatial development of the region. The analytical steps leading leading to the "outputs" of the project include: (a) baseline analysis; (b) spatial systems analysis; (c) linkage analysis; (d) analytical mapping; (e) analysis of unintegrated and poorly served rural areas; and (f) identification of spatial and functional gaps. The Potosi Department is only one of six participating in a major rural and regional planning program in Bolivia, and it is anticipated that once the methods developed in Potosi are tested they will be adopted in the other five Departmental regional planning programs. In fact, the methodology presented for Potosi was sufficiently well received at the outset that it may be picked up by some of the other Departments even before testing in Potosi.

Participation by the target population was lacking in the Bicol project, as noted, although in Upper Volta it was addressed to some degree through the intensive interviewing involved in developing profiles on each of the selected centers. The need for a participation element in the Bolivia project was highlighted at the January 1980 workshop: for example, one of the Bolivian engineers asked how the analytical process outlined above could lead to "investment packages" that were reflective of needs felt by the farmers, who, after all, are the intended beneficiaries of the project. The problem is twofold: (a) how to obtain the information from the farmers and other rural residents, and (b) how to convert that information into data that could be utilized effectively by the planners. A report on this rather delicate problem was commissioned entitled, Public Participation in Regional Development Planning: A Strategy for Popular Involvement, by the Development Group for Alternative Policies. It identifies six basic approaches for eliciting rural input into the planning decision process, and describes the advantages and shortcomings of each. It also suggests how the information obtained through each approach may be integrated into the planning process and sets out as one option, a technique, CODINVOLV, which converts qualitative and declarative information and responses into quantitative punch card or computer data. The six approaches set out by the report as illustrative mechanisms for popular participation in regional development planning are:

a. "One on one" approaches --e.g., personal interviews, questionnaires, household surveys, and individual observations (for example, by a trained anthropologist).

b. Communication with community leaders, e.g., village chiefs, traditional leaders, and other local spokespersons.

c. Interaction through community meetings, specifically called meetings or public hearings--a process requiring considerable skill and sensitivity.

d. Interaction with representative community and multi-village organizations, e.g., church groups, women's groups, and neighborhood councils.

e. Interaction with representative functional organizations, probably more effective as an entry point in participation than as the final word on local views.

f. Consultation with regional organizations, such as regional planning and development authorities and regional corporations.

In the case of Potosi, a combination of interaction with regional level organizations and with village leaders may be the most appropriate of the approaches to apply. This remains to be determined, and plans are underway to build the participation element into the Potosi project. Whichever approaches finally are employed, the chances for success are enhanced by the fact that it was local planners who first perceived participation as a need.

On the other hand, participation in the Potosi project will be complicated by a condition which frequently confronts development planners and decision makers. Basically, the whole region is underserviced and agricultural potential is limited. Hard decisions will have to be made about which areas should be given highest priority. The choice will be between those which are poorest and have the least productive potential and those which are relatively better off and have greater potential. These are not choices that can be made through the participation process.

Conclusion

It is too early to assess fully the impact on rural and regional development programs of strengthening the rural service functions of urban centers. However, the logic of the concept and of the methodology by which it may be applied to a field situation is gaining in acceptance even as further testing is in process. Reportedly, the approach is being applied widely in the Philippines and appears to

have made a lasting impact on the nature of rural and regional planning. Additional field test applications of the urban-functions-in-rural-development approach with an added beneficiary-participation element are underway in Guatemala and Cameroon, and planned for Sudan. Related AID-assisted projects are at various stages of development in Kenya, Peru and the Dominican Republic. India and Taiwan also have experimented with the approach.

There is little doubt that the models of the literature have been translated successfully to field applications. Next steps will include an assessment and synthesis of the collective analytical and planning experiences, followed by a longer-term evaluation of the impacts of these projects on the progress of rural and regional development.

[Extracted from a paper delivered to the 8th PTRC Seminar on Urban and Regional Planning in Developing Countries, University of Warwick, England, July 1980.]

RED CROSS DISTRIBUTION OF FOOD IN FAMINE AREA FOLLOWING THREE YEARS OF SEVERE DROUGHT. (PHOTO-FAO BY PIERRE PITTET)

U.S. Private Voluntary Organizations Assisting Third World Development

John G. Sommer

[The term private voluntary organizations, abbreviated here to PVOs, refers to non-profit groups formed by private citizens outside government, using money that is contributed voluntarily. Such groups are found by the thousands in the United States, as in other countries, created for a great variety of purposes. Here we are concerned only with the more limited number of them who work overseas in developing countries, and whose activities serve the development of those countries in some way. Some of these organizations are based on religious groups; others are not. Some of them have very narrowly defined purposes--e.g., to provide one particular service to a limited area or group. Others may have very broad official objectives--to serve humanity, especially the ill, the hungry, etc. Whatever the official aims, we consider here what organizations actually do and where they do it--i.e., those who contribute to developmental purposes in the Third World. It must be recognized that in recent years a number of these PVOs have been working closely with governments, both in American and European overseas programs and in national government programs of developing countries. This means that some of their income may not be private. But they retain their private identity and freedom to choose what they will or will not do, with or without governmental contracts or cooperation. They would not exist without private voluntary funds, and their methods of working tend to differ from those of government agencies.

This article provides an overview of the different kinds of developmental activities undertaken by PVOs, and discusses a number of issues that have arisen in that connection.]

Private and voluntary activities in the Third World can be classified for purposes of this discussion under two main headings: relief, and development. While not all agency representatives observe a sharp

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distinction between the two types of activities, it is critical to draw one, since they focus on two fundamentally different problems. Indeed, the failure to observe the distinction has resulted in much of the frustration over aid in the past. Relief, after all, attempts to fill stop-gap needs for human survival. Development efforts, on the other hand, have--or should have--as their goal the achievement of improved standards of living, (defined on a variety of planes) and the capability to be self-sustaining into the future. There are borderline cases where short-term relief programs may pave the way for longer-term developmental efforts, but too often this transition is not made.

The voluntary agency trend is now to emphasize development as much as relief, based on a growing recognition that if solutions can be found for the root causes of poverty, then ultimately one can break out of its "bottomless pit" and, among other things, be better able to cope with disasters as well. Yet there is still a certain ambivalence in agency programming, an ambivalence that derives partly from pragmatic perceptions of diverse needs and partly from the conflicting signals given by different types of donors. Human nature being what it is, the movement toward "development" is inevitably influenced by the lure of the dollar. In general it has always been easier to obtain private individual contributions for relief after well publicized disasters than for less dramatic, longer-term endeavors. Among some outside funding agencies, however, most notably the U.S. Agency for International Development since 1973, there is currently a clear emphasis on supporting PVO programs aiming for long-term development results. The American public, on the other hand, has barely begun to make the transition to understanding the longer-range complexities of development, although it responds most generously to emotional relief appeals. Agencies must understandably maximize income, and this encourages them to be as ambiguous as possible about their goals and ideologies. Ambiguity increases the number of contributors to whom agencies may appeal; it is therefore a rational strategy for fund-raising agencies to 'becloud their policies in a fog of ambiguity.' It is this dichotomy that may partially explain the curious mix of programs that emphasize both visible short-term and less visible long-term goals to please both types of supporters. At the same time, the tendency to blur relief and development may lie in a failure within the organizations themselves--their boards and executive ranks--to comprehend fully or agree on what is meant by "development."

For purposes of discussion, and notwithstanding considerable overlapping, one can group most efforts of private and voluntary organizations in development under three headings: development of physical and income-generating infrastructure; development of institutions; and development of human resources. The first type of effort refers both to the building of physical infrastructure such as roads, irriga-

tion works, and industrial installations, and to providing other types of production-oriented inputs such as seeds, pumps, and fertilizers that directly or indirectly give people their livelihood and sustenance.

Physical and Income-Generating Infrastructure

Many private and voluntary organizations have contributed, and continue to contribute, to physical infrastructure development in the Third World. A study of aid to Brazil noted that "more than half of the aid of private bodies goes for schools and hospitals...[and] that construction and equipment absorb almost half of the aid... This could well be an indication that the criteria are often palliative or [reflect] the desire to achieve visible results that can give satisfaction to the contributor." The question, indeed, is whether those efforts to create physical infrastructure are both income-generating and equity-promoting over the long run. Not surprisingly, the largest contributions on the physical side have come from the largest agencies, such as CARE. These efforts have made extensive use of U.S. government food resources to feed workers who are organized to build up physical infrastructure.

Physical infrastructure tends to be popular with private organizations, as it is with government and multilateral aid organizations, for three reasons. First, as suggested by the Brazilian example, the end product is highly visible, thus demonstrating to those who have contributed the resources what they have accomplished (and making them happy to contribute and build more). Second, physical infrastructure is relatively easy and straightforward; one has only to design what is needed and hire people to build it. "Self-help" programs are a more imaginative variation here, involving the local population assisting the construction on a voluntary basis, thus helping to ensure their continuing interest, maintenance support, and--theoretically--further participation in improving their own lives thereafter. On the other hand, the local initiative involved in such programs is sometimes exaggerated, with the effect occasionally being one of simply getting a job done with cheap labor. There is also a third and more culture-bound reason for the popularity of physical infrastructure projects, namely that because communities in the West have developed infrastructures, there is assumed to be an obvious need for physical facilities everywhere. The danger lies in the Western assumption--often misleading--that a village without a school or hospital automatically needs a school or hospital. Some efforts that contribute through physical infrastructure could be counterproductive to more favorable development goals by displacing other less visible activities.

Health. A case in point in the field of health is exemplified by a young and talented Bengali doctor who, unlike the majority of his more profit-oriented peers, was committed to improving health care for

the people of a rural area not far from Dacca, the capital of Bangladesh. Realizing that any program, to be viable over the long term would require its own self-financing mechanism, he devised a medical insurance scheme inexpensive enough for the villagers to afford, yet sufficient to cover at least part of the recurrent costs of the medical services offered. Realizing, too, that local involvement was necessary in order not only for this particular scheme to succeed but also for the people to begin to enjoy some of the fruits of broader developmental processes, he engaged some thirty-five committed auxiliary health workers to interact intensively with the villagers. Their main task was not only to cure diseases but also to convey information and guidance on preventive medicine--for example, the need for sanitary drinking water and food handling, and for improving the nutritional value of their diets--as well as family planning. Because gastrointestinal maladies accounted for a major share of the illnesses in that area, the need for scarce capital-intensive hospital facilities could be reduced by following such labor-intensive paramedical practices in the villages themselves. However, the doctor's initial mistake, as he himself observed in a candid moment, was to allow his own ego, and that of the foreign voluntary agency supporting him, to permit the construction of a relatively large central hospital building, the grand design of which was in obvious contrast to the simpler local setting. As the building was going up, he observed for a time a decreasing sense of motivation among his staff members to mingle with the poor; in the early months they had been enthused by the challenge of their rural development role, but they then became increasingly spoiled, he felt, by the rich impression created by the new hospital building.

This situation and others similar to it indicate that, although poor working conditions can also discourage staff and lower morale, one of the problems of overfinanced infrastructure is that its ostentatious image (not to mention its subsequent maintenance costs) may conflict directly with the values one wants to encourage--or that are otherwise more realistic--in very poor settings. In other situations, however, buildings can have positive psychological effects; and in any case they have their normal utility. Many areas, for example, continue to rely on the services of missionary hospitals.

Agriculture. Because there are only a few voluntary organizations that have sufficient resources to build many schools, hospitals, feeder roads, bridges, or irrigation facilities, their major contributions to physical and income-generating infrastructure tend to be in the area of small- to medium-scale agricultural development. The classic example is what has become known as the Green Revolution. In the 1960s, new high-yielding varieties of wheat and rice that have the potential for multiplying crop yields were introduced into a number of countries. Because the new seed varieties require more fertilizer and more careful regulation of other inputs, especially irrigation water,

they have been criticized for being more helpful to rich farmers than to poor farmers because the latter are less able to afford these inputs; also, poor farmers may lack both the knowledge base required to utilize the new technology and the risk-taking capability to try it out.

On the other hand, many observers feel that the poor, with their small plots, can profit more from Green Revolution technology than can the rich, with their large plots, because of the former's greater practice of the more intensive cultivation required by higher-yielding varieties. It is here, in fact, that the voluntary organizations have made particular contributions in spanning the information, technology, and input gaps to the otherwise ignored poor farmers. International Voluntary Services and the Mennonite Central Committee with their agricultural technicians; Oxfam-America through its small but strategic grants of seeds and well equipment, and its institutional support; and World Neighbors and a whole host of church and secular organizations assist in promoting these new technologies. They assist in the production not only of wheat and rice, but also of soybeans, vegetables, and other nutritious dietary supplements previously either unknown in particular settings or infeasible until faster-growing wheat and rice varieties permitted multiple cropping patterns and thus more efficient use of land. World Neighbors, for example, reported in 1970 that in one cooperative project with a Gandhian group in South India, "the output of vegetable foods...gave an increase of 6,050,000 pounds or an average per capita increased availability of vegetable foods of 60.5 pounds. There was also an increase of 650 grams per person in animal foodstuff, largely from eggs and poultry." For every dollar invested by World Neighbors, this amounted to an annual food value of $43 for local consumption.

A linkage between relief and development programs is readily apparent in the PVO response to the widespread droughts of the mid-1960s and 1970s in South Asia and Sahelian Africa, which served to mobilize efforts in agricultural infrastructure. There have been cycles of fat and lean years throughout history; now it appeared that the vulnerability of whole populations to climatic vicissitudes could be eased by invoking the new technologies and the affluence of the West to deal with the root problems of food scarcity. It thus became a logical extension of relief feeding efforts to dig wells, construct water channels, contribute pumps, and train local people in the potential of agricultural advance. Church World Service, Lutheran World Relief, Catholic Relief Services, Africare, CARE, Community Development Foundation, their local counterpart organizations (particularly among the churches), and many others--including European and Canadian voluntary organizations--found themselves contributing.

The problem, again, is how to make sure that this assistance really helps the poor majorities in the Third World. Poor farmers

lack risk capital to attempt new cropping methods or livestock breeds. The geography of irrigation and drainage flows does not necessarily coincide with equity considerations in the sense that a dam needed to control the flow of water to both rich and poor farmers may have to be placed for reasons of nature near the rich farmer's field, which tends to give him control through easier access. Organizations attempting to introduce improved breeds of animals will naturally have more confidence in the most "reliable" farmers with a reputation for being able to care for them well; this is understandable since everyone loses if the animals fall into the hands of untrained farmers unable to ensure their survival and reproduction. Poor farmers usually have no proven track record. This is why Heifer Project schemes, for example, insist that the initial, better-off beneficiaries repay their original animal grants to poorer, higher-risk farmers by giving them the offspring as they are born. Otherwise the poor would be left still further behind.

Handicrafts and light industry. In many areas, private and voluntary efforts are directed to the encouragement of employment-generating small enterprises for handicrafts and light industries, as well as various commercial and service trades. In Kenya, the U.S. and European church-supported National Christian Council trains and sponsors handicraft artisans; their products find a ready outlet through the tourist trade. Partnership for Productivity is helping with the managerial training required in introducing people to a variety of small business ventures in western Kenya. In Honduras, Technoserve has assisted in the establishment of carpentry shops in which the country's timber-growing advantages are exploited to make wooden products for export. The Community Development Foundation assisted a group of Honduran women in purchasing a corn-grinding mill to enable increases in their production of biscuits. And in Bangladesh, the Christian Organization for Relief and Rehabilitation, the Mennonite Central Committee, and Oxfam cooperated to establish the Jute Works, an organization committed to enabling women--initially widows of the Bangladesh liberation war--to achieve self-sufficiency through the fabrication of jute handicrafts. By 1976 the Jute Works had an annual turnover of $500,000.

Development of Institutions

Less tangible than physical infrastructure, but at least as important to development, is the institutional context of planning, decision-making, and implementation of change-oriented policies. U.S. private and voluntary organizations--along with the international aid establishment generally--have been active at several levels in both building and opening up institutions to give the poor greater access to planning and management resources. The foundations and university groups frequently help at the higher up or "apex levels" of the government or the education sector, and the smaller voluntary organizations tend to help closer to the grass-roots level.

Planning institutions. A major "apex level" activity of the foundations and universities has been the assistance given to national planning commissions in a number of Third World countries, notably in Asia. For newly independent nations short of both material and managerial resources, the need for careful planning and allocation of those limited resources is crucial. Colonial administrations, concerned with political control and commerce, were not organized for this kind of development planning. Thus, for example, the Ford Foundation financed advisory teams from Harvard University to help Indonesia and Pakistan, among other countries, become involved in these countries at different levels of national agricultural, educational, and management planning under either foundation or U.S. government funding. While generalizations are risky, it can safely be said that these efforts succeeded in their goals of institution building to the extent that they were able to recruit competent and culturally sensitive American or European advisors, and the setting afforded minimal local political and bureaucratic impediments.

Events often take unexpected turns. In Indonesia, highly intensive foundation-funded and university-conducted efforts to train entire economics faculties served unexpected purposes when the Sukarno regime was overthrown in 1965/66 and replaced by General Suharto's more technocratically oriented government, which drafted the U.S.-trained economists to high government-planning posts. While the universities may have suffered, Indonesia's national economy improved dramatically under the tutelage of these economists. In Pakistan, the Ford Foundation funded high-level and competent U.S. academic assistance to the government's planning group. Political and bureaucratic priority was attached to many of the group's recommendations, and the country's gross national product rose encouragingly. Yet there, too, events took an unforseen course. First, in 1968, the Ayub government toppled, due in some part to discontent over the unevenness of economic progress; and in 1971 Bangladesh went its separate way, in part because it had been a neglected region. The Harvard advisory team, though perhaps as concerned as the Pakistani government had been with equity considerations, was charged in its planning with a lack of sufficient sensitivity to either Bengali or poverty-group needs; and the Ford Foundation was jolted into undertaking in 1969 an introspective post-mortem of its role in assisting those planning efforts.

Research institutions. If policymaking is partially based on political judgments and realities, it must also draw on knowledge derived from research. U.S. private assistance groups have made major contributions here too. They have supported academic institutions and field-oriented institutions on the principle that Third World decision making should be based, at least in the long run, on Third World research.

Agriculture is a good case in point. While voluntary organizations have been instrumental in spreading Green Revolution technology among the poor farmers, the foundations--principally Rockefeller and Ford--are responsible for establishing and funding the centralized research institutes that developed the new technology initially. In fact, there are now nearly a dozen such institutes linked together for support through the Consultative Group on International Agricultural Research, which operates under the auspices of the World Bank, Food and Agriculture Organization, and U.N. Development Programme. Their research covers a wide range of products and local conditions, including crops such as wheat, rice, various tropical agricultural products, coarse grains (millet and sorghum, for example), and potatoes. If one adds in the research institutes' country-level affiliates in a number of Third World nations and considers the amount of new food production resulting from the new technology, the network has proven to be an immensely significant one that represents perhaps the greatest single contribution of the private nonprofit sector to world agricultural development.

Broad-based community development institutions. Community development theorists and practitioners have long held that broad-based participation on the part of all segments of a local community is necessary if equitable development is to occur. One form of institution building in the Third World that is directed to these goals is represented by U.S. cooperatives. The zeal that has gone into spreading cooperative structures for housing, rural electrification, small enterprises, credit unions, and so on often appears at least as intense as the zeal that infuses religious missionaries. Because cooperatives have been successful and influential forms of social and economic organization in parts of Europe and the United States, they have had considerable political support in the U.S. Congress and in U.S. AID, and are seen by many, like physical infrastructure, to be essential to development in the Third World. Indeed, co-ops have succeeded in a number of Third World settings, particularly in parts of Latin America and Asia. Some other societies, particularly in their more traditional sectors, are culturally less receptive to the Western style of cooperatives. Village-level co-ops, not surprisingly, work best where social and cultural homogeneity is greatest. The fact that inequity rather than homogeneity is characteristic of many Third World societies makes the co-ops, like other forms of organization, susceptible to manipulation of the poor and impotent by the rich and empowered.

One of the more interesting models for promoting development is that employed by some private groups in the field of credit in Latin America. Because the credit gap is one of the major constraints to development in a number of Latin American settings, a variety of outside assistance agencies, both governmental and private, have attempted

to help in that area. Yet worldwide experience has shown that credit in the absence of necessary technical assistance and overall supervision is either insufficient or, where it profits the wrong people, counterproductive. Thus, both the Pan American Development Foundation and the U.S. Credit Union National Association (CUNA) have assisted in the formation of associations throughout the continent that dispense not only credit but also technical and supervisory support to local cooperatives and other groups. As a result, no doubt, of their approach, their loan repayment rates are very high, in sharp contrast to the repayment rates of governmental and other lending institutions offering fewer support functions. In Honduras, for example, the private co-op repayment rate was about 88 to 90 percent in 1975, and the government co-op rate was about 65 percent. The Honduras case is of interest in another sense in that at least one major private credit organization has been a member of a larger institutional grouping called CONCORDE, the other members of which are engaged in education (including the influential radio schools), technical assistance, and various types of community development activity. Through the joint programming that is thus possible, the impact of the individual component inputs is magnified.

Another attempt to institutionalize participatory development at local levels is reflected in the methodology of the Community Development Foundation (CDF), also known (mainly for fund-raising purposes) as the Save the Children Federation. CDF insists that the inputs it provides and the activities it supports must be governed by a committee on which all local groups are represented--rich and poor, powerful and powerless, men and women, and whatever variety of castes and religious groups may be present in the particular area. Theoretically, this could have a significant impact in many situations, for traditional societies are often not known for their democratic "one person, one vote" modes of governance or for representation of all groups in the governing process. In practice, therefore, such efforts are fraught with difficulties. For example, it is not clear, if an issue arises in which the local committee and CDF representatives have differing views, that the committee will always prevail; nor is it clear that broadbased decision-making would be applied more generally to non-CDF funded activities that would continue into the future. The point is that local traditions and patterns of organization tend to be strong; transitory outside projectizing, no matter how well funded, is usually unable to force permanent change of this nature without traditionalist reinforcement.

A further example of efforts to institutionalize increased participation can be seen in the growing number of programs currently being promoted by some private and voluntary organizations, including CDF, to enhance women's roles in development. Development planners in the host countries have not always taken this new concern seriously, con-

sidering it to be an export of a Western movement that has little application to their societies. Yet the women's movement has developed its own manifestations in the Third World, and increasingly, groups of Third World women are exerting pressure on their governments to respond to their needs and action priorities.

Churches. Among the major institution builders overseas are the churches. Aside from their efforts to build local church groups, they have traditionally been very active in creating hospitals and schools. Indeed, they were in some areas the original institution builders, responsible for establishing the schools and colleges that trained many of today's most prominent Third World leaders. Today the major Catholic and Protestant denominations are increasingly channeling their support to the Third World through their local religious affiliates, partly in recognition of the substantive desirability and long-term efficiency of such an effort, and partly in view of the political sensitivities toward outside religious groups on the part of many Third World governments. Thus Catholic Relief Services, like the worldwide Catholic hierarchy, has given priority to building up the capabilities of Caritas or other local Catholic assistance organizations in countries where CRS works; and the (Protestant) Church World Service, like the World Council of Churches network as a whole, has assisted the various national Christian councils of Asian, African, and Latin American countries. CWS, at the same time, has moved increasingly from an emphasis on projects or programs to one on the quality of interpersonal and interinstitutional relationships, simultaneously increasing the size of its own international (as opposed to U.S.) staff and the range of its multilateral approaches. Much the same has been true of the smaller Quaker and Mennonite bodies.

In the preceding pages, examples of some of the PVOs' major institution-building efforts have been described. But there are also dozens more that could be cited: the various national volunteer corps for student and youth involvement in the Third World which were given a significant impetus by the U.S. Peace Corps; the Peace Corps itself, which was substantially modeled after the earlier volunteer-sending programs of the International Voluntary Services and the American Friends Service Committee; the YMCA and YWCA movements, which involve young people in group activities, sports, and training programs; the 4-H Clubs for rural youth leadership development; the Salvation Army; the Red Cross, which began in Europe in the nineteenth century and soon became an important international movement, institutionalized in the form of national organizations in nearly every country of the world; the Boy Scouts and Girl Scouts, which began in the United Kingdom with Lord Baden Powell and which, with both colonial European and U.S. encouragement, extended throughout the Third World; a variety of U.S. and European child adoption and other welfare agencies; and CARE and Catholic Relief Services (cited earlier), which

played both initiating and exemplary roles in the institutionalization of social welfare functions both in governments and in the voluntary sectors of Third World countries.

U.S. and European private and voluntary organizations have done much to encourage appropriate adaptations of indigenous institutions for welfare to current realities. The institutions they have supported have sometimes had largely palliative effects, but other times have contributed to broader changes in favor of greater equality of opportunity for the poor. The analytical problem is that the positive and negative results of institution building--particularly insofar as they abet access and equality of opportunity for the poor--are far harder to assess than those of physical infrastructure. Still harder to assess are the results of human resource development.

Development of Human Resources

While virtually any developmental activity affects human resources, those that place primary emphasis on their improvement are considered here. The gamut is broad, ranging from social welfare and child adoption schemes at one extreme, through education, to "consciousness raising" leading to the possibility of more radical change at the other. In between lie people-to-people volunteer efforts, scholarship programs, skill-training efforts, "technical assistance," and, of course, the religious efforts of the missionaries.

Social welfare. The most straightforward way to affect human resources is through direct gifts and provision of services to poor people. The child sponsorship agencies, such as Christian Children's Fund and Foster Parents Plan, are typical here in that they raise money from U.S. "foster parents" and convey it (after covering administrative expenses) to a particular child in the Third World. The voluntary organization is thus providing a brokerage service between two individuals who then exchange letters periodically to enliven this mutual involvement. Partly because the notion of pure handouts and their implied paternalism have come under increasing attack, both in the West and in the Third World, the child sponsorship agencies are increasingly applying portions of the donor gifts to service programs benefiting not only the child but the larger family and community as well. Foster Parents Plan in Colombia, for example, divides the $16 contributed monthly by each parent by giving $5 directly to the child, applying $6 to community services such as education and health, and leaving approximately $5 for administrative expenses. In this way the organization is better able to ensure that at least some of the funds are utilized for the general well-being of the child and family, perhaps in ways that improve their long-term development outlooks. On the other hand, the child sponsorship agencies still justify their direct handouts--the monthly grants plus special holiday gifts

frequently sent by the foster parents--as increasing the participation of recipient families in their own development. Indeed, they argue, it is in some ways better to give cash, for it can be spent according to the families' own priorities rather than in accordance with some one who decides from outside what is best for them.

Another example of the social welfare approach to human resource development is that of the Salvation Army and the variety of schools, daycare centers, and programs for the aged and handicapped conducted by them and by a number of other religious groups. In Kenya, for example, the Salvation Army has established literacy and homemaking centers for teenaged girls, training in farming and bee-keeping, and vocational workshops in schools for the crippled and blind (the Salvation Army being the first in Kenya to assist in the latter area). Many other religious and non-religious groups have assisted in similar efforts in some of the most remote parts of the world. Of course, some observers would say that these are not developmental activities, because most are dependent on continuing foreign funding, generally on the foreigners' terms. At a different level, however, these activities are encouraging the development of a generation of people who could, in turn, affect general community advancement in the long run. This suggests, therefore, that one should judge the developmental effects of such efforts as much by their impact on *people* as by their impact on *institutions*, as long as dependencies on unsustainable outside funding sources are avoided.

The hallmark of the private and voluntary organizations has been their ability to concentrate on the more human aspects of development. Founded on the notion of people-to-people assistance--this element primarily distinguishes their efforts from governmental ones--their typically small size, humanitarian motivations, and overall ethos combine to reinforce the personal approach. Even though a negative reaction to the too-fuzzy humanity of the past has begun to lead some organizations to more technocratic and bureaucratized approaches today, such organizations still tend to have advantages over large official and multilateral efforts.

Training and technical assistance. One of the most useful contributions of private organizations has been the provision of fellowships for study abroad, enabling thousands of Third World nationals to learn the skills necessary for managing modern economies and technologies. The endowed foundations have been particularly active in this arena, not only in funding students but also in sponsoring joint research efforts, conferences, and other forums where Third World people can come together with each other and with their peers from the West. Of course, not all aspects of this coming together are positive for development; training in the West has come under fire for tending to alienate the trainees from the realities of their own

national situations when they return, or their failure to return home after training. Many people have also criticized the Western exportation of the "jet-set scholar" phenomenon. In an interdependent world, however, sharing must be presumed better than not sharing, the vital point being the need to ensure equitable sharing of opportunities for knowledge both within societies and across national boundaries.

Partly because of the brain-drain problem--the non-return of trainees from abroad--but also because much of the overseas training has proven less than relevant to location-specific Third World needs, private assistance efforts are increasingly focusing on training conducted within the individual country itself or in analogous Third World settings. The Ford Foundation, for example, has moved very substantially in the direction of funding Asians to study in Asia, Latin Americans in Latin America, and so on. This permits grappling with local problems in "field" situations and with peers who have had experience in solving them. In a period of tighter funding for such programs, it also means that each dollar spent will go farther, given the lower transportation and living costs involved. The transition is not an easy one; Sri Lankans accustomed to the glamor of a British university experience find that studying in neighboring Indian institutions provides a less prestigious credential upon their return home. Some, of course, see the logic, especially as certain Third World institutions have gained sufficiently in competence and prestige to serve as regional resources. An extension of this trend is for short-term training to be conducted by Western technical specialists in the particular Third World country itself. While numerous trade-offs are involved in deciding whether to provide training by exporting students or by importing experts, increasingly the preference is for local training, which can have a broader impact by exposing more people to foreign specialists while at the same time ensuring relevance to a specific Third World country's conditions.

"Technical assistance" is a term that has been used almost interchangeably with "development assistance" for voluntary agency efforts (and also for organizations like the Peace Corps). It describes much of the rationale behind several volunteer-sending organization: International Voluntary Services and the Mennonite Central Committee, with their technical agriculture and public health specialists; some of the cooperative organizations, with their specialists in credit and co-op management; some of the member organizations of PACT, with their small enterprise backgrounds; and most pertinently for VITA, which serves as a source of information on increasingly popular village technologies for Third World development organizations. The purpose of technical assistance is to transfer improved techniques of agriculture, public health, education, nutrition, and management to people in the Third World. In recent years, increasing attention has been given to structuring these transfers to increase the certainty that those trained,

or exposed to the techniques as recipient-country "counterparts" will fill critical roles in their countries' development efforts, thus multiplying the initial contribution of the foreign volunteer. This has happened to an impressive extent in many places; yet technical skills are not being transferred in a vacuum, and political, administrative, and larger economic imperatives still play the largest roles in affecting the fates of individual technical assistance efforts.

Consciousness raising. In some kinds of situation, foreign voluntary organizations are confronted with a choice between providing palliatives within an "unjust" system or trying to change that system. The concept of consciousness raising finds its most articulate expression in the writings of the Brazilian educator, Paulo Freire. Freire's experience with people in northeast Brazil led him to the observation that people are exploited or otherwise fail to realize their full human potential because they are not aware of their situations, of the factors that cause them to be as they are, and of their potential options for self-improvement and self-actualization. Thus he advocates an educational method that would enable people to change such structures through a "critical consciousness raising" process that leads to "appropriate actions." Traditional forms of learning are of no use unless people can apply what is being taught to their daily lives and to ways of improving them. Traditional extension programs and other developmental activities may be similarly useless, even if they are focused on helping the poor, if the poor do not know how to internalize their meaning in order to take optimum advantage of them. Because Freire insisted on a methodology that would not explicitly incite rebellion--after all, this would be tantamount to using poor people as fodder for someone else's revolution--his notion of consciousness raising calls for a subtle self-questioning process by which alternative courses of society and action can be explored. It is essential to his methodology that the search for solutions be initiated from within the group so that the group determines its own actions with all the dignity that such internalized responsibility implies. Indeed, it is this element that distinguishes the consciousness raising approach from the more traditional forms of community development in which many voluntary organizations have been involved over the years.

The consciousness-raising approach is coming to the fore in some development strategies discussions, and practical applications are being attempted in Tanzania, Guinea-Bissau, Thailand, Bangladesh, and India, as well as in Latin America and no doubt in other places. Many consciousness-raising efforts in Latin America--indeed, most of the nonunion, nonparty development activities--have been initiated by the Catholic church. While the theoretical virtues of the approach seem clear, its relatively recent application as well as the difficulties inherent in its implementation have meant a paucity of current evi-

dence as to its effectiveness in actually enhancing the possibilities for improving people's lives.

Cultural awareness, as an intrinsic part of consciousness raising in the sense that an image of one's individual and community identity is a necessary prelude to sound development, is an area in which some PVO activities are in evidence. The JDR III Fund, the Asia Foundation, the Ford Foundation, and Obor have recognized the importance of local cultural expression as a concomitant of development, each pursuing articulated needs in its own individual way. John D. Rockefeller's JDR III Fund was a pioneer in offering support for the preservation and development of Asian arts. The Asia Foundation, which funds a variety of training activities, has been especially innovative in its support for training Buddhist monks in Thailand to become involved in local development activities in ways culturally relevant to the strongly Buddhist traditions of that country and its people. The Ford Foundation's overseas cultural involvement has been recent; although its support of archeological and arts activities constitutes only a small share of its overall budget, that support is significant in symbolizing the recognition that there is more to development than economic indicators alone. Obor, a small organization run on a shoestring budget, is dedicated to the publishing of books in the Indonesian language in order to encourage indigenous discussion of development topics that were earlier the exclusive province of the foreign-language-speaking elite.

Measuring Success and Failure

Were development an end product rather than a process, it might be relatively easy to evaluate programs aimed at its achievement. One could decide on certain attributes--cash income, literacy, caloric intake, mortality rate, days lost to work through illness, or whatever--and conclude whether one's "development" efforts had succeeded in measurable statistical terms. The measuring could be done on national, provincial, district, community, and even individual family levels. There would always be a problem of separating the foreign aid influence on any given situation, but one could presumably cope with this problem through analysis and common sense.

Development, however, is not so much an end product as it is an historical process. Grappling with far more than the amelioration of poverty, it involves the very essence of the whole person with his self-reliance, sense of dignity, and culturally defined spiritual attributes. It is nearly impossible to evaluate success on these exalted planes other than through highly subjective, sensitive interactions with the local group that is being aided. However, it is useful to survey how various types of private and voluntary organizations have grappled with the effectiveness question--a question of concern

not only to individuals involved in the development process but also, increasingly, to the funding agencies that choose whether or not to support the voluntary organizations.

Until the past few years, everyone talked about evaluation, but few did anything about it. It was widely felt that the private humanitarian agencies, many of church origin, were effective simply because they were "doing good;" missionaries were acting as witnesses to God's works on earth, and they interacted with the poor; these were good ends in themselves. Their relief and rehabilitation programs distributed goods from the rich to the poor; this could hardly be anything but laudable. Their motivations, too, seemed pure. What more was there, then, to evaluate? As times and standards changed, doubts increased--doubts fostered by widening gaps between rich and poor; by disillusionment within the United States that aid to the Third World was not having the same effect as it had had in Europe; by a growing recognition of the existence of poverty and injustice at home in the U.S., as illustrated by the civil rights movement; by the decline in overt cold war competition; and by all the basic reassessments of American values, identities, and interests that these developments helped spawn. Simultaneously, increasing concern was being expressed within the Third World countries--concern that having shed their colonial chains, they still found themselves affected by new manifestations of Western paternalism, including those inherent in the classical aid relationships. This considerable flux in the self-perceptions of both sides is leading to new ways of assessing successes and failures, and to new modes of joint action in the future.

All this is not to say that a number of organizations had not, in their own ways, already been giving attention to assessing grant and activity performance. Yet it is fair to state that for the majority of organizations, especially those receiving U.S. government funds, it was the 1973 Foreign Assistance Act that spurred what has now become a real trend toward more regular evaluation. The 1973 foreign aid bill provided a clear mandate to the U.S. Agency for International Development to channel more of its funds through private and voluntary organizations. The congressional debate made it clear that support for official aid, having already significantly declined, would decline further, or even disappear, unless it could be shown that poor people rather than rich elites and military causes were benefiting from it. By 1974, therefore, AID was propagating the virtues of the logical framework matrix (the "logframe") as a methodology for impelling proper planning and evaluation of foreign assistance projects. (See Development Digest, July 1979, pp. 71 and 80; see also p. 105 for a proposed method of evaluating PVO projects.)

At the time it was introduced, the logframe appeared to represent everything the majority of voluntary agencies did not; scientific

exactitude in a world of amorphous human imponderables, and the triumph of statistics and computers over what were seen as fuzzyheaded do-gooder mentalities. Many voluntary organization staff members, resentful of any dependence on U.S. government financing, were further offended by the U.S. government's making that financing dependent on their adoption of the logframe methodology. Many felt that this overly quantitative approach failed to recognize the human elements in their programming. On the other hand, some appreciated the logframe as a device to focus their thinking about projects in a more orderly way; for these groups the device proved useful. Whatever their reaction to it, the logframe did challenge the voluntary agencies to think of their programs in a different light than before.

In 1975, a group of leading voluntary organization executives convened under the auspices of the Overseas Development Council to define the most critical issues they foresaw for their programs over the coming years and decades. One of the critical issues they agreed on was the need for some framework within which they would be willing to be judged by themselves and by others, and they thus attempted to evolve a set of relevant program criteria. The criteria they agreed on, while expressed in generalized terms, address the issues of dignity and self-reliance, and could have extremely far-reaching and constructive program implications if really implemented. For example, recognizing the problem of lack of continuity in their efforts, the participants noted that a local group must be able to sustain and improve on any PVO development activity after an outside agency's help is withdrawn. Hearing their efforts criticized for having the effect of fostering the status quo, in which the rich dominate the poor, they stated that their programs should result in increasing--or at the very least not diminishing--the power of a poverty group within its own local or national system. Furthermore, "the local group must be as aware as the PVO of the political, cultural, and economic implications" and risks of embarking on any given program. In response to the frequent complaints of paternalism, the participants agreed that "the power of the local group vis-a-vis the PVO should grow during the course of the program," and that "the PVO should make itself actively accountable to the local group, sharing power over the program with that group." Indeed, they agreed, it must be the local group that defines its own needs in the first place, and that then has the major responsibility to decide with the PVO the terms and conditions of the program. To minimize the dangers of overly ethnocentric Western approaches, "the PVO should work in a manner that respects the primacy of local cultural values, while at the same time not violating its own cultural standards... The PVO must openly state to the local group its own motivation, goals, and evaluation criteria for the program...[and] evaluations should be made, or at the least shared, with local groups."

This emphasis on the critical primacy of the local group over the foreign voluntary organization raises the related question--answered by the voluntary agency executives only in general terms--of who evaluates the programs. To date, the issue has been primarily one of agency insiders versus outsiders. Africare, for example, in order to ensure objectivity of results, insists that only outsiders should assess its programs. Other organizations insist that only insiders conduct evaluations. They fear that outsiders may be biased by their own preconceived notions or by unfamiliarity with all the elements that went into the program's history; or they feel that if evaluation is to be useful for future programming decisions, it should be an internal process to ensure that the lessons are learned and internalized by those with a proprietary interest in the process for the future. Still other organizations set up assessment teams comprised of both insiders and outsiders.

PVOs and the role of evaluation: two cases. One of the most exemplary evaluations of a voluntary organization program--remarkable both for its thorough methodology and its revealing conclusions--is that of the American Friends Service Committee's Barpali multipurpose village development project in the State of Orissa in India. The AFSC had sponsored this project from 1952 to 1962; in 1971 one of the American participants returned to the scene to study what results were evident nearly ten years later. No other organization is known to have taken this detailed a retrospective look at its earlier village efforts. Through interviews with several local project staff members, as well as with local government and other officials, it became clear that lasting changes in agriculture and health had come to Barpali through the AFSC involvement. But the feature of the program that seemed to be best remembered was the AFSC confidence in the local people's ability to help themselves. "They did not give gratis or charity. Instead of doling out, BVS (Barpali Village Service) extended a helping hand... The most important feature of BVS was a sincerity of purpose which was lacking in Government programs whose only purpose was to spend money allocated for a project... Mixing with the people was the most important feature of BVS... The project helped people to become self-sufficient." Significantly, the main criticism seemed to be that the AFSC project should have continued longer; ten years was long enough to teach about the need for new agricultural and sanitary practices, for example, but not long enough to bring about all the changes required. The self-help approach was foreign to local customs, which had been shaped by caste hierarchies and colonial structures. Since the new approach was not subsequently emphasized by government development programs, villagers gradually reverted to their old roles after the AFSC departure. This negative turn of events was countered only to the extent that former project associates who later went to work for the local government were considered more effective workers because of their earlier experience.

It may be helpful to look at a second case--that of World Education--to illustrate the benefits of evaluation and particularly of examining development programs in their larger environmental contexts over time. World Education, like many of the more creative U.S. voluntary organizations, grew out of the vision of an extraordinary person--in this case an American dowager, Mrs. Welthy Fisher, who decided at an advanced age to take up the cause of increasing literacy in India. Throwing herself whole-heartedly into the cause, Dr. Fisher raised enough money to create in Lucknow an institution called Literacy House. Literacy House grew and thrived and soon became India's principal center for developing innovative educational curricula and instructional materials for teaching functional literacy outside the constraints of the traditional classrooms of the formal school system. While the formal system was placing emphasis on literacy for literacy's sake, the new voluntary institution saw literacy primarily as a tool for people to improve their everyday lives through access to written materials on better hygiene, nutrition, agriculture, animal husbandry, and family planning. While the formal system relied primarily on rote teaching, Literacy House developed methods of teaching through the use of puppets; this attracted village audiences and held them spellbound, thus increasing the likelihood of the multiple educational messages sinking in. The curricular and instructional materials developed by Literacy House, with assistance from Dr. Fisher's U.S.-based World Education organization, were soon being used for ad hoc nonformal education efforts in many parts of India, and were translated into languages besides the Hindi of the Gangetic plain. To be sure, there has been no institutional way to propagate the instructional methodologies pioneered by Literacy House other than through these local adoptions on the part of interested but scattered groups; the overall education systems of India's states are far too entrenched and tradition-bound for reforms to be instituted more broadly. Yet this is not to say the attempt should not have been made; in the long run, ad hoc successes can add up to a significant whole.

More problematic--at least for a time--was the question of continuity. Dr. Fisher, for all her extraordinary energy and vision, had incorporated into the Literacy House effort one tragic flaw: an overreliance on her own charismatic leadership and personal ability to draw and provide sufficient funding to keep the effort going. When she retired from the scene in her mid-nineties, and when AID funding faded away with the deterioration of diplomatic relations between the United States and India in the early 1970s, there was no one to pick up the bulk of the Literacy House bill. The talented local staff was plunged into a mood of gloom, and several lost their jobs. Subsequently, the national and state governments picked up enough of the bill so that work could continue. But whether the lost momentum and resulting bureaucratization can still be reversed is one of those questions that crops up repeatedly in the annals of short-term histories of development efforts.

The nature of development is such that what is predictable is unpredictability. Thus one can never be sure if lessons learned in one program will prove relevant to another program in another setting. Development, in this sense, is unique and particularistic. Private and voluntary organizations that wish to be truly innovative and effective over the long run should not be overly concerned with temporary setbacks, or even with more permanent setbacks and failures. Indeed, it is often--and correctly--argued that risk-free programs cannot be expected to lead to the kind of fundamental social and economic change that is needed, particularly given the structural problems of poverty. If anything, more calculated risks need to be taken than in the past, as long as their implications are well understood in advance by both the outside agencies and the concerned local people. Voluntary organizations--because they are relatively small, flexible, and low visibility entities--are especially well suited to taking such risks for progress.

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U.S. Private Voluntary Organizations In Development: An Assessment

Elliot Schwartz

[This article defines the comparative advantages of PVOs in development assistance, i.e., their strengths and weaknesses compared to other types of organizations. They are seen as strongest in reaching poorer people with services, in fostering innovation and self-help, in low cost of administration, and other respects.]

In general, private voluntary organizations (PVOs) can be defined as organizations that are private, nonprofit, and tax-exempt. The word voluntary refers more to the nature of the contributions individuals may make to these organizations than to their volunteer-sending programs, since few actually engage volunteers. For the purposes of this study, cooperative organizations are included within the definition while universities, colleges, and various research or scientific institutions are excluded. Of the thousands of U.S. nonprofit agencies, there are an estimated 400 to 500 that are involved in some form of assistance to less developed countries (LDCs). In addition, there are countless indigenous voluntary associations located in the developing countries themselves.

PVOs which are active overseas engage in works of relief, refugee aid, and disaster assistance, as well as community and economic development. PVOs are active in all sectors of economic life: communications, construction, education, food and agricultural development, commerce, health and population planning. The difficulty one encounters in attempting to generalize about PVOs is that they are an extremely diverse group. Yet, within this diversity, there is a community of perhaps 30 core organizations which perform the bulk of the relevant PVO activity. Increasingly, pressures

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from within the LDCs themselves, but also AID's encouragement, are pushing this community toward a more common set of operational objectives definable as development assistance--including both social services and directly productive activities. The last five years, in particular, have seen major reorientations of many PVO programs. Even the relief activities which many PVOs still engage in are being reexamined for their potential developmental impact; programs that were initiated on a relief basis often become entry vehicles for other programs which have more of a developmental impact. Thus, the PVO community has been moving toward a greater involvement in development assistance activities which run the gamut from simple nutritional education to complex integrated rural development projects.

An Evaluation of PVO Effectiveness

The primary issue of concern to this study is to evaluate the effectiveness of the PVOs in carrying out development assistance activities. Consensus today would rate the PVOs as excellent practitioners of the basic human needs development strategy at the grass roots level. In fact, they have been the leaders and innovators of this approach, and it is here that they have a comparative advantage. There is wide respect within the development community for the work that PVOs are doing. In addition, their work is expanding in areas which development specialists deem most useful, and contracting in those thought less important (i.e., more rural development, less relief).

Seven criteria may be used in assessing the effectiveness of PVOs in meeting development assistance goals:

1. fostering self-help initiative among the poorest of the poor;
2. mobilizing U.S. private financial and human resources;
3. stimulating innovative projects which can be replicated elsewhere;
4. strengthening people-to-people contact;
5. encouraging the establishment of indigenous participatory institutions, particularly in the private sector;
6. creating the conditions for self-sustaining development efforts, which will not require outside assistance; and
7. increasing the capacity of LDC's to absorb outside capital by raising the level of local skills and resources.

Additional criteria which have been suggested are the demand for PVO services by LDCs, and relative cost-effectiveness of their services.

1. Fostering Self-help. Unlike their more well-known relief activities, the PVOs engaged in development assistance activities concentrate on encouraging private initiative. They rarely go where they are not invited, and generally undertake the role of assisting with

local self-help efforts. Many projects come about as an expression of need and a desire for help by groups which have been overlooked by government programs, although the PVO may often work directly with the host government in providing services. The Catholic Relief Services in Tanzania indicated that it is often asked to provide support--mostly monetary--to local groups who come to them as a provider of development assistance. Like most other foreign assistance donors, PVOs find that it is often easier to work with groups or individuals who are somewhat better off than the poorest. Nevertheless, because of the PVOs' largely charitable purposes and their greater emphasis on cultural awareness, they are typically more effective at working with the poorest groups than are other donors.

2. Mobilizing Resources. PVOs are capable of mobilizing substantial financial resources. It can also be said that their mobilization of human resources is substantial as well (one PVO consortium estimated that it, alone, had over 30,000 practitioners in the field). What is important, however, is that PVOs have been very successful in recruiting experienced and highly motivated technicians, educators, and administrators, despite generally modest salary levels.

3. Stimulating Innovative Projects. The PVOs have a reputation for being innovative with projects, particularly in terms of their approach toward insuring local participation and acceptance, and this is certainly true of many of them. Because of their grass roots contacts, they also appear to have a greater ability than official organizations to identify needs and assure the feasibility of meeting them. However, many PVO projects are not really any different from other projects, except perhaps for their scale or purpose--PVOs do not build hydroelectric dams. A PVO may, however, be a contractor for an AID bilateral project.

Although it is difficult to generalize, at least some PVOs are able to be more innovative in their approach because they are freer from government regulations than regular bilateral projects. For example, the "Operation Bootstrap" project for vocationalization of education in Tanzania began as an experiment to determine whether teaching basic artisan skills was feasible. Once it was proven, the government became interested in extending this activity. A somewhat different program of vocational training, initiated by Opportunities Industrialization Center International (OICI) in Ghana and Nigeria attracted the attention of other African countries, which subsequently sought to duplicate OICI projects.

The extent of replication of PVO-originated projects is difficult to evaluate, since few statistics are kept. There is, however, ample anecdotal evidence of emulation by donors designing official bilateral programs, and by national governments attempting to extend proven local work to a national level. Several examples arose in Tanzania

which indicated both host government and AID willingness to copy PVO successes. There is no question that PVOs are freer to experiment than bilateral donors are, and that the ability of PVOs to demonstrate the feasibility of a particular approach often paves the way for larger scale efforts. However, it is not always clear to what extent these replication efforts are making a full or successful transition from the pilot project stage. In the Tanzanian case, for example, the PVOs were skeptical of both the national government's and AID's ability to emulate their programs, due to difficulties in attracting similarly dedicated personnel on a large scale.

4. Strengthening People-to-People Contact. Certainly the PL-480 food distribution programs, and very often other PVO programs, present an image of Americans working with and helping peoples of other countries. In some projects, however, the PVO works with a local counterpart organization, and the project might appear to be that of the counterpart. Alternatively, the PVO may cofinance with a third country PVO which might overshadow the American role. In the majority of cases, however, U.S. visibility to the project participants is apparent, and the public image is one of private Americans rather than the U.S. government (although U.S. government contributions to the PVOs are clearly identified to the host national government). It is thought that this contributes to international friendship.

5. Indigenous Institutions. Perhaps the most significant contribution to the development process by the PVOs is the encouragement of indigenous participatory institutions, mostly in the form of ongoing community structures. This is especially true at the early stages of a country's development. In particular, PVO activity has often been instrumental in assisting with the establishment of an institutional infrastructure through which individuals could be brought together and participation in development encouraged. In more advanced LDCs where this process has already taken place, the PVOs provide one of the few mechanisms for supporting private sector development since almost all other forms of aid are of a government-to-government nature.

6. Supporting Self-sustaining Development. It is difficult to evaluate the degree to which PVOs have succeeded in creating the conditions for self-sustaining development, particularly because the number of variables involved is generally too large to allow attribution of success or failure to any one source. On the positive side, it can be said that, through training techniques, the PVOs are often successful at transferring responsibility for further training or program implementation to indigenous participants. There are cases, particularly in Latin America, where PVOs have been able to phase out their participation in programs which they initiated and to have these programs continue under local auspices. On the negative side, many PVO programs do not involve income-generating activities, which diminishes the prospect of a project sustaining itself without external assistance. In a number of

cases, particularly where host government priorities and/or political pressure dictate, funding may be taken over by host government sources. However, LDC governments are besieged by funding requests, and although they may promise initially to sustain funding they are often unable or unwilling to do so when the time arrives.

7. Increasing LDC Absorptive Capacity. Because of the number of variables involved, it is very difficult to measure the ability of PVOs to increase the capacity of LDCs to absorb capital. For very poor countries, almost any increase in local skill, health and industrial levels should increase the country's absorptive capacity. The PVOs are heavily involved in activities aimed at improving education, health and production, and therefore, at least according to theory, ought to be raising absorptive capacity at the same time. The basic question, which is beyond the scope of this study, is whether the absorptive capacity is increased more by large-scale capital infrastructure projects, or through the kinds of basic human needs activities in which PVO are typically found.

8. Measuring Demand for PVO Services. This criterion was suggested by several sources, including the PVOs themselves. By this measure the PVOs must be judged highly effective at what they do. PVOs have, for a variety of reasons, become increasingly accepted vehicles for accomplishing development program goals: PVO executives generally have more project proposals pending than there are funds to finance them. The World Bank is beginning to finance and to look toward cooperation with the PVOs in order to enhance the impact of their programs at village levels. Host governments are increasingly inviting PVOs to take part directly in government programs. For example, in the southern Sudan, the Sudanese government and the World Bank are jointly financing a project under which International Voluntary Services works with village level extension workers. In Tanzania, Operation Bootstrap is being invited by the Ministry of Education to develop a nationwide curriculum in vocational education.

9. Cost of Services. A final characteristic of most PVOs is that they have been able to perform with generally low overhead costs. While there are differences among agencies, the annual averages for a representative sample of PVOs have remained only about 4 percent. To some extent this may reflect a traditional style of operation which might be improved with more expenditure on management services. But generally it seems that they can make a dollar go further than others, partly due to lower salaries and decentralized programs, and partly because their donors demand that their contributions be delivered to recipients with minimum diversion to administrative costs.

[Extracted from Private and Voluntary Organizations in Foreign Aid, an internal U.S. Government report, November 1978.]

Catholic Relief Services Nutritional Education Project in Morocco: An AID Evaluation

By Judith W. Gilmore, Carol C. Adelman, Anthony J. Meyer and Melvyn C. Thorne

[The following is taken from an official project evaluation by the U.S. Agency for International Development (AID) of a nutritional feeding and education program carried out by the Catholic Relief Services, one of the major U.S. private voluntary organizations working overseas. It is included here to illustrate one of the activities in which such organizations seem to do well.]

The first food shipments from the U.S. Government under Public Law 480 arrived in Morocco in 1957. In 1972 priority was placed on feeding poor mothers and their young children. Later, it was decided that PL 480 Title II commodities should be combined with nutrition education to maximize the nutritional impact of food aid. In 1975, Catholic Relief Services (CRS) and Entraide Nationale, the Moroccan counterpart institution, designed an AID project which would integrate their ongoing food distribution efforts with a new nutrition and health education program. By 1978, when the Ministry of Social Affairs took over the program, it had been replicated on a nationwide scale.

The authors visited Morocco in February 1980 as an AID impact evaluation team. We had two major questions to answer: was the food-plus-nutrition education program dating from 1975 still functioning two years after the termination of AID funding, and if so at what level of quality? Did the program have any impact on children's nutritional status and on mothers' practices and knowledge? We collected nutritional status and behavioral data, conducted lengthy interviews with program personnel and mothers, and visited 15 of the

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program's "social education centers." We concluded that nutrition education in conjunction with food assistance has had a measurable and positive impact on the 450,000 mothers and children participating in the program.

Nutrition and Health Setting

Morocco, with a higher per capita GNP than most developing countries, qualifies as a "middle-income" country. Yet its health and nutrition status falls short, with infant mortality up to 170 per thousand in rural areas, and severe (third degree) malnutrition in some five percent of preschool children (i.e., they weigh under 60 percent of what an average American child weighs at their ages). These data are on a par with the most malnourished countries of Latin America and exceed the median for Asian and African countries. According to a 1971 survey, some 40 percent of Moroccan children under five years old are moderately malnourished. While the poorest children weigh the same as U.S. children at birth, by three or four months detectable differences develop. The differences widen so that between 10 and 22 months of age a Moroccan child stands the gravest risk of dying from malnutrition and disease, the one compounding the other. The government and outside donors had tried to attack these conditions through the existing health system, but were able to reach, according to the most optimistic estimate, only 5 to 10 percent of the poor population. As some signs of poverty worsened, awareness quickened, and the main participants--the Moroccans themselves, the U.S. Government, and private relief groups--realized that much more needed to be done. It was in this setting that the AID/CRS nutrition education project began in 1975.

The Project

On twenty days in each month, eleven months each year, a different group of 25 mothers arrive at the social education center--for a total of 500 mothers a month. They have their certification of "indigence" and many have malnourished children. They usually come from one to ten kilometers, and as far away as 45 kilometers in the north, on donkey or foot, often with a cluster of their neighbors. They attend the 20 to 50-minute class, register the weight of their child, pay their 2 Dirham (about $.54) fee and receive their monthly ration of food.

These activities began in April 1975 when AID approved a grant of $282,000 for Catholic Relief Services, a private and voluntary agency headquartered in New York, to introduce nutrition education courses in its 250 food distribution centers. Later, funds were increased to $453,000 and the project extended until November 30, 1978. Food commodities were provided under PL 480 Title II, equalling $8,431,020 worth in 1980, approximately 45 kilograms annually for each enrolled

child under five years of age, with three rations per family. Only families certified to be below the official poverty level were eligible to receive the monthly food donations.

To launch the new education component, a nutrition institute at Marrakech was established. This institute was designed to train a cadre of competent, motivated Moroccan women at the provincial and local levels. Some 500 women from villages with social education centers were recruited and trained as teachers or "monitrices." Many of these women had previously been with the program, distributing food to mothers and weighing children at the centers, but they had worked as administrators and not as educators; they lacked training. To back them up, and to provide a means of communicating with the monitrices in their small and often isolated centers, 30 mid-level supervisors were also trained. These were women with more education, chosen through a much publicized national contest, and sent to the Tunisian National Institute for an intensive three-month training course in basic nutrition and health. Four Moroccans were selected at the same time for a three-year degree program in Tunisia; they were to assume the teaching responsibilities at Marrakech, replacing expatriates.

Right from the start, CRS and Entraide Nationale placed greatest emphasis upon making the program relevant to poor mothers' problems. They designed teaching instructions comprehensible to rural people, and used foodstuffs and materials commonly found in the villages. The curriculum they developed was a practical combination of crucial lessons in nutrition, sanitation, personal hygiene and the treatment of childhood diseases. Thus, the Marrakech Institute, the program-wide training, and the mothers' curriculum provided the foundation for the program.

Nutritional Impact

Had the system of 300 social education centers made a difference in the nutritional status of Moroccan children? Our team analyzed an existing survey and conducted our own studies. We concluded that children in the program were less malnourished than others, and impressively so, because of the program. Even those children who were better off on entering the program maintained or improved their nutritional status. And we were convinced that the education component itself and not just the food commodities contributed vigorously to the success of the program.

The difference between program children and those just entering the program is dramatic; the program resulted in a 69 percent reduction in moderate and severe malnutrition, a difference equal to or higher than that found in most feeding programs throughout the world. The relatively large ration size in Morocco could explain some of these effects. It is greater than in most countries--45 kilograms per recip-

ient per year--and the number of rations per family is also higher. Each mother receives three rations, one for herself, one for her child enrolled in the program, and one for a younger sibling not in the program. Thus each child is provided with approximately 40 percent of its caloric, 70 percent of its protein, and 73 percent of its iron needs; along with other foods from the family, this is more than enough to promote normal growth. But the food is usually shared among other family members, thereby reducing its impact on individual targeted children. More than half the mothers we spoke with admitted that older children or relatives consumed some of the rations. However, the size of the ration may have been enough to overcome negative effects of family sharing, making possible the powerful nutritional impact reported above.

We then examined the independent role of nutrition education in bringing about this impact. To our knowledge the impact of nutrition education on overall nutritional status has not been documented in any other study. Some nutritionists dismiss education programs; they contend that even poor mothers know what and how to feed their children and lack only the food and income, not the know-how. Other nutritionists disagree. They claim that certain feeding practices should be changed, even within the constraints of a poverty environment. This argument has proceeded without much scientific foundation on either side.

In Morocco, CRS conducted a study comparing children who received food alone with those receiving both food and nutrition education. This was possible since CRS ran a feeding program from 1972 through 1975 without an education component, which was not introduced until 1975. The study contrasted the weights of 728 program children in 1978 with those of brothers and sisters of the same age who had been in the program in 1975. The 1978 program children had experienced the complete food plus nutrition education program, while their brothers and sisters in 1975 only had food. In essence, the study looked at the 1975 "Fed" children and the 1978 "Fed and Ed" ones, and found a staggering difference. In 1975, 34 percent of the "Fed" children were moderately or severely malnourished. In 1978, only 16 percent of the "Fed and Ed" children were in this category; severe malnutrition was virtually eliminated. At the same time the program maintained the nutritional status of those who were relatively better off to begin with.

We wanted to test the Catholic Relief Services' conclusions with our own more controlled data, because the children weighed in 1978 could have received food for a longer period than the comparison group measured in 1975. We compared 1978 children benefiting from food plus education ("Fed and Ed") with comparable 1975 "Fed" children--both groups having received food for approximately the same length of time. The results argue persuasively that an impressive nutritional impact

was achieved with the addition of the education program. Thirty-three percent of children who received only food were moderately or severely malnourished, compared to 11 percent of those benefiting from both food and education. Such conclusions are supported by the small study we conducted of mothers' nutrition knowledge and practices, described below.

We are convinced that the CRS program has had a major impact on the nutritional status of the children in the social education centers. But has it affected the nutritional levels of a significant number of preschool children in Morocco as a whole? Our data indicate that about 32 percent of the children entering the centers were malnourished at the outset. More than one quarter (28 percent) were moderately and 4 percent severely malnourished. The centers as a whole reach only six percent of all malnourished children under five. Clearly, the program could do a better job if nutritional status were given more emphasis as a selection criterion. Yet it is also true that too rigid a screening procedure would endanger the program's positive preventive role in keeping borderline children from sliding into serious malnutrition. The government of Morocco should try some adjusting of its selection criteria in order to improve program efficiency.

Income Effect

The 25 mothers we interviewed in their homes all came from among the poor of Moroccan society. Only four had any formal schooling, and two others had limited training in hairdressing and embroidery. The majority of husbands were seasonal laborers or unemployed. Those with some technical skills--one was a blacksmith, one a mason and two were in farming--worked part-time or sporadically. Two soldiers (one retired) with fixed salaries were the exceptions. Our Moroccan colleagues, including a sociologist and a nutritionist, confirmed that these families were at poverty level with minimal earning capacity.

Forty percent of Moroccan families are considered poor by UN standards--below $260 per capita income. The social education center program reaches 11 percent of these families, a respectable showing for a single new program. In this context, it is clear that food aid relieves some degree of financial stress on poor families. The local retail value of U.S.-donated food is almost $11 million. This translates into approximately $73 worth of food annually for each Moroccan family participating in the program, an income supplement ranging from 4 to 24 percent of the $50 to $260 per capita incomes of these poorest families.

Changes in Knowledge/Behavior of Mothers

In order to assess the project's impact on mothers' knowledge and behavior, we set up our own informal study. At each of the centers, we randomly selected for interviews mothers who had been in the program for more than one year. Mothers enrolled in the program for less than 3 months, or in a few cases not at all were interviewed as a comparison group. We wanted to see if real differences in nutritional knowledge and practice were evident between the 13 program and 12 comparison mothers. We looked at eight indicators, each important for good health and nutrition:

- During infant feeding, did the mothers supplement their breast milk with additional food at six months or less?
- Did they wean their babies from the breast abruptly or gradually?
- Could they describe the appropriate diet during pregnancy and nursing?
- How did they treat infant diarrhea?
- Could they name the diseases treated by vaccinations?
- Did they know the animal or vegetable substitutes to use when there was no money to buy meat?

The mothers responded as shown below. In all of the areas probed, except for animal protein substitutes (not stressed in the class curriculum), the program mothers demonstrated more knowledge of nutrition and health than the control group of mothers.

	Number of Mothers Responding Correctly	
Indicator	Program Mothers (n = 13)	Comparison Mothers (N = 12)
Supplementation at 6 months or less	13	8
Gradual weaning	13	5
Pregnancy diet	10	0
Nursing diet	10	3
Diarrhea treatment	10	5
Diseases treated by vaccination	2.1*	1.2*
Animal protein sources	8	8
Vegetable protein sources	11	5

*Mean number named per mother

Program mothers in general were aware of the importance of a balanced diet and were preparing meat or fish for their families at least once or twice a week if they could afford it. Comparison mothers, on the other hand, were less systematic about their families' food consumption, stating that they eat "what is around" or "what God provides."

In addition, all the program mothers knew how to read and discuss the program weight charts, demonstrating an understanding of the relationship between food and growth.

Catholic Relief Services' own dietary surveys, carried out in 1975 and again in 1978, had shown that participating mothers altered their weaning practices dramatically as a result of their three years of instruction. In 1975, 91 percent of the 845 mothers questioned weaned abruptly as compared to only 15 percent of the 692 mothers in 1978. The surveys also showed statistically significant increases in the consumption of protein foods, fruits and milk products by their two to five-year olds. Our conclusions, supported by CRS's own survey, indicate that there is a meaningful difference in the level of knowledge between program and comparison mothers, and that the program has been surprisingly effective in changing child feeding practices and more general attitudes towards nutrition.

When we reflected on the likelihood of such change resulting from only a dozen classes a year, it became evident to us that the social education center probably functioned as a source of health information diffusion and of informal reinforcement of nutritionally and hygenically beneficial behavior. Each center seemed to generate an elaborate network of influence which reached mothers who were not participants. In one instance where a comparison mother was well informed, we discovered that she had learned everything she knew from her sister-in-law, a long-standing program participant. We were continually confronted with evidence of this kind of diffusion. Whenever we went for an interview in a mother's home, almost always a friend or two and their children would listen in. The monitrices who conduct home visits claim that neighbors join in on most occasions. Several monitrices were asked if mothers who were not in the program ever sat in on the educational sessions; answers ranged from 15 mothers a week up to seven a day. Every center where we inquired has a waiting list of 10 to 150 mothers. At Zagora, 1000 women from a single mountain village requested the opening of a new center nearer their home. In Ouarzazate province, teaching materials gathered from the center were being considered as a model for a new primary school booklet on nutrition and health.

Evolution in Women's Roles

In some communities in the early 1970s when the feeding program was just beginning, women did not venture out of their homes, even to pick up food from the local centers. Men persisted in bringing their children despite the urging of monitrices to let the mothers come. According to Mohamed Barbach, Director of the Agricultural Center in Beni Boufrah, "The husbands would not let their wives go out. They had the key." By 1974, this pattern was already changing.

We became convinced that part of the power of the centers had to do with the evolving status and role of women in Moroccan society. The impact of the center on the role of women might even be greater than the impact on the practices we have discussed, but more difficult to document. Several women simply told us that before the center they went out of their home only for food, water, and fuel--and to visit with an occasional neighbor. This also seemed to be a truism among the community leaders we interviewed. The centers appeared to be--and were certainly perceived to be--a key factor in providing an opportunity for women to share in the benefits of a broader community life.

The monitrices encourage access to a wide range of social services, such as vaccinations, hospitals, child care facilities, schools and women's associations. The social education center itself is usually part of a larger Ministry of Social Affairs complex, sometimes shared with an activity of the Ministry of Youth and Sports or the Ministry of Agriculture. It is often located near a Ministry of Health dispensary. Mothers feel more comfortable with these medical services after having been to the center, and have reported receiving more prompt treatment because of the center's intervention. More women are now giving birth in hospitals, particularly when a first child is involved or prenatal difficulties are foreseen. Some credit the centers with influencing women to have their children enrolled in child care centers or primary schools. Others noted that mothers from the centers were more receptive to changing their health practices:

> There is a difference between mothers from the center and others (who come to my dispensary). They are more educated; they follow the treatment better; they come to the dispensary sooner than the others. For vaccinations, I have to go out and chase in the others, but the mothers from the center come in on their own.
>
> -Alharrak Najib, M.D., Beni Boufrah

At some centers, up to 35 mothers a week return on a non-class day to discuss their problems with the monitrice. Many of these women are asking for counseling services or more education to fulfill their personal aspirations.

The monitrices and provincial directrices have found the CRS program to be a means of upward mobility. These women from lower class families and limited educational backgrounds would normally stay at home or at most enter low paying or volunteer social work. Most provincial directrices interviewed were recruited directly out of secondary school; about half the monitrices we met had been involved in social service activities while the others stayed at home or had housework-related jobs. After joining the program these women acquired a

new stature in their community. They had steady jobs with fixed salaries.

Institutional Strength and Growth

Despite the ending of AID funds in December 1978, we found a solid, well-organized system which had expanded since the program's transfer to the Ministry of Social Affairs in early 1979. Since then, 50 new centers have been created, 100 new monitrices trained, and a new curriculum developed for a fourth year of training. In addition to the port, warehousing and inland transportation costs of food shipments--which they have always paid--the Government of Morocco has taken over all project administrative expenses since 1979. This includes the costs of continued CRS assistance, the training school at Marrakech, all administrative personnel, and the salaries and travel of the provincial directrices. The Government contributes some $4.7 million annually for the successful operation of this program. In addition, the local center costs including the monitrices' wages are financed by the mothers themselves. The mothers' monthly payment was recently doubled to 2 Dirhams ($.54) in order to improve the salaries of the monitrices.

From on-the-spot observations in 15 centers (11 randomly selected), we noted consistently good operational procedures:

- Delays in food deliveries were the exception not the rule;
- Each center maintained excellent and uniformly kept records;
- Monitrices interacted actively with mothers, creating an excellent teaching and learning atmosphere;
- Infant weighing procedures were being followed and an improved system of referrals to health care facilities had been introduced;
- Monitrices conducted weekly home visits to follow absent or sick mothers;
- Provincial Directrices were visiting each center on a monthly basis as scheduled.

During our tour of the field sites, we observed several classes and were impressed with the dynamism of the monitrices. They followed the lesson plan printed on their plastic class outline guides and seemed to be well trained in the use of demonstration materials and posters. But what transpired was not a rote repetition of an exercise learned at Marrakech; an extraordinary level of interaction between the monitrice and mothers took place with comments, questions, answers, or stories contributed by mothers. For classes at four different centers, we tabulated an average of 3.4 responses per minute, with 79 percent of the mothers making individual comments. This high level of interaction indicated an opportunity for learning far superior to

the more static lecture or rote response styles witnessed by team members in other countries, and in other settings in Morocco.

Cost-effectiveness. The Morocco feeding program cost of $34.47 per person per year is roughly comparable to other feeding/education programs throughout the world, given its contents. Costs of similar programs range from $10 in Kenya to $32 in Colombia. These are below the Moroccan figure mainly because the calculations were made over four years ago when food prices were lower. Also, few if any of these programs had full-scale nutrition education components or features like the Marrakech training school. Considering the nutritional and other impacts of this program, it is extremely cost-effective in comparison with the majority of feeding programs, which have shown little or no nutritional impact.

Dependence on food. The program's reliance on food aid is an inherent problem if one starts to consider its future. This dependence inhibits its present potential for expansion, and could endanger its continuation if there should be any uncertainty in PL 480 food deliveries. It is questionable whether Morocco can import enough food for its own private consumption needs, let alone government food donation programs. Substituting local foods for PL 480 Title II commodities would require a major reorientation of agricultural and economic policies designed to boost domestic production. It is important to begin to consider whether and how donated food can be phased out without diminishing the program's nutritional impact.

Conclusion

The Moroccan example highlights what is possible to achieve--in a reasonably cost-effective manner--when nutrition education is combined with food distribution. It is difficult to say with precision whether food or nutrition education was the determining element. This report contains data which suggest that nutrition education contributes significantly to nutritional improvement. On the other hand, in order for nutrition education to work, it appears that a minimum amount of food may be necessary to counteract the effects of family sharing and, at the same time, provide a fairly substantial income supplement to poor families. What seems clear is that few of these nutritional impacts would have occurred to the degree observed with a feeding program alone.

[Extracted from Morocco: Food and Nutrition Education, and AID Project Impact Evaluation report on Grant No. AID/NESA-G-469, August, 1980.]

Voluntary Agencies and the United Nations

Tristram F. Betts

[Private voluntary organizations have a tradition of independence, but in the Third World development field there have been a number of moves toward coordination and even joint organization. The U.N. has had a role in bringing these organizations into the field and in some joint programs.]

According to the Development Assistance Committee of the Organization for Cooperation and Economic Development (OECD), the grants made by the voluntary agencies of its member countries in 1974 totalled $1,217 million and $1,371 million in 1975. These totals give a measure of the formidable contributions made from voluntary sources. We cannot assume that the greater part of the activity they represent lay in the field of development as such, nor that any specific proportion of this funding was directed as a matter of principle to the twenty-nine Least Developed Countries within the UN definition. However, an examination of the current program of the major European agencies reveals an important involvement in most of the countries in the UN list of the least developed; for example, for Oxfam--21 countries; for the Organization for Rehabilitation through Training (ORT)--12 countries; and for the recently formed Euro Action-ACORD group--5 out of the 7 countries with which it is so far involved. But these are pragmatic actions incidental to a policy of concern and response wherever human need is brought to their attention. In general then, the attitude and policy of most, if not all, of the voluntary agencies lies closer to the World Bank concept of Poverty Target Areas than to the current UN emphasis on the Least Developed Countries.

Mr. Betts, after a career as a Conservator of Forests in Nigeria, worked as rural development adviser for OXFAM, IUEF and the International Council for Voluntary Agencies and as a consultant in this field for several United Nations Agencies.

It is possible today to detect within a number of the major agencies, and even in their representative body, the International Council of Voluntary Agencies (ICVA), certain hesitations, and even skepticism over some aspects of UN development activities, despite the fact that a fair amount of collaborative effort does exist. This situation makes it the more important to recognize that it was two particular types of UN-inspired activity in the 1960s which sparked off the emergence among the main body of voluntary agencies of a developmental, as opposed to a purely welfare, philosophy.

The Freedom from Hunger Campaign. The initiation by the Food and Agricultural Organization of the United Nations (FAO) at the beginning of the 1960s of the Freedom from Hunger Campaign (FFHC) has proved to be one of its most enlightened achievements. The formation of National Freedom from Hunger Committees in the donor countries, and the resulting enhanced availability of information about Third World problems, immediately caught the imagination of the major agencies. To give only one example, it was the FFHC which induced Oxfam to adopt its system of field directorates and redirect an increasing proportion of its funds from short to long term projects. The voluntary agencies, moreover, soon found that the publicity campaigns mounted by the FFHC, allied with their own publicity procedures, paid off in a widening and deepening of their fund-raising capacity. This in turn led to an increasing emphasis given by the private agencies to public education in the donor countries on Third World questions, a process aimed not merely at existing and potential adult contributors but also at the adolescents in schools and universities who could become their future constituents.

In addition, the FFHC created the opportunity for collaboration in the field between FAO and a number of the voluntary agencies involving joint activity at the grass roots level. These projects were modest in concept and frequently failed; but a considerable number survived which have had, and still have, great value as pilot schemes from which the participants and the voluntary agencies acquired valuable experience. One of the problems we face today is how the intimate relationship with the local people and the high motivation of the volunteers engendered in such projects can be preserved when attempts are made to extend them on a wider regional or national scale.

The Refugee Problem. The other area of joint activity between voluntary agencies and the UN system since the mid-1960s provides an obverse image of the one just related. The Office of the United Nations High Commissioner for Refugees (UNHCR), by the statutory limitations imposed upon its functions, was not itself an operational body and cannot be defined as a development agency. In its early years its prime pre-occupation was a definition of the legal status of refugees and the establishment of refugee rights and privileges in the

countries of asylum. Its first involvement was with the displaced persons of Europe and elsewhere resulting from the Second World War, a process far removed from the problems of the Third World. It was not until the middle 1960s that the displacement of rural people arising from colonialist struggles and the problems of post-colonial adjustment in Africa confronted the UNHCR with the problems of major rural settlement.

The initial need was for immediate medical succor, food and short-term shelter for thousands of families streaming destitute across unfrequented borders, sometimes under hot pursuit or in general panic. UNHCR chose as its operating agent the International Red Cross, itself backed by contributions from many voluntary agencies. At first, there were hesitations over providing permanent settlement for these people because of the possibility of an early return to their countries of origin. Later, however, when these hopes were dashed (as in Burundi, Uganda and Tanzania) the necessity for permanent settlement became mandatory, first, to remove the refugees to secure areas, and second, to save them from pauperization and re-establish them on a more permanent basis in areas allocated through generosity of the governments of asylum. Inevitably the land which could be spared for this purpose lay in areas of sparse population, only partially inhabited by the nationals of the country because of hostile natural environment with minimal infrastructure and communications.

Thus UNHCR was drawn into a wide spectrum of activities of which it had little experience including: the establishment of road networks, of village water supplies, and simple medical and educational services; the clearing of land and the drainage of swamps; eradication of the tsetse fly and other pests; and the establishment of agricultural crops. The governments of asylum themselves, overstrained by their own developmental efforts, could make little contribution in these remoter areas. With only limited backing from any of the UN Specialized Agencies, UNHCR had to rely primarily upon voluntary agencies. Thus in Tanzania there evolved a tripartite arrangement whereby the Lutheran World Federation (LWF) became the executing agency in the field in partnership with the Tanzanian government and UNHCE itself. In Burundi the Association Internationale de Developpement Rural (AIDR) played a similar role. Behind these was the strong support of a number of other voluntary agencies, notably the World Council of Churches (WCC), Oxfam and the Scandinavian refugee organizations, which provided technical and planning assistance as well as funding.

The 1967 Conference on African Refugee Problems initiated a widening debate on the problems of rural development and the part which the voluntary agencies should play in it. In that year, Oxfam

in particular introduced a new professionalism in its approach to refugee settlement by inviting (on a fee-paid basis) the professional services of the recently-formed Agricultural Development Service of the World Bank for the planning of an integrated approach to certain problem areas in Tanzania and Uganda. In 1968, the Oxfam field representative was invited by the United Nations Development Program (UNDP) to participate as a consultant in a Preliminary Assistance to Government Mission on rural development to Uganda.

The ICVA Working Group on Rural Development

The International Council of Voluntary Agencies (ICVA) was formed in 1962 to act as the clearing house and contact point for over 100 major agencies. During its 1968 General Conference in London, major attention was devoted to the subject of integrated rural development and the possibilities of joint action by voluntary agencies. Arising from this, the Scandinavian countries mounted a series of seminars to which the Oxfam field representative, now accepted as a specialist in this field, was invited to lead discussion on the same subject. These discussions in London and Scandinavia resulted in 1969 in the formation within the ICVA of a standing Working Group on Rural Development. Under the aegis of one of the member organizations, the International University Exchange Fund (IUEF), a field office in Nairobi was established to assess the possibilities of voluntary agency intervention in Africa.

There remains, however, a strong body of resistance within the ICVA membership against the surrender of individual agency autonomy to the joint action concept. One of the weaknesses--as well as strengths --of the voluntary agencies is their individualistic specialization and their jealously guarded independence. The advantage of this individualism has been that their fund-raising efforts have shown little overlap, and each organization has developed its own constituency. A disadvantage is that attempts to achieve united action and the pooling of resources in face of a commonly recognized need remain extremely difficult. It is fair to say that, even before the ICVA General Conference of 1968, a number of the major agencies had begun to think and act in terms of development activity as such and even, in some cases, to create special sub-sections of their organizations for work in the development field. For example, the Lutheran World Federation established a Community Development Service which, between 1962 and 1976, endorsed some 662 development projects, mainly in the medical, agricultural and educational fields, at a total cost of some $52 million. At a later stage, and covering similar fields of activity, the Catholic churches of North America and Europe created the organization International Cooperation for Socio-Economic Development (CIDSE) with headquarters in Brussels, concentrating mainly in the field of human development at the village or institutional level--allocating in 1973 alone some $51 million to these purposes. On a similar scale a non-

denominational agency, Concern, was formed in 1968 in Ireland with a prime interest in education, rural development, health and agriculture in the Third World. In 1976, Oxfam in the United Kingdom, was devoting some 67% of its $8½ million income in that year to health, social development and agricultural projects. These examples could be multiplied. But this new consciousness of development needs did not necessarily imply a greater willingness to avoid duplication of effort and to achieve a more efficient economic pooling of resources by accepting common action.

The Evolution of ACORD

From the ICVA Working Group meeting of 1972 there emerged one group of agencies, a rump perhaps of the total but a very powerful one, which persisted with the concept of joint action. It comprised the African Medical and Research Foundation International, Nairobi; Church World Service, New York; the Danish Refugee Council, Copenhagen; the International Organization for Rural Development, Brussels; the International University Exchange Fund, Geneva; the Norwegian Refugee Council, Oslo; and Oxfam, Oxford. These agreed to come together in an informal consortium for the funding and prosecution of a particular major project in Sudan, at a cost approaching $1 million, for the establishment of a multi-purpose training center for Southern Sudanese artisans and secretarial staff in Juba. This project and this form of joint action received the warm support of the Sudan government, and despite logistic difficulties has had a resounding success.

The formation of this consortium was probably the most significant outcome of the May 1972 meeting. It later acquired legal status under Swiss law as the International Agency for Cooperation and Development (IACOD). Since the Sudan experience it has gone from strength to strength, attracting to its membership additional organizations such as the Canadian University Service Overseas and the Overseas Development Group of the University of East Anglia in the United Kingdom. In 1974 the decision was taken to redefine more closely its objectives and to change its name accordingly. Under this new title, the Agency for Co-operation and Research in Development (ACORD), it was an organization concerned not merely with fund-raising and the propagation of information about Third World problems, but was itself primarily a field agency. It began by expanding its program in the Sudan beyond vocational and rural development training into such activities as rural water supplies, scholarships and educational support. Later it was drawn into the critical situation in the Sahel where it was commissioned by another group of eight European non-governmental organizations, known as the Euro Action Sahel group, to administer a large long-term development program in Mali, Upper Volta and Niger. This program includes projects involving

the re-organization of cooperatives and development schemes to benefit nomads and small farmers. ACORD has extended its interest to specific development possibilities in the new Portuguese speaking nations and in Tanzania. A natural and significant outcome of these activities has been an agreement between the Euro Action group and ACORD to join forces as a single organization known as Euro Action-ACORD, with headquarters in London, in 1977.

In some cases, Euro Action-ACORD may be asked to mount an operation by itself; in other cases, one or other of its member organizations may be asked to undertake the operational function with the joint backing of the body's membership. This obviously offers some answer to the criticisms voiced regarding the embarrassment caused to recipient governments besieged by a multiplicity of voluntary agencies. The greater the concentration of inter-agency effort, the easier becomes the relationship with the government concerned. Yet this particular difficulty may have been somewhat overstressed, for it is true that generally speaking the relationships between voluntary agencies and recipient governments have been smooth. In more than one recipient country, for example, voluntary agency participation has been approved in such bodies as the local Freedom from Hunger Committees; in others, such as the LWF Community Development Service in Tanzania and the Christian Council of Kenya, they have been incorporated directly within government programs. The lack of information available to recipient governments regarding the capabilities and objectives of the voluntary agencies which approach them remains a problem, however, and it is important that a more coherent catalogue of such information should be made available.

A further advantage of the more comprehensive resources of Euro Action-ACORD is the capability it has acquired for involvement in much longer term commitments than were previously undertaken by voluntary agencies. Until recently it has been a weakness of voluntary agency activity in the development field that most of them have been unable or unwilling to commit themselves to projects of more than one or two years duration, mainly because of uncertainty about their own continuing fund-raising capabilities. For similar reasons, the projects they have adopted have lacked the vital follow-up and the coherence of approach necessary to give their invaluable grass-roots experience the opportunity to grow and widen over significant areas. The plea has been made in the past by such organizations that it has been their function to recognize a spark in a locality, to fan that spark to significant dimensions by means of projects which would be pilot operations ("poles de développement") and to show the way for more competent authorities to follow. But, without an assurance that this follow-up will take place, such spark-off projects can die a natural death; and to light a fire and achieve an involvement--an enthusiastic involvement--within a rural community, and then leave,

can lead too often to disillusionment among the people who made the original effort. Fortunately, the growing confidence of major voluntary agencies in their accelerating fund-raising capability and the increasing recognition and support they are receiving from their home governments has made them less wary about the commitment of funds. Consequently, in a context where fifteen years is a significant period to achieve results, they are moving from commitments of one or two years into five years or more.

Bilateral Government Funding through Private Organizations

The question of the acceptance of financial assistance from their home governments has caused a good deal of debate and hesitation among voluntary agencies in the past. One difficulty has been over the fact that in the past bilateral official aid was often tied, confining the use of such funds to the products of the donor country, a practice which itself is alien to the voluntary principle. Furthermore, there has been a feeling that to accept any major measure of governmental aid ran the risk of a confusion in the minds of voluntary agency supporters between freely made charitable contribution and government taxation, to the detriment of the former.

Despite these hesitations, however, the relationships between the voluntary agency movement in various countries and their governments have shown steady growth and improvement in attitudes. In the United States, for example, two main denominational voluntary agencies, Catholic Relief Services and the Church World Service, have long been recognized as important channels of government food and material surpluses for both emergency and developmental purposes. Scandinavian governments have been content for a number of years to provide a regular budget to specified voluntary agencies without strings attached. In West Germany the major religious voluntary agencies have received significant financial support from a government-levied church tax. In 1971 the International Development Agency of the Canadian Government (CIDA) adopted a most enlightened collaborative policy with the voluntary agencies of that country; and in 1974 the British government through its Ministry of Overseas Development adopted a similar policy on a more modest scale. The emphasis placed by CIDA on the elimination of bureaucratic procedures in its relations with agencies and recipient governments is hopefully and indication of a similar trend in attitude among other donor governments.

UN-Agency Collaboration

Despite the more secure and coherent mobilization of resources by the private agencies and their growing sureness of touch towards, and involvement in, rural development, there persists a mood of skepticism towards the methodology employed within the UN system, a skepticism

which is the main stumbling block to the achievement of common or at least complementary programs. It is the writer's contention that the root cause of this unease lies in the fact that within the UN system it has become almost axiomatic that where development projects are sited in the rural areas FAO is chosen for its technical competence as the operating agency, without reference to the deeply felt immediate social needs of the people directly involved. There is indeed a wide debate within the agencies involved in rural development between two schools of thought. The first of these, epitomised by FAO, argues for what has been described as the "bang bang" or "initial thrust" attack on economic backwardness in rural regions, by selecting areas which offer the highest promise of immediate economic return and in which an intensive concentration of capital inputs and expertise can (hopefully) achieve an observable and significant increase in the GNP. The contrary argument, which commands the support of the major voluntary agencies, is that to concentrate economic development in the more favored areas of the country is to neglect and intensify the poverty and backwardness of the less fortunate areas.

Despite this cleavage of opinion, there does appear to have recently emerged, at least in principle, in the higher echelons of the UN system and among bilateral and non-governmental organizations one general area of common ground. A great deal of lip service is now paid to the importance of involving the people themselves at the grassroots level in rural development, whatever form it may take. Space does not permit reference to the case histories that support the following observations from a special investigation of rural development programs in Africa in 1975-76, commissioned by UNDP, which form a precis of the writer's findings. These are: A.) That however explicit the views expressed at headquarters regarding popular involvement and participation in project planning and execution, there is little evidence that in FAO-managed projects it has penetrated effectively to field level; B.) That the projects most successful in achieving popular participation have been the small scale schemes, usually FFHC and usually with private agency involvement, with modest targets and modest resources, and with minimal expatriate expertise and a significant volunteer element; but that the problems of translating such comparatively modest programs into large scale area activity have so far proved difficult to resolve; C.) That generally speaking (often self-admittedly in hindsight) the major constraint common to most projects has been the failure of project management to win over the active participation of the people; and this is a phenomenon which bodes ill for the perpetuation of project aims and objectives once outside assistance is withdrawn.

Surely the opportunity exists for a much more effective interplay between UNDP and agencies such as Euro Action-ACORD. It is suggested that it would be a wise move to incorporate in the UNDP Resident Representative's Offices in the recipient countries an individual

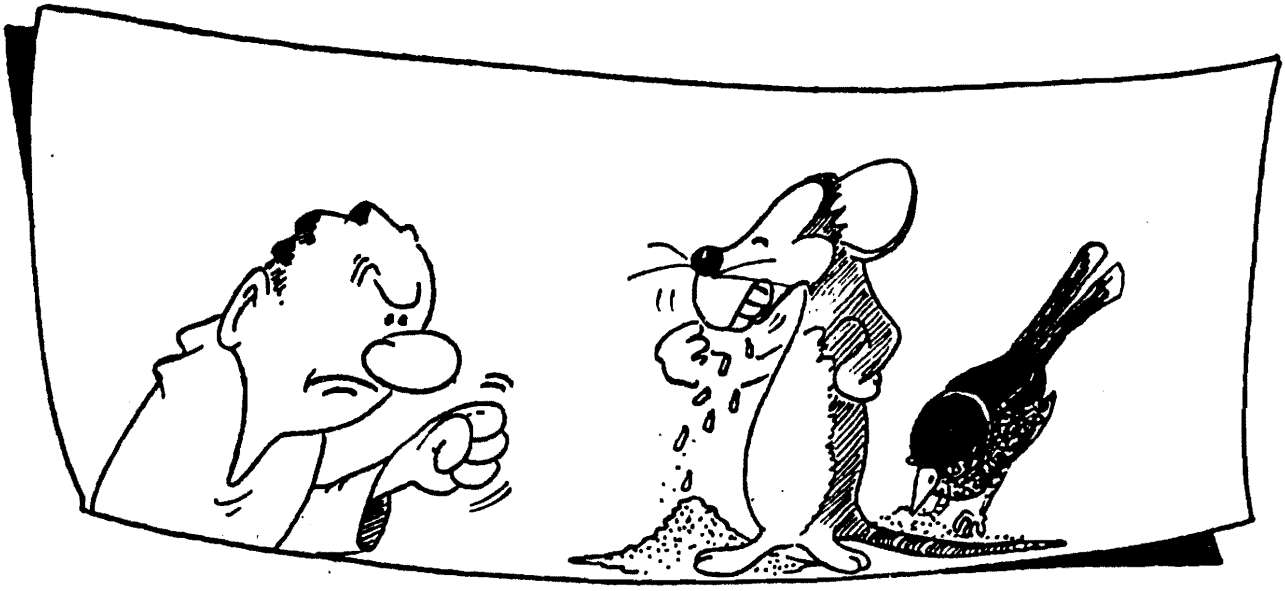
seconded from the voluntary agencies, to keep him informed of the possibilities for voluntary agency participation in development projects, particularly during their preliminary phase. UNDP might employ a sub-contracting system: for example, by bringing in the African Medical and Research Foundation as a sub-contractor to WHO in the health field; and perhaps Euro Action-ACORD in the fields of rural training and village amenities. Such a proposal will undoubtedly arouse strong opposition, especially from those in the voluntary agencies who would mistakenly consider the acceptance of a sub-contracting role, even on a freely negotiated basis, as beneath their dignity and a threat to their identity. It is nonetheless an area of discussion which deserves to be pursued.

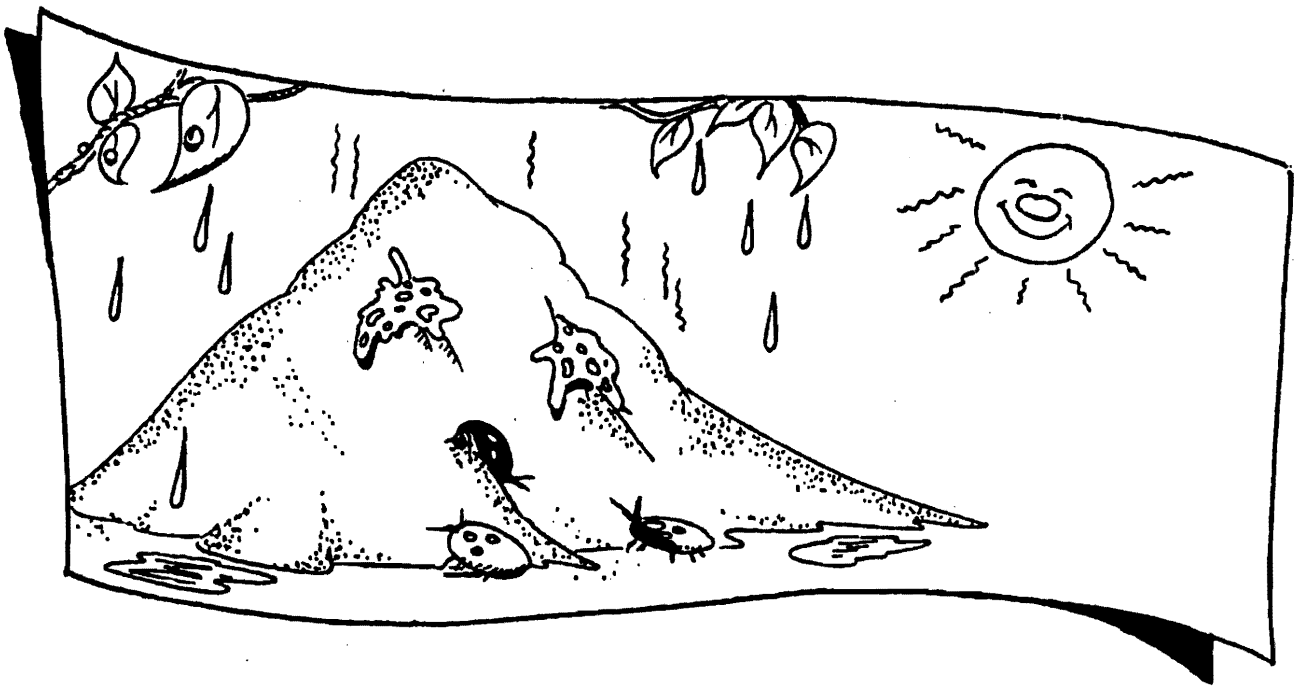
Conclusion

In this paper so far we have traced the development and increasing maturity of the voluntary agency approach, but we have not explored the motivations behind it, an issue which is of curcial importance to the recipient governments. How is it that during a period of world slump and economic difficulty in the Western world, the incomes of their voluntary agencies, drawn mainly from the contributions of millions of ordinary men and women, have not only sustained themselves but have been accelerated? The explanation can only lie in the persistent basic Samaritan spirit which exists in ordinary people in spite of circumstance. Many of us will remember the surge of hope which flooded the Western world with the creation first of the League of Nations, and then of its successor the United Nations. While the UN Development Programme today suffers from increasing financial stringency, the voluntary agency movement appears to go from strength to strength. From the point of view of the Western World it has its basis in the Christian ethic. Elsewhere the sensitive teachings of the Koran in regard to charity are the motivating force. Yet this magnificient response from ordinary men and women of goodwill goes beyond denominational preaching. It is clear that the reaction among ordinary people when confronted with the sum of misery in the poorer areas of the world is a deep unease at their own more privileged situation.

[Extracted from "Development Aid from Voluntary Agencies to the Least Developed Countries," Africa Today, Vol. 25 No. 4, Oct.-Dec. 1978, pp. 49-62.

POST-HARVEST FOOD LOSSES





CARTOON ILLUSTRATING THE MAIN SOURCES OF FOOD LOSS FOLLOWING HARVEST--RODENTS, BIRDS, FUNGUS, INSECTS, DAMPNESS AND HEAT. (CARTOON FROM MANUAL ON SMALL FARM GRAIN STORAGE--SEE ARTICLE P. 110.)

Post-Harvest Food Losses In Developing Countries

U.S. National Academy of Sciences

[The extent of postharvest losses of food in the developing countries is some $10 billion, and prevention of such losses is accordingly more important than is generally appreciated. This article surveys various aspects of the problem.]

By the year 2000, it is projected that world population will increase from the present 4 billion to between 6 and 7 billion, and with them the need for food will grow at least proportionately. Estimates indicate that between 450 million and 1 billion people do not have enough to eat now, and this number is likely to increase with the population. To cope with current and future food demand, governments have traditionally emphasized two lines of action: reducing future demand by slowing population growth, and augmenting food supplies by expanding production. A third vital complementary measure, however--reducing the loss of food during and after harvest--has not been adequately emphasized.

Although the methods of loss estimation are frequently suspect and the supporting data rough, there are sufficient data to show that substantial amounts of food are being lost annually in the post-harvest system. Since estimates of loss and production in developing countries are subject both to differing interpretations and degrees of accuracy, projections of the amounts of food that might become available through loss reduction are doubly difficult. Within these limitation, however, it is necessary to make rough

A Committee on Postharvest Food Losses in Developing Countries, with Prof. E. R. Pariser of the Massachusetts Institute of Technology as Chairman, was organized to make this study for the National Academy of Sciences, Washington, D.C.

approximations to illustrate the possible magnitude of the losses involved as a guide to policy.

Conservative expert opinion resists generalizations of loss estimates because they cannot be substantiated by statistically sound data. For planning purposes, experts cite minimum overall losses of 10 percent for durable crops like grains and 20 percent for nongrain staples, perishables, and fish. Table 1 gives an extrapolation in monetary terms of these minimum loss estimates for 1976. The figures in Table 1 indicate that in the developing countries a conservatively estimated minimum of 42 million metric tonnes of cereal grains and legumes were lost in 1976; this amount is equivalent to 60 percent of the annual total cereal production of Africa, 95 percent of Canada's annual cereal grain output, and slightly more than the production of Indonesia and Thailand combined. At 250 kg per year, this tonnage would provide more than the annual minimum calorie requirements of 168 million people--twice the population of Pakistan, or a quarter of the population of India.

TABLE 1 1976 Estimates of Minimum Postharvest Food Losses in Developing Countries*

	Durables	Perishables	Fish
1976 food production (million tonnes)	420**	255**	
Estimated minimum loss percentage	10	20	
Estimated minimum loss (million tonnes)	42	51	10***
Estimated price/tonne (US $)	165****	25	225***
Estimated loss value (US $ billions)	6.9	1.3	2.3

*"Developing Market Economies" according to FAO (1977) definition.

**Production estimates from FAO (1977) assuming 79 percent of durables and 75 percent of perishables are actually used for food (based on NRC, 1977).

***James (1977).

****Figure used by the International Food Policy Research Institute (IFPRI, 1977).

Table 2 presents analogous calculations based on projections of food crop production in 1985 and continued losses and prices at present levels. These figures represent a conservative minimum estimate of 107 million tonnes of total posharvest food losses, which, together with 10 million tonnes of fish losses, is valued at approximately US $11.5 billion. Successful implementation of the United Nations General

Assembly VIIth Special Session Resolution calling for a 50 percent reduction in postharvest food losses by 1985 would, therefore, save an estimated US $5.75 billion worth of food annually.

TABLE 2 1985 Projections of Minimum Postharvest Food Losses in Developing Countries

	Durables	Perishables	Fish
Projected 1985 food production* (million tonnes)	472	302	
Estimated minimum overall loss percentage	10	20	
Projected minimum losses (million tonnes)	47	60	10
Estimated price/tonne (1976 US $)	165	25	225
Estimated loss value (US $ billions)	7.8	1.5	2.3

*Based on approximately 2 percent annual increase from 1976 FAO production reports and figures in the World Food and Nutrition Study (NAS, 1977, Appendix A, Table 1) of approximately 75 percent of total durable crop production used for food in 1985. Also assumes the proportion of durables to perishables produced in 1976 (61:39) will hold for 1985, and that there are no improvements in food conservation.

A 2 percent annual increase in production of food crops over 1976 volume would result in a production of durables very close to the projected demand figures for grain in 1985--474.5 million tonnes. However, even if this production were achieved, a shortfall of food grain would result because of the projected postharvest loss--a minimum of approximately 47 million tonnes. Production sufficient to meet both the projected demand and the estimated 10 percent postharvest loss would require an increase of 2.85 percent annually. But if the United Nations Resolution's 50 percent loss-reduction target were to be achieved over this period, the annual production increase required could be reduced to 2.32 percent.

General Causes of Postharvest Grain Loss

Knowledge about the nature and extent of postharvest losses is much more extensive for cereal grains and grain legumes than for other commodities for a number of reasons. In most societies, these more durable foodstuffs are (or have been) the most important in terms of quantity produced. They are traditionally stored, and the survival of a society has depended on keen attention to this process (this has been less true in the case of the nongrain staples.) It

is easier to protect dormant dried grain from external attack by insects or rodents than it is to prevent physiological deterioration or fungal attack of perishables. Perishables are often seasonal crops that provide a relatively constant supply of a variety of fruits and vegetables without storage. Many grow with minimum attention; their husbandry is therefore much less important and demanding than that of durable staples.

The bulk of harvested cereal grains and legumes passes through a fairly well-defined series of steps--the postharvest system. After harvest, the crops are threshed or shelled, dried, stored, and finally processed. Each commodity has its own variations in this process and some have additional steps that enlarge the system (rice parboiling, for example), but there are enough similarities in the flow of durables through the system to enable generalization about loss problems.

Preharvest factors. The genetic characteristics of a grain variety greatly influence the postharvest losses it is likely to incur. Traditional varieties are generally well adapted both to their usual environment and to post-harvest handling. The grains that survive storage and are used in subsequent seasons have evolved characteristics that favor their survival. These may include, for instance, lower moisture content in the ripe grain, which then dries more readily, and a thicker seed coat for repelling insects and rodents. The introduction of varieties selected for high yields has resulted in greater postharvest losses where the new varieties are not as well adapted to postharvest conditions as traditional varieties. This problem should be a consideration both in selecting high-yielding varieties and in providing for their postharvest treatment.

Damage to the growing crop may affect its postharvest characteristics, as may crop protection treatment prior to harvest. In particular, insect infestations of a maturing crop may increase its vulnerability to loss after harvest; however, residual insecticide may reduce the extent of postharvest insect damage.

Harvesting factors. The time at which harvesting occurs has an important effect on the subsequent storage quality of the grain. Typically, the harvest may begin before the grains are fully ripe and may extend until mold and insect damage are prevalent and shattering has occurred. Grain not fully ripened contains a higher proportion of moisture, and will deteriorate more quickly than mature grain because the enzyme systems are still active. If the grain remains in the field after maturity, repeated wetting from rain and dew at night, along with drying by the hot sun, may cause grain to crack (particularly long-grain paddy), and may increase the likelihood of insect damage (especially in maize, paddy, and pulses).

Crops standing in the field after maturity become more liable to harvest losses. Ripened grain is more likely to be shattered onto the ground during harvesting. Maize loss may result from the loosening of the ripened husk and subsequent mold infection or insect attack. The probability of insect infestation in the field is also likely to increase if the crop stands too long, as is loss to rodents, grain-eating birds, and other vertebrates.

Threshing and shelling. Traditional methods of threshing to separate grains from the plant, such as the use of animals to trample the sheaves on the threshing floor--or its modern equivalent, using tractor wheels--may result in the loss of grain not separated. This method also allows impurities to become mixed with the grain, which may cause subsequent storage problems. The use of flails to beat the grain from the stalk may also damage the grains or kernels and is not always effective. However, modern threshing and shelling devices may also be used incorrectly, or on crops for which they were not intended, often resulting in excessive grain damage. Generally, threshing and shelling will contribute to losses if carried out in a manner that cracks grain.

Drying. Drying is a particularly vital operation in the food handling chain, since moisture may be the most important factor contributing to the rate of deterioration during storage. Drying is used to inhibit germination of seeds and to reduce the moisture content to a level that prevents the growth of fungi and bacteria; it can also retard attacks on the grain by insects and mites.

In developing countries, the methods available to farmers for drying crops are often limited to a combination of sun and air drying, although supplemental heat is frequently employed. In many cases, seed grain may be treated separately from food grain and with greater care. Drying is a complex process requiring considerable skill and effort on the part of the farmer. The success with which the grain is preserved over shorter or longer periods depends to a great extent on the care and attention given to the drying and subsequent storage. Drying is often complicated by the introduction of high-yield varieties or by production of a second, irrigated crop (double-cropping) that matures and must be harvested during wet seasons. In these cases the grain requires artificial drying. The increased production of high-yield varieties and their differing characteristics may also tax the farmer's ability to handle the grain properly by traditional methods. Consequently, new drying and storage procedures must be adopted or the crop must be sold undried.

Overdrying--which can easily occur in arid regions, or after excessive exposure to sun or other heat--can cause breakage, damage to the seed coat, bleaching, scorching, discoloration, loss of germ-

Right: Traditional threshing with ox-drawn "norag," Lebanon.

Below: Rice threshing, Indonesia.

Below: Field drying paddy, Indonesia

Below: Sun drying millet, South India.

inative power and nutritional content. Too-rapid drying of high moisture crops also causes damage; for example, bursting (or "case-hardening"), which causes the surface of the grain to dry out rapidly, sealing moisture within the inner layers. Underdrying or slow drying (a problem in humid regions) results in deterioration due to fungi and bacteria, and, in extreme cases, leads to total loss.

Solar technology for artificial drying is receiving attention because of its negligible running costs in comparison with traditional fuels, which are becoming not only expensive but, as in the case of firewood, harder to find--consumption of wood is causing deforestation in many areas. However, the fundamental problem with solar devices is that they do not operate effectively when they are most needed--to dry grain that must be harvested during a wet spell or in the rainy season.

The manual used by the Peace Corps and Volunteers in Technical Assistance (VITA), *Small Farm Grain Storage* (Lindblad and Druben, 1976), contains descriptions and instructions for constructing a variety of improved grain dryers, 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. Clearly, methods of drying must be selected for the particular climatic, economic, and social circumstances in which they will be used. This is especially true where existing drying methods have evolved over long periods of time to meet community and family survival needs. Alternative methods should not be recommended without awareness of all possible consequences to the farmers.

Storage losses. The extent to which deterioration and loss occurs in storage depends on physical and production factors (which have been mentioned) and on the storage environment and biological factors. In addition, physical damage to the crop during harvest may also affect storage. Undamaged cowpea pods, groundnut shells, and the husks of paddy grains afford these crops a noticeable degree of protection from infestation by most insect species, although the space these encasements occupy reduces the volume of grain that can be stored.

Storage conditions have much to do with the rate of deterioration. High temperature and humidity encourage mold formation and provide conditions favoring the rapid growth of insect populations. Deterioration is minimal in cool areas, more marked in hot, dry ones, high in cool and damp conditions, and very high in hot, damp climates. Climatic conditions during and after harvest affect the ease with which natural drying may be carried out and may dictate the need for artificial drying. Seasonal and daily changes in temperature differences between stored grains and the surrounding en-

vironment can result in movements of moisture among quantities of bulk or bag-stored grains or in condensation on the grain. Concentration of moisture can lead to conditions favorable to the development of fungi.

Some climates lessen the residual activity of certain pesticides, and can reduce the effective life of storage containers and structures. Certain structural materials may alter the effectiveness of different insecticides.

Deterioration is also related to storage methods and management. For example, cob maize stored in open-sided cribs absorbs moisture more rapidly during the rainy season than shelled maize in mud-walled cribs, so that conditions for rapid insect development are produced earlier in the storage season. On the other hand, properly designed open-sided cribs will allow relatively rapid drying of unhusked ears of maize and reduce losses due to mold. Traditional pest control methods are often effective in keeping down infestation levels. For example, some farmers storing pulses and larger grains will mix a smaller seed or sand with the grains to fill the intergranular spaces. This effectively inhibits the development of bruchid beetles. Other farmers use a fire under their storage cribs to repel insects, either through the effect of the smoke or by keeping the grain dry. The admixture or overlay of ashes derived from burning various woods or dried animal dung is another method affording protection against insect attack.

Biological factors. The principal biological agents of deterioration during storage are insects and mites, fungi, and rodents. Insect pests are a greater problem in regions where humidity is high, but temperature is the overriding factor that influences insect multiplication. At temperatures of about 32°C, the rate of multiplication is such that a monthly compound increase of 50 times the present number is theoretically possible. Thus, 50 insects at harvest could multiply to become more than 312 million after 4 months.

The nutritive requirements of insects are much the same as those of vertebrates, so that crops with the highest nutritive values for man are also those most susceptible to insect damage. Furthermore, insects often select the most valuable portion of the seeds. For example, four important maize pests attack the kernel's embryo and reject the starchy endosperm, thus removing the most nutritious part of the grain as well as destroying the power of germination. In certain cases, farmers may keep only small amounts of a nutritious crop, such as beans, because they believe damage and loss to be inevitable.

Weight loss in products has economic as well as nutritive importance and, in the absence of effective control measures, insect attack on cereal grains and beans can be extremely severe, reducing the commodity to empty husks and dust. Large numbers of insects can be expected to produce heavy weight losses, and the resulting contamination by dead and live insects and their excreta can be sufficient to make the commodity completely unpalatable and unacceptable in the market.

Control measures depend first on storage hygiene, whether or not insecticides are available. Storage containers must be checked and cleaned as carefully as possible. Old stored grain should be checked and, if necessary, redried and cleaned to control existing infestation. New dry grain should be kept separate from old stored grain because of the risk of cross-infestation. Similarly, stores should be as remote from the field as possible; it should be assumed that new grain is infested from the field. Control must include a regular system of inspection and preventive actions to maintain storage hygiene, and take counter measures where infestation is found.

Traditional pest-control systems not involving insecticides are adapted to local circumstances. Use of local herbs, mixing ash with grain, and smoking are effective measures and should be encouraged. Every effort should be made to build on traditional technology, and innovations should be undertaken with an understanding of the social and economic implications. This is particularly important in the case of insecticides that present severe health hazards or have other environmental, economic, or social implications (such as over-optimistic expectations that new technologies will solve all problems and remove the need for traditional efforts).

Many insecticides are becoming widely available in developing countries as their application is encouraged by suppliers and extension services. Some are more hazardous to humans and (potentially) to the environment than others, but all should be used with great care. Some can be used on seed grain in high concentrations that would be dangerous if used on food grain. The grain-storage insecticides are of two main types:

- Contact poisons such as dusts, dispersible powders, and emulsions. Some insecticides, such as BHC, are quite stable and have long residual action; others, like malathion, usually have little residual action and are used where human consumption of the grain precludes the use of longer-acting chemicals. Some compounds may be mixed with grain at the time of storage, while others are used for spraying storage containers or bagged grain. The level of application and its timing in relation to expected human consumption are

major problems for extension services seeking to improve insect control in rural grain storage.

• Fumigants, which are gases, can penetrate bulks of grain and kill insects and their larvae living within grains. The negative factors are that all fumigants are safe only when used by trained personnel, and that they have no residual action to protect grain from subsequent reinfestation. A first requirement involves improving application methods and more careful monitoring of insecticide use to achieve maximum control of infestations. Reports of insect resistance to chemical insecticides are frequently encountered, and awareness about the drawbacks of chemical use is also increasing. As a result there has been renewed interest in traditional nonchemical control techniques, and in developing alternative approaches to pest control.

The principal non-insecticidal methods of coping with insect infestations involve: manipulation of the environment to make it less favorable to the insect; breeding resistant crop strains; using natural enemies of insects such as parasites, predators, and disease carriers; sterilizing insects to interfere with normal reproduction; and using attractants and repellants.

Some of these methods are not new techniques. Traditional methods of controlling insects in storage involve mixing sand, limestone, ash, or herbs with the grain which, in addition to forming a barrier against the movement of insects through the grain, abrade or absorb the wax coating of the insect's protective cuticle, causing a loss of body moisture. In many areas insects (and rodents) are repelled by smoke from small fires, used either within empty granaries to decontaminate them or under granaries constructed of permeable materials such as woven plant fibers. The fire also assists grain drying. In other areas, stored grain is inspected frequently and is redried in the sun if insects are observed. Hermetic storage, with grain sealed in airtight containers, is highly effective in excluding insects. However, the system is difficult to maintain for large quantities and is usually confined to relatively small amounts of seed grain.

Along with investigations of newer possibilities for nonchemical control measures, traditional methods should receive greater attention in order to increase understanding of their underlying biological basis. The knowledge gained about both approaches can form the basis of more effective and safer methods. Since the methods are dependent on manipulation of the ecology to the detriment of insects, they are highly location-specific, which increases the need for research and adaptation of techniques to local circumstances. This will require long-term study, making it unlikely that there will be alternatives to replace or greatly reduce insecticide use in the near future.

Fungi attack grain in storage when the drying has been inadequate, when large numbers of insects are present causing a temperature rise in the grain, or when the stored crop is exposed to high humidity or actual wetting. Fungal development does not normally take place when the moisture content of the commodity is below the moisture content of the environment at a relative humidity of 70 percent. Fungi penetrate the endosperm of grains, removing the nutrients. In many cases the embryo is attacked first and eventually destroyed. Fungal spoilage is more serious in those regions with a permanent high humidity, or where a season of high humidity coincides with the time when grain is dried or stored. Microoranisms may multiply and create heat that can increase in unventilated stores sufficiently to completely destroy the grain. However, losses due to fungi are reduced by improvements in drying and storage technology, and do not need to be treated separately.

Rodent damage to stored food can occur in a number of ways. The animals not only consume the food (damage to maize grains is characteristic in that the embryo is usually removed first), but also foul a large amount with their excretions (which may carry microorganisms harmful to man), destroy containers by gnawing holes that result in leakage and wastage of grain, and paw into and scatter grain while they eat. This scattered grain, along with that which leaks from gnawed holes, is subject to contamination. Damage to grain stored in bulk may be much less than to grain stored in bags because rodents are unable to burrow into the bulk.

These problems have recently been reviewed in a report prepared by the U.K. Centre for Overseas Pest Research and the Tropical Products Institute. This report analyzes extensive information provided by a number of governments. It concludes that in most countries very little is known about the extent of the problem, although some countries with high losses, such as India, have considerable expertise in this area and allocate large resources to the control of rodents. Techniques for rodent control fall into the following broad categories:

- Rodent exclusion efforts in store construction;
- Improved sanitation, which includes removing food and harborage from the surroundings or reducing it as much as possible.
- Poison baiting, including use of the anticoagulants such as chlorophacinone, warfarin, coumarin, diphacinone, and coumatetralyl, and acute poisons such as zinc phosphide, barium carbonate, red squill, and vacor;
- Fumigation with phosphine or other gas;
- Trapping and hunting;
- Use of cats and dogs; and
- Rodent repellents.

Estimates of the effectiveness of these techniques are mixed; experience is sometimes contradictory even within the same country. Results depend on the thoroughness with which the control technique is applied and the length of time it operates. Control usually is more effective when a combination of methods is used, particularly those that prevent access to food. The persistence of the rodent problem is obvious in a report from Israel where it is fully recognized and control is vigorous and well organized, but where the estimated loss to crops in the field remains at 5 percent. It should be recognized that store rodents cannot be eliminated unless field rodents are also controlled.

Observations from the People's Republic of China indicate that well-organized rodent exclusion, together with sanitation and field control, may have been rather successful, although no published figures are available. Traditional and modern granaries are reported to be protected by detailed attention to cleanliness, by physically isolating the granary, by laying concrete on the area around and underneath the granary, and by providing rat barriers at points of potential access.

New rodent-control technologies, even simple ones, may meet considerable resistance at the farm and village level. For instance, local acceptance of baffles fitted to traditional storage containers has been slow, at best. In this and similar cases, more research may be needed to determine whether such unpopular solutions to problems are the most effective. There are also reports that rodents are becoming resistant to rodenticides, although there is little evidence of this from tropical regions, which indicates that research on this subject is also desirable.

Although many countries fully recognize the seriousness of food loss caused by rodents the editors of the report of the Centre for Overseas Pest Research conclude that "the one single 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."

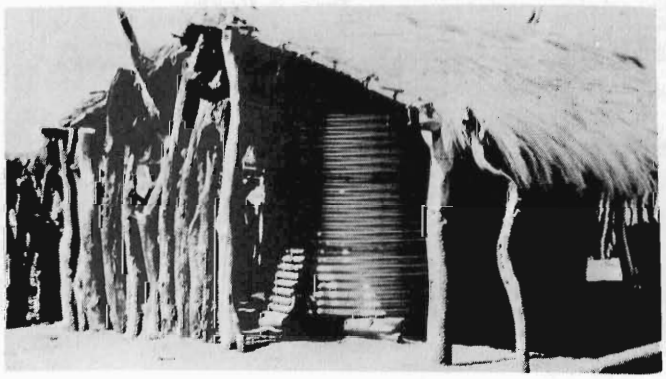
We have discussed the physical, environmental, and biological causes of grain losses during storage. Now we will turn to the methods of reducing storage losses, including a brief description of traditional and innovative storage practices.

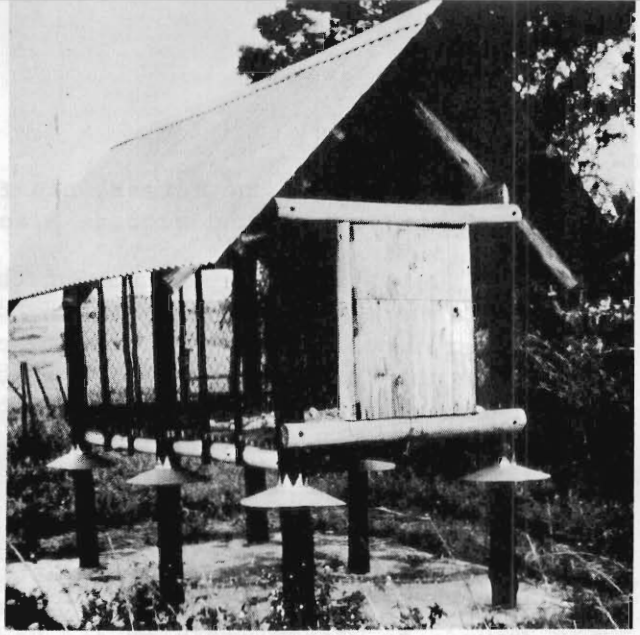
Reduction of Storage Losses

In developing countries, storage on the farm is an important part of the traditional farming system, both in the subsistence sector and the semisubsistence or farm-to-village market sector. It is essential both for conserving seed for the next planting and for stockpiling

Above: Traditional storage houses, Laos.

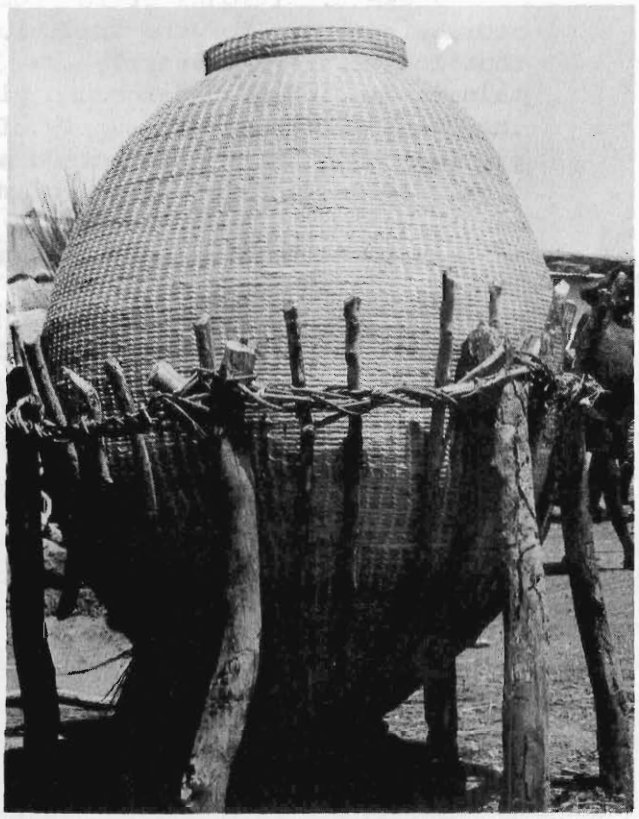
Below: 1-2 tonne metal grain tank, Swaziland, raised from ground and sheltered from rain.





Above: Recommended mesh-sided crib, Swaziland, with corrugated iron roof and metal rat baffles.

Below: Grain storage basket, northern Ivory Coast.



staples to feed the farmer, his family, and his livestock until the next harvest. Sound storage practice has three elements:

1) Proper preparation of the grain for storage, including drying and, where possible, separating out any infested or spoiled grain and other impurities; 2) Sound storage structures that provide protection from moisture (rain and ground moisture) or excessive drying, and a barrier against insect and rodent pests; and 3) An appropriate system of monitoring the quality of the stored grain and treating and handling it while it is in the store.

Traditional storage practices. Traditional systems have evolved over long periods of time to satisfy storage requirements within the limits of the local culture. Grain for seed is frequently sealed in gourds or clay containers and kept in the house. Larger amounts of grain for human and animal consumption are stored in containers constructed of plant material, mud, or stones, often raised off the ground on platforms and protected from the weather by roofing material. The design and materials vary according to local resources and custom.

These traditional grain storage systems may provide reasonable storage security for the traditional farmer, but this does not mean that losses are necessarily low. With the exception of sealed containers (including underground pit stores in drier areas that control insects by limiting the supply of oxygen), the traditional structures provide only limited protection against insect and rodent damage, particularly in areas where the climate is warm and humid or where grain is stored for extended periods. Nevertheless, it does mean that there is less risk of large-scale losses under traditional decentralized storage systems.

Subsistence or traditional farming systems are being improved by the introduction of high-yielding varieties of grain, which farmers are encouraged to grow. However, as a consequence of increased production the traditional storage system is proving inadequate not only in capacity, but also in protecting grain from damage, since the new varieties may be more susceptible to insect attack.

There are three approaches to solving traditional storage system problems:

- Improving small-scale on-farm storage;
- Centralizing grain storage with efficient collection, drying, and large-scale stores; and
- Breeding new varieties of crops that are less susceptible to storage loss.

Of these approaches, the last two are important long-term possibilities with political, social, and economic implications that are largely outside the scope of this report. They will require expanded research efforts, particularly on the socioeconomic aspects of centralizing storage.

New on-farm storage practices. In recent years, this aspect of postharvest technology has been receiving considerable attention. In East Africa, adaptations have been made to the traditional design, for example, by fitting "rodent baffles" (Kenya and Malawi) or mud-plastering cribs for the storage of shelled grain (Zambia and Malawi).

In Guatemala, India, and Swaziland, prefabricated corrugated or plain (flat) metal storage tanks have been in use for a number of years. These tanks permit fumigation of the grain with hydrogen phosphite tablets, reduce the probability of reinfestation by insects and rodents, and reduce the rate of moisture absorption. By 1976, at least 40 percent of Swaziland farmers were using them.

Introduction of improved grain bins has not met with the same success in Ghana and Zambia, where concrete stores proved unacceptable to farmers because of rising costs, material shortages, and difficulties in construction. A more recent approach, adopted in Zambia, is to produce a cheap, easy-to-construct container using readily available materials. The container, known as the "ferrumbu," incorporates the features necessary for safe grain storage and should be affordable by emergent commercial farmers.

In Southeast Asia, metal storage containers have been introduced on a fairly wide scale. Problems have been encountered, however, with drying rice adequately before storage, providing sufficient ventilation, and preventing stored rice from absorbing moisture from the humid atmosphere. Solutions to these problems are considered essential in reducing losses of stored rice in Southeast Asia.

Small-scale on-farm grain storage technologies have been compiled by Lindblad and Druben in the Peace Corps-VITA manual mentioned above, which has been made widely available to developing countries. The Lindblad-Druben manual includes discussion of the advantages, disadvantages, and construction instructions of various grain-storage methods, [some of which are shown on pp. 110-19 below].

- Traditional basket storage;
- Bagged storage;
- Airtight storage-underground pits, including "Thailo" (ferrocement-lined traditional Thai grain silo), plastic sack storage, metal drums and bins, and sheet metal silos;
- Earthen structures-mud brick silos; and
- Cement and concrete structures--cement stave silos and village concrete silos.

Losses during processing. Primary processing losses occur during threshing and milling; parboiling; or further processing, e.g., baking, canning, etc.--outside the focus of this study.

There is a tendency for processing losses to increase as larger amounts of a crop are produced and strain the capacity of a traditional processing system. Maize normally shelled by hand, for example, may be placed in sacks and pounded with a stick to detach the grains from the cob. Mechanical processing is generally less efficient than manual processing, both because it is incomplete and because of damage to grains due to their variations in size or poor adjustment of the machinery. Manual processing efficiency may be used as the standard against which the efficiency of machinery is measured.

In many societies central milling facilities process grain brought in by farmers for a price determined by the initial unmilled volume or weight, and there is thus little incentive for mill operators to reduce subsequent losses due to poorly adjusted equipment or leakage and spillage. Payment may also be in kind, with part of the milled product or the milling by-products going to the miller.

Attitudes towards broken grains vary from society to society; acceptability of off-color grain due to poor parboiling or drying varies. In many cases, this simply means that the poorer members of society have the broken grains and dust, or otherwise lower-quality grain, and there is little economic loss to the producer. In Pakistan, the Council on Scientific and Industrial Research has experimented with reconstituting "whole" rice grains from broken grain and rice powder, with favorable consumer response.

Conclusions

Implementation of the United Nations Resolution on 50 percent food loss reduction will require substantial resources including, in particular, trained men and women. We believe that available information justifies worldwide expansion of current efforts, directed particularly toward helping developing countries to establish their own postharvest loss-reduction policies and programs. The current level of international effort expended for estimating and reducing losses is hard to quantify, since few organizations and programs are limited to, or clearly identified by a concern for postharvest loss activities. It is also difficult to disaggregate expenditures on storage, for example, from national agriculture budgets, or large agricultural development loans. But there is general agreement among knowledgeable observers that, with a few notable exceptions, the overall level of effort directed to postharvest losses is inadequate compared with both agricultural production activities and the potential savings of food.

There are many reasons for the inadequate attention paid to the postharvest system, differing from country to country. Among the more important reasons for this neglect is the lack of professional identity and opportunity for career employment, which in turn reflects the limited attention and money allocated to the problem. In part, this is because the high costs and environmental consequences of continued expansion of production have only recently made postharvest food conservation an obvious alternative. Further, the cost effectiveness of postharvest loss reduction has not been demonstrated on a broad scale. Nevertheless, loss reduction through "sound conservation practice," involving actions that use relatively small increments of time and money, is a reasonable way to protect the greater investment of labor, capital, and other inputs already committed to food production.

[Extracted from a study by a Committee on Postharvest Food Losses in Developing Countries. Published by the National Academy of Sciences, 1978.]

Copies of this study, which also covers materials on preserving perishable foods and fish, can be obtained by writing: National Academy of Sciences, 2101 Constitution Avenue, N.W., JH-214, Washington, D.C. 20418, USA.

Storage Techniques for Villages

Carl Lindblad and Laurel Druben

[The following extracts are from a manual on Small Farm Grain Storage, used by VITA and the U.S. Peace Corps to instruct people who are dealing directly with villagers. It contains specific directions for users of these techniques (much more detail than is shown here). What follows takes up basket granaries, airtight storage in plastic bags, metal storage including oil drums, and a design for a mud-block storage bin.]

Storing grain in basket granaries. Grain has been stored in basket-like containers made of grass, reeds, bamboo strips, or small branches for thousands of years. The particular building material depends upon the plants available near a farmer. These basket granaries are so traditional and widely used that it does not seem necessary to include a plan for making them. There are almost as many different kinds of baskets as there are villages making them, and the skills for this kind of work are passed on within families. What this manual will present is some suggestions for improving basket granaries so that grain stored in them is more protected from insects and molds.

To increase the protection of grain kept in baskets:

- Keep the basket off the ground. Make a strong platform upon which the basket can sit. The shape of the platform will depend upon the shape of the basket. Putting the basket on a platform prevents moisture from coming through the ground into the basket. The platform also offers more protection from rodents.

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- Make sure the basket is well protected from the rain. If it is a grass or reed basket, keep it in the house or some other dry building.

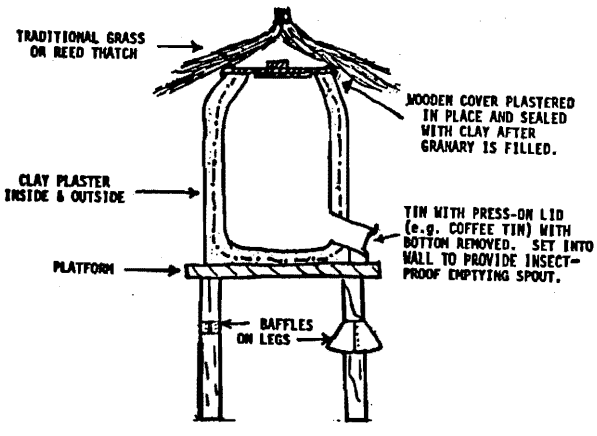
- If it is woven of material which can be kept outside, make sure the roof thatch does not let any rain into the grain.

- Place rodent baffles (guards) on the legs of platforms which support the baskets. These prevent rodents from climbing or jumping into the baskets. (The rodent proofing section contains information on making rat baffles.)

- A tin can, with a plastic cover that can be put on and taken off easily, makes a good emptying chute (see the picture below). Cut the bottom out of the can and fit the open end of the can into the lower part of the basket. This makes it unnecessary to take off the cover each time grain is taken out.

- Baskets can be plastered inside and outside with mud, clay, or cow dung. Covers should be tight and sealed with plaster of the same material. It is important for farmers to realize that grain holding a lot of moisture, whether threshed or freshly harvested, should not be placed in baskets which have been plastered in this way. Plastering makes the basket much more airtight. Moist grain needs to have air passing through to dry it. If moist grain is put into storage without enough air, it will mold and rot quickly.

IMPROVED GRANARY



Airtight Storage

Insects can still grow and reproduce in very dry grain. Grain dried to a 12 or 13% moisture level will not mold, but can still be very good food for insects. The moisture level in grain has to be 9% or less to slow down insect development. Very high and very low temperatures also slow down insect growth. But most farmers will have trouble getting their grain below 12% moisture and in using temperature to control insect development. They often do not have the special equipment necessary to do these things.

More and more farmers do use insecticides to control insects in grain. But some insecticides are dangerous; some are expensive; sometimes they are not available; and there is increasing concern about using chemicals of any kind on food products.

How it works. Airtight storage simply means putting grain into containers which keep air from getting into the grain. Some air is let into the container at the time the grain is put into storage. But after the container is sealed, no more air enters. The respiration of the grain and any insects in it uses up all the oxygen. Insects need oxygen to live. They die without it. Any molds present which require oxygen also will die.

You can show farmers how airtight storage works by putting some insects and grains on a very smooth surface and turning a glass over on top of them. Make sure the glass is tight against the surface. Seal it with wax or some other material. Or seal some grain kernels and insects in a glass jar. Cover the jar with a screw-on lid or a plastic sheet. Just make sure no air can enter the container.

Wait for a while. The insects will begin to move more slowly. Finally, they will die. How long it takes for the insects to die will depend upon the number of insects, the amount of grain, and the size of the glass container. You can speed up the experiment by placing a lighted candle under the glass container. The flame on the candle requires oxygen to keep burning. The flame will use up the oxygen in the container quickly. When the oxygen is gone, the flame will go out. Soon, the insects will die. The lack of oxygen, which kills insects does not seem to hurt the grain or to keep seed grain from germinating when it is planted.

Successful airtight storage depends upon a number of things:

- Building containers which are airtight. This means using materials which do not let air flow through them, for example, metal, plastic, concrete. These containers must be checked to make sure there are no cracks or holes. Some-

times a farmer will see light coming through cracks in a large container. If the container is a gourd, for example, he can check for cracks by filling it with water to see if there are any leaks. All cracks in storage containers should be sealed for good protection. In addition, it is usually a good idea to coat or paint the entire outside (and sometimes the inside) surface of the container with tar or oil-based paints (they are waterproof and also do not let air pass through). For a farmer who cannot afford to buy these materials, there may be local trees and plants which produce materials useful for waterproofing.

- Sealing tightly the holes for putting grain into the container and for taking grain out. Tar, wax, or pieces of rubber cut from old tires and inner tubes can be used for this.

- Filling airtight storage containers to the top is important. Full containers, which are sealed against air, can kill insects in a few days. But if the container is not full, the insects take a lot longer to die. And before they die, they may damage a lot of grain.

- Keeping the storage container closed. Unless the airtight container is quite small, farmers probably will want to store the grain they use for food separately. The storage container holding the food grain is opened often. Every time a container is opened, more air containing oxygen enters the stored grain. This added air and frequent opening encourages insect growth.

Choosing a method of airtight storage. A farmer has to decide what he needs his storage method to do, and, then, he must figure the costs of each method. Some of the methods, such as metal drums and plastic sacks, cost more money. But they are definitely airtight when used correctly and are very likely to make up their costs by good storage of grain. Other methods, such as the Improved Mudblock Silo, are hard to make airtight, take longer to build, and require more upkeep. But they can hold large amounts of grain, and they can be made with local materials. Airtight storage is something farmers who store dry grain should work toward. (REMEMBER: IF THE FARMER IS STORING GRAIN WHICH HAS A MOISTURE CONTENT OVER 12-13%, HE SHOULD NOT USE AIRTIGHT STORAGE. Grain which has a high moisture content should be stored so that air can pass over the kernels.)

Storing grain in plastic sacks. Plastic bags make good airtight storage containers:

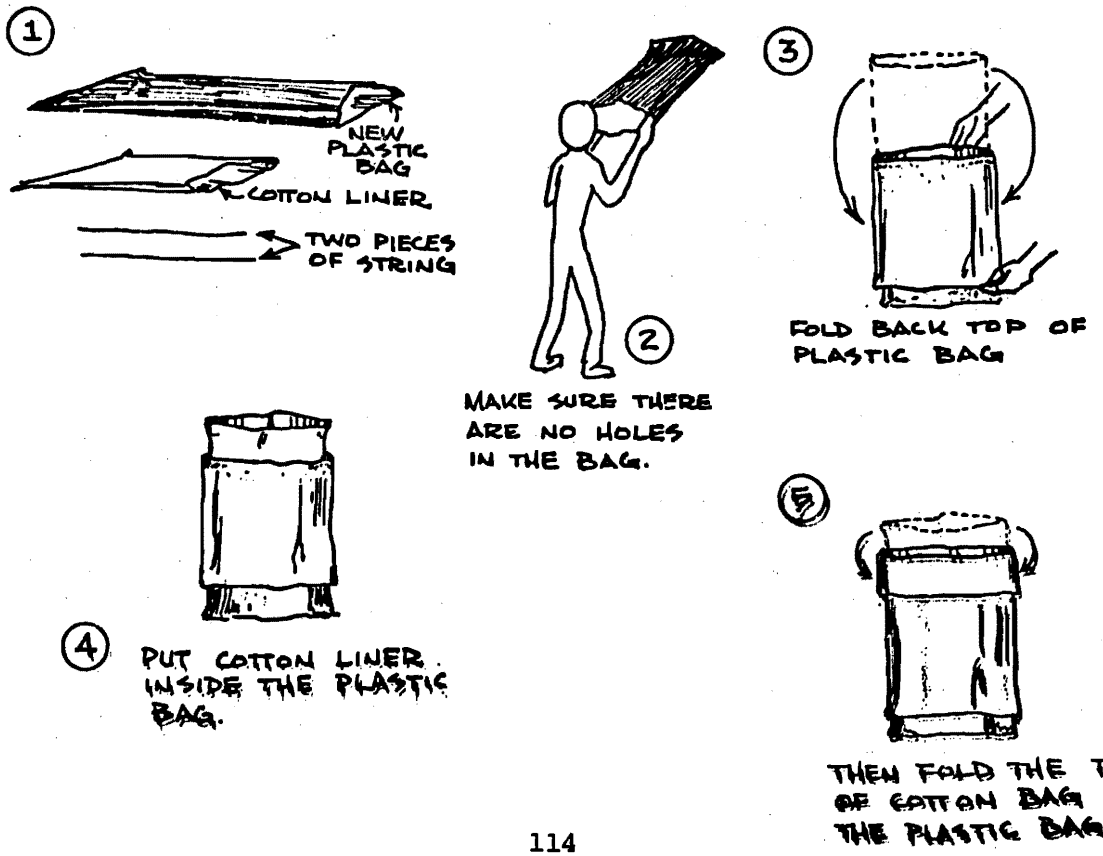
- Use plastic bags which are .20 to .25mm thick (500-700 gauge).
- Make sure there are no holes in the plastic. Even the small-

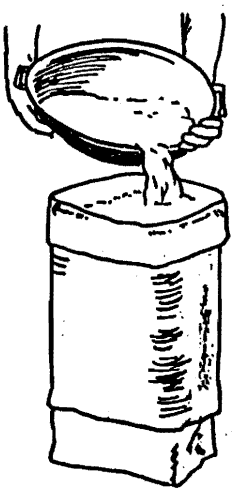
est hole will cause problems.

- Some insects can puncture plastic when trying to escape from the sack. But this can be stopped by putting a cloth bag of tightly woven cotton inside the plastic bag. The cloth is added protection.
- Use grain which is very dry.
- Add insecticide to the grain. It can take a week or more for insects to use up the oxygen which is in the bag.
- Fill the sacks and seal them tightly.
- Store the filled bags off the ground on a smooth surface so that they will not be punctured by the floor or anything sharp.

Advantages: Plastic bags are easy to store.
Plastic bags are easy to move around.
They provide good protection against insects.
Plastic bags make good containers for fumigating small quantities of grain.

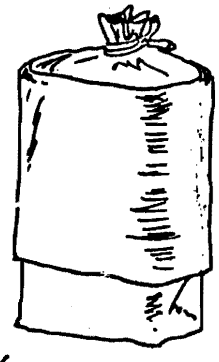
Disadvantages: Plastic can be torn or punctured easily.
They are generally good for only one year and must be replaced after that because small holes have been made in them.
Rodents can eat through plastic.
Plastic bags are expensive in some areas.





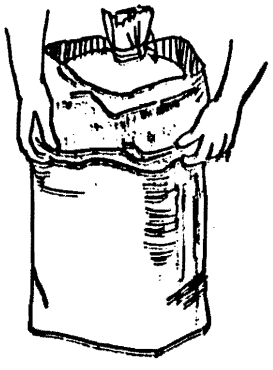
(6) ALMOST FILL UP WITH GRAIN.

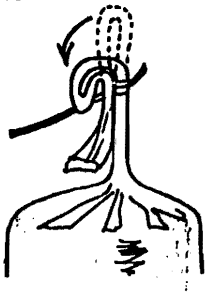
(7) FOLD THE COTTON BAG OVER THE TOP OF THE GRAIN. TIE WITH A STRING.



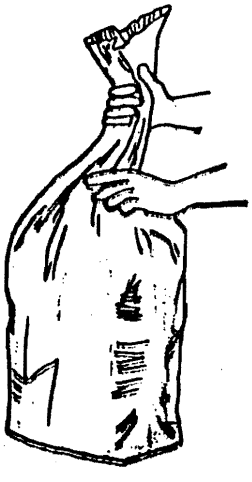
(MAKE SURE THERE ARE NO SEEDS BETWEEN LINER AND PLASTIC BAG.)

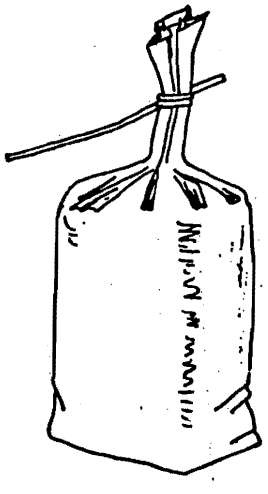
(8) DRAW BACK THE PLASTIC CUFF





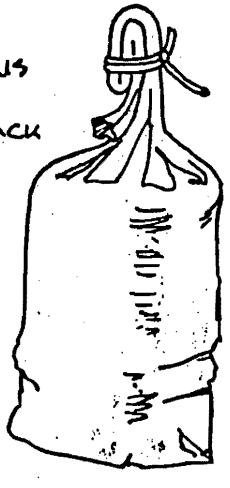
(9) SQUEEZE PLASTIC TIGHTLY ABOVE THE TIED COTTON BAG TO PRESS AIR OUT.





(10) DOUBLE TIE IT.

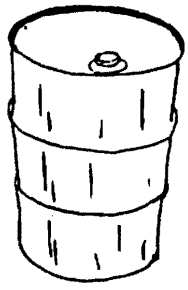
(11) FOLD UP THE SURPLUS PLASTIC AND THEN BEND THE FOLD BACK ON ITSELF.



(12) TIE THE TWO HALVES OF THE FOLD TIGHTLY TO GETHER.

Storing Grain in Metal Drums

In many parts of the world, 220-litre drums are available and not too expensive. If farmers in your area can find oil drums, this is a storage method which may be a good investment. Sorghum, maize, millet, cowpeas, and groundnuts are among the materials which can be stored successfully in these drums. The grain should be dry (12% moisture or less) when it is put into the drum.



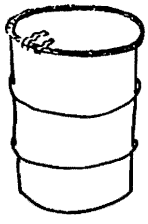
Here is the procedure for using a drum:

- Make sure the drum is clean and dry inside.
- Check for holes. Holes in these drums can be plugged with wax.
- Pour clean, dry grain into the drum through the small top opening. Use a wide-mouth funnel to help with this job.
- Shake the drum to let the grain settle; then fill it again.
- Make sure the drum is full.
- Screw the cap on tightly. If the rubber ring on the inside of the cap is missing, smear the cap with grease.

Each drum holds about 660 kg of grain.

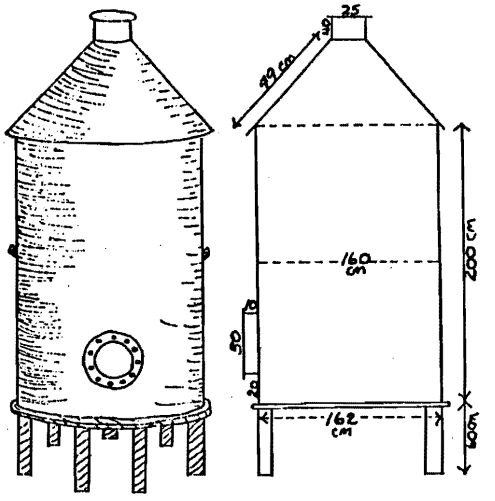
Advantages: Provides good airtight storage control of insects.
Protects the grain from rodents.
Works well for seed grain; does not seem to hurt the ability of the seed to germinate.
Is available in most areas and is not expensive.
Makes a good container to fumigate grain in.

Disadvantages: Has a small opening for filling and emptying.
Special clamp-on lid is sometimes available, but this lid does not create airtight conditions and insecticides must be used.
Works best when grain is being stored 5 months or more.
Has to be kept out of sunlight to prevent moisture changes and heating in the stored grain.
Can rust and must be repaired carefully for airtight storage to be continued.



Sheet metal silo. This silo was developed by the Institute of Tropical Agriculture Research in Benin (formerly, Dahomey), Africa. It is a good example of an easily made metal storage container. The

model below is made of sheet metal, 1mm thick, welded together at the seams. It has two openings, one for filling at the top of the bin and one for emptying at the bottom. The cost of the 3 ton model shown here is about $175 (U.S. currency) when manufactured in small numbers.



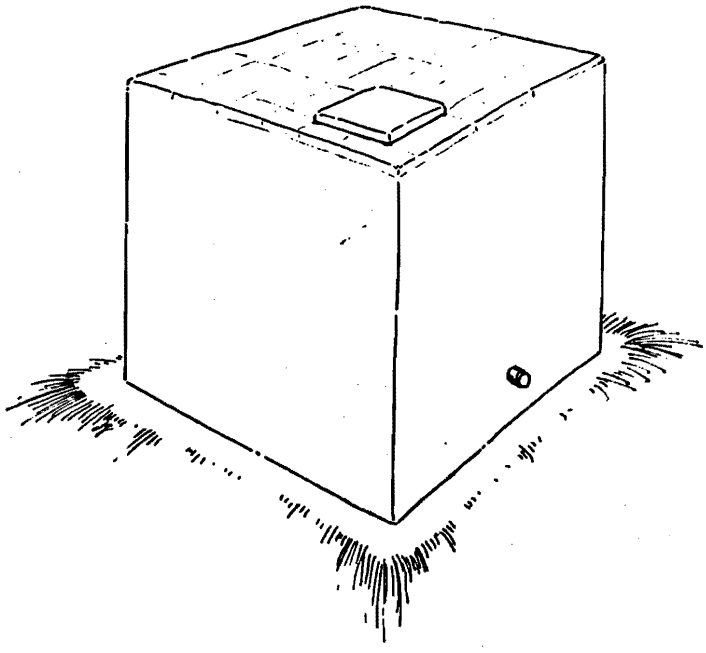
The Indian Pusa Bin

The Pusa Bin was developed in India by members of the Agricultural Research Institute in New Delhi. It is made of mud bricks, covered inside and outside with a smooth coating of mud or mortar. It is relatively simple and inexpensive to construct and maintain. This bin is double-walled all the way round--including the floor and roof--with a layer of plastic sheet between the inside and outside walls. The plastic protects against moisture and keeps air from entering the stored grain.

Protect the bin from rain. If the bin is not erected under a shed and it rains often, it will require too much repair and rebuilding, and the grain may get wet and mold. However, complete shading from the sun is not necessary because mud walls do not hold heat. This is one advantage of a mudblock structure over a metal bin.

In India, rats cause great storage losses. For this reason, the bottom 50 cm of the outside wall and the first layer of the floor slab are made of fired, or "burned," bricks. These bricks are harder than un-fired bricks, like mudblocks, and rats and mice cannot gnaw through the bin walls or burrow up underneath the floor to get to the grain. Another way to keep out rats and mice is to use sheet metal over whatever kind of non-hardened material you use, in the same places.

THE INDIAN PUSA BIN



This plan is for a 2 metric ton bin. You may vary the size of the bin to fit your needs. The plan uses an insulating layer of plastic sheet. The Pusa Bin is airtight and waterproof only if the plastic sheet is made and used correctly. The plastic sheet used should be at least 700-gauge thickness, to resist tears and punctures. If plastic sheet is not available or if it is too expensive, some other form of waterproofing will be needed in warm rainy areas. Check out what is available locally. Tarfelt--heavy paper impregnated with tar --can be used. Experiment with bricks containing cement. Try painting the bin with asphalt, coal tar or any other local waterproofing substance. Remember, the bottom of the bin must be waterproofed to stop migration (seeping of moisture from the earth below).

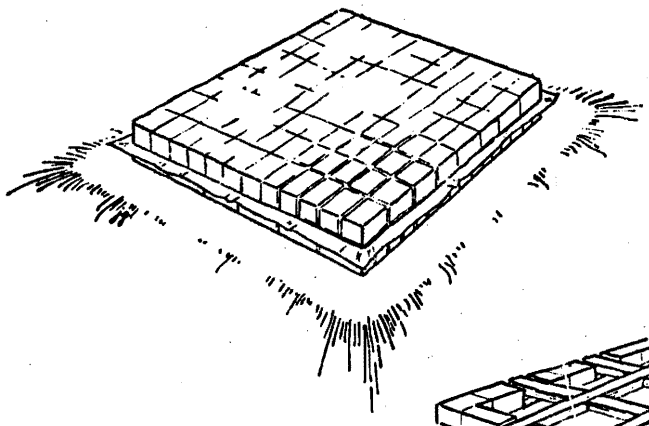
[Extracted from Volume III, "Storage Methods," of Small Farm Grain Storage, published by Volunteers in Technical Assistance (VITA), Washington, D.C. First printing 1976.]

The three volumes of Small Farm Grain Storage entitled "Preparing Grain for Storage," "Enemies of Stored Grain," and "Storage Methods" can be obtained for use. For information write to Stephen Clark, VITA, 3706 Rhode Island Ave., Mt. Rainier, MD, 20822, U.S.A.

BUILDING THE PUSA BIN

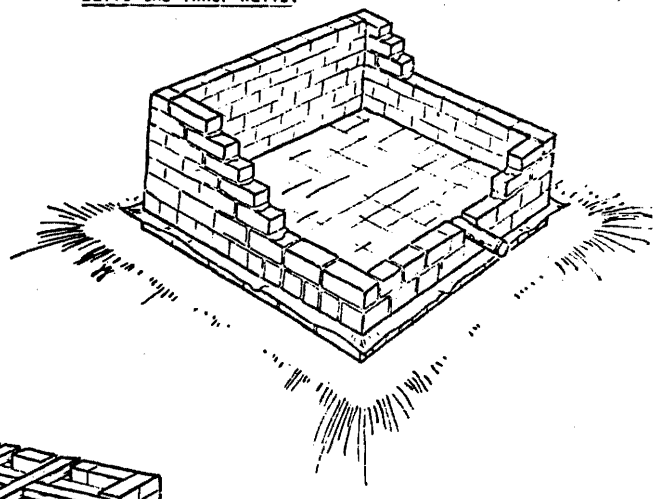
(1)

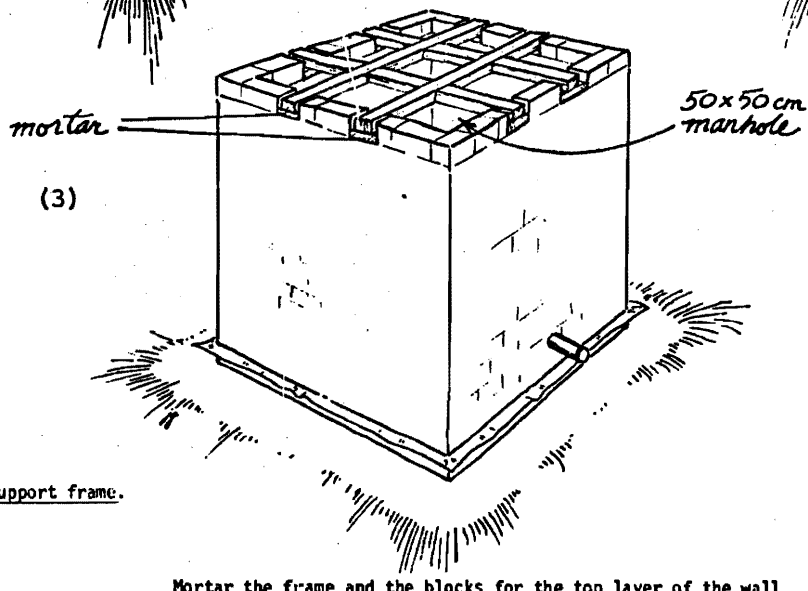
Lay down a layer of mudblocks and mortar on top of the plastic, the same size as the first brick layer.



(2)

Build the inner walls.



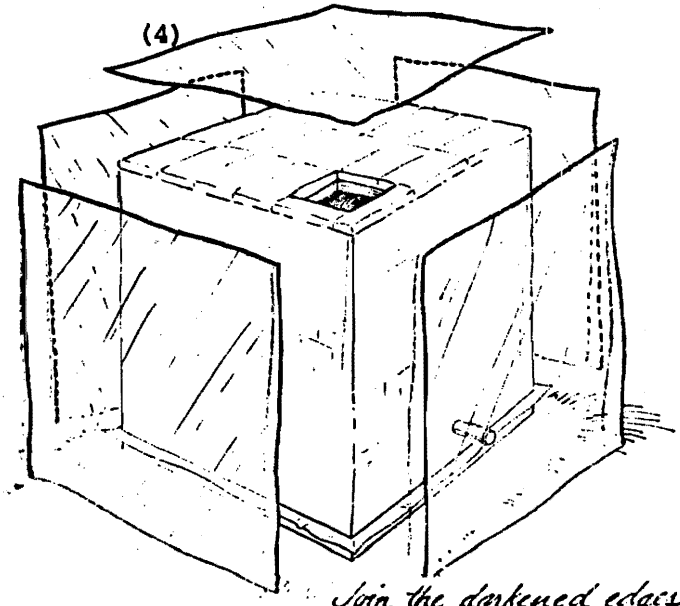


(3)

Install a roof support frame.

Mortar the frame and the blocks for the top layer of the wall into place. Make a smooth top surface on the walls.

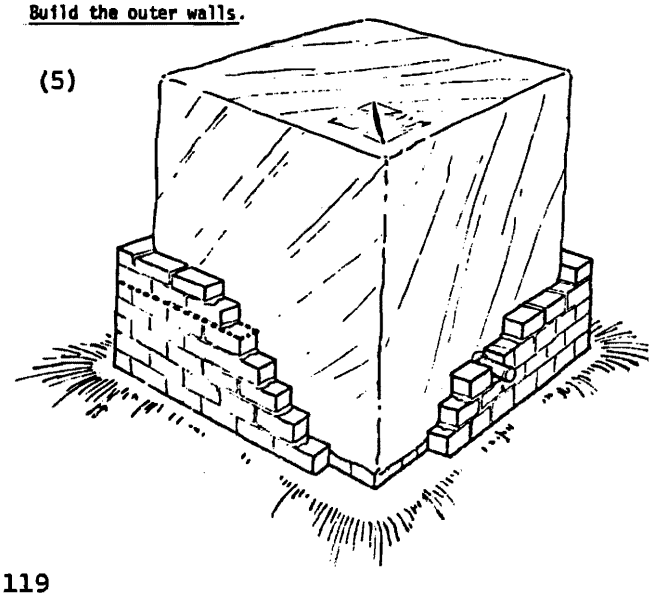
(4)



Join the darkened edges of the plastic sheets

Build the outer walls.

(5)



Appropriate Technology for Foodgrain Storage Under Indian Conditions

N.S. Aggarwal, B.R. Birewar,
K.K.S. Chauhan, G.K. Girish,
S.N. Sharma, and B.K. Verma

[India faces storage problems on a large scale at various levels, requiring different technologies. This article focusses on choices faced by government organizations handling relatively large volumes of grain.]

With the development of Indian farm technology and the consequent increase in agricultural production, storage facilities created for subsistence farming have not kept pace with the changes brought about by commercialized farming. Increased productivity cannot be translated into a proportionate increase in the level of real incomes in an economy in which the storage system is inefficient. Hence, the need for an appropriate and efficient storage system is imperative.

Food grains in India account for about 75 percent of the gross cropped area. Their production over the last 28 years has shown a significant increase, achieving a level of 125 million tonnes in 1977/78 from a level of 52 million tonnes in 1967/68 and 28.8 million tonnes in 1949/50. Since Indian agriculture largely depends upon agro-climatic and monsoon conditions, the precise forecasting of food grain production is difficult. Organizations such as the Administrative Staff College of India (ASCI) and the National Commission on Agriculture have projected a level of 164 million tonnes by 1985, rising to 230 million tonnes by the end of the century. Of the total food grain production of India, about 60-70

The authors are with the government of India's Ministry of Agriculture and Irrigation, the Indian Grain Storage Institute, and the Food Corporation of India.

percent is retained on the farms for family consumption, seed, feed and other purposes. The surplus for marketing is thus estimated to be about 30-40 percent.

Almost all those engaged in the process of marketing are faced with the problem of storage. The various storage agencies are the producers, merchants, transport agencies, warehouses, the public and state agencies and the consumers. In view of the wide variations in objectives, problems of storage vary significantly.

In terms of absolute quantities, farm storage is very large compared with both trade and public storage, and was even greater before the Second World War. Private trade also plays a major role. It is estimated that 70-75 percent of the marketable grain surplus is stored by traders for periods of time and purposes which may vary from place to place. Nevertheless, the facilities of public agencies have increased fourfold over the last 15 years.

Government Programs and Policies

The main food policy objectives have been as follows: (a) To stabilize consumer prices and safeguard interests of the low-income consumers; (b) To ensure reasonable prices and incentives for increasing production; and (c) To build up a buffer stock of grain as a safeguard against shortages and high prices, or to support falling prices. Measures along the following lines have been taken from time to time: (a) Introduction of a public distribution system for the acquisition and sale of stocks; (b) Regulations to curb speculation and hoarding; (c) Restrictions on the movement of grain; (d) Regulation of bank advances against grain; (e) A ban on forward trading.

The quantity of food grain distributed through government channels has averaged more than 10 million tonnes per annum. A network of 240,000 fair-price shops serves 566 million people in rural and urban areas. The Government of India has decided to build up a buffer stock of 12 million tonnes, over and above the operational stocks needed for the public distribution system, which range between 3.5-3.8 million tonnes in April and 8.2-8.8 million tonnes in July. The Government is further considering a buffer reserve of 14 million tonnes by 1982/83. Storage requirements to maintain buffer reserves and peak operational stocks of 9 million tonnes, with an operational margin of 8 percent, work out to 23 million tonnes at present and 25 million tonnes by 1982/83.

Multiple cropping has led to a higher moisture content in grain at the time of harvesting, while the coincidence of harvesting with rains in some areas causes severe problems in drying and threshing. Sun drying is largely resorted to at present; mechanical dryers are

used occasionally. Grain is currently handled manually; to keep pace with the increases, efforts are being made to introduce mechanical handling.

Various loss estimates have been made. The Government of India Expert Committee on Post-harvest Losses (1967) estimated that food-grain losses at various stages account for 9.33 percent of production. Storage loss was put at 6.58 percent, and threshing, transport and processing losses at 1.68 percent, 0.15 percent and 0.92 percent, respectively. Various agencies have estimated grain losses due to different factors as reflected in Table 1.

TABLE 1. ESTIMATED GRAIN LOSSES
(Percentage)

	Source of estimate				
		ASCI and public agencies			
Cause of loss	*Expert Committee*	*Farm level*	*Trade*	*Conventional godowns*	*Silos*
Insects	2.55	3–4	3–4	0.5–1.0	0.5
Rodents	2.50	0.5–1.0	0.3–1.02	–	–
Birds	0.85	–	0.2	0.2	–
Moisture	0.68	–	0.2	0.2	0.2
Other	–	–	0.3	0.3	–
Total	6.58	5.0	5.0	2.0	1.0

Sources: Interim Report of the Government of India Expert Committee on Post-harvest Losses; Administrative Staff College of India

Government Programs to Minimize Farm Losses

The upward trend in the production of food grains will continue to affect farmers' post-harvest losses. The Department of Food launched a "Save Grain Campaign" during 1965/66 as a pilot project, and from 1969 to 1970 as a regular plan. The Indian Grain Storage Institute (IGSI) at Hapur, Uttar Pradesh, and its field stations at Bapatla (Andhra Pradesh) and Ludhiana (Punjab) are engaged in R and D work. The objectives of IGSI include improved storage structures, coordination of all storage research, training in handling and storage, and orientation and review programs.

Designs of various metallic, non-metallic, indoor, outdoor, underground and partly underground bins have been developed, as well as improvements of existing structures of simple design, and the use of discarded coal-tar drums. In a collaborative program, data have been collected on losses, regional insect distribution, field infestation, and the quality of grain marketed. Extension programs are being carried

out with the help of 11 offices in different parts of the country as part of the "Save Grain Campaign." Six more offices will soon start functioning. The aims are as follows:

(a) To train farmers, traders and extension officers in improved methods of grain storage and preservation;
(b) To extend scientific techniques through demonstration and publicity, and develop model villages;
(c) To arrange credit facilities for farmers to buy improved storage structures;
(d) To maintain liaison with state governments, and to arrange for a steady supply of storage structures and pesticides.

Under the Save Grain Campaign, within the framework of the fifth five-year plan up to March 1978, 9,380 farmers have had stipendiary training programs and 71,344 volunteers have had shorter courses. There have been 108,349 grain fumigations, 3,921,812 rat burrow fumigations, 293,166 domestic rodent control operations and 166,850 prophylactic treatments, in addition to 589 radio talks, 62 television programs, 1,101 press reports, 783 exhibitions, 1,494 film shows, and 62,349 stencilled slogans. In addition, 60,390 leaflets containing advice have been given to farmers. The designs developed at IGSI are in demand in other developing countries.

The state governments of Andhra Pradesh, Haryana, Uttar Pradesh and West Bengal are being provided with financial assistance to set up their own Save Grain Campaign teams. In addition 100 Farmers Training Centers have been included in a program to promote scientific storage. The Department of Food is meeting the cost of appointing a woman demonstrator at each center to work in nearby villages to educate women, training the instructional staff of the centers and supplying pesticides and publicity equipment.

Food Grain Storage by Public Agencies

Public agencies are responsible for procurement, transportation, storage and distribution of grain, especially wheat and rice. Storage is necessary to regulate supply and prices. The total capacity owned by the Food Corporation of India (FCI), the Central Warehousing Corporation (CWC) and the State Warehousing Corporation (SWC) increased from 2.5 million tonnes in 1965/66 to 917 million tonnes in 1977/78. Moreover, only 60 percent of the total storage capacities of CWC and SWC are utilized for grain.

After the creation of FCI in 1965 and its gradual take-over of all storage accomodation from the Government by 1969, public agencies constructed new facilities to meet the growing demand. FCI launched successive crash construction programs, and other agencies followed suit. However, the growth pattern and investments have not matched

demand in the past decade or so. In the absence of adequate covered storage capacity, FCI resorted to large-scale open storage popularly known as cover and plinth (CAP). This type of storage, a new and cheap technique, was a landmark in technology developed by FCI.

Types of storage facilities. In India, food grains are handled, transported and stored in bags. Accordingly, the entire marketing and storage facilities are geared to the bag handling system alone. Bulk-storage facilities constitute a very small fraction of the total available in the public sector. Existing infrastructure facilities, cheap labor, marketing, handling, transportation and storage facilities have been factors inhibiting the adoption of the advanced technology of bulk storage. Though it has been realized that bulk storage in vertical silos has advantages, the system has not yet gained wide popularity. Only since the early 1970s has modern storage technology received some impetus through the setting-up of vertical reinforced concrete silos at selected centers.

The conventional godown ["godown" is the Indian word for a storage shed or warehouse] is a rectangular rodent-proof structure known as a "flat warehouse" in Western terminology. The standard basic unit has a capacity of 5,000 t. Depot complexes made up of these units are generally designed to conform to the configuration of the land area and the needs of road and rail inflows. Designed for bag storage, they provide considerable flexibility for different grains and other commodities, and are accessible to any means of transport. All handling operations are manual.

The dimensions of a typical godown are 21.8 m X 127.6 m X 6.35 m. The design makes it weather-proof, gas-tight (for fumigation), rodent-and-bird-proof, and impermeable to subsoil moisture. Provision is made for natural aeration. The floor is designed for a peak load factor of quintal bags stacked 22 high.

Bulk storage structures include steel silos, reinforced concrete circular and hexagonal bins, and reinforced concrete vertical silos. Steel silos are now considered obsolete in view of their high requirements of scarce steel.

The reinforced concrete circular bins have a capacity of around 4,000 t, are circular in shape, and are constructed on a platform 3½ ft. (1.1m) above the ground. The diameter is 77-1/3 ft. (23.6m) and the side walls are 35 ft. (10.7m) high. The roof is domed, and the flooring, also of reinforced cement-concrete, is laid to slope over 3 in. (75mm) of lean concrete in the proportion of 1.5:10. A layer of 700-gauge polythene is sandwiched between the lean concrete and the sand filling underneath. Grain feeding is by hopper and pneumatic equipment, which can also be used for extraction. Aeration is

through a duct and fumigation through 1/2 in (12mm) diameter pipes inserted at equal intervals on the periphery. Inherent limitations of slow receipt, dispatch and drying facilities make the bins unsuitable for high turnover.

The new reinforced concrete vertical silos are similar to grain elevators in Western countries and are constructed of concrete reinforced with steel. Capacity is generally more than 10,000 t. A conical hopper bottom is 13-1/3 ft. (4.1m) above the ground. For feeding from the top, a hopper empties bags on to a conveyor belt. For reclamation a conveyor runs under the hoppers. Aeration is from the top by fans installed in the head house, and the air escapes through openings in the hopper bottom. The silos also have a temperature recording system. Improved types are being built in Punjab and Uttar Pradesh.

Compared to hopper bottom silos, the flat bottom-type has 25 percent more capacity, with the disadvantage of slow emptying and hand cleaning. For high throughputs it would be feasible to use hopper-bottom vertical silos with built-in electrical and mechanical equipment for grain handling. Vertical silos, recognized as the best form of bulk storage from the point of view of better aeration and faster handling, are quite expensive. These need to be adopted, if at all, only at strategic locations such as ports.

CAP or open-storage techniques were evolved by the FCI as a short-term measure for transit purposes in 1971/72. They have all the essential features to meet urgent needs in arid and low-rainfall areas for all hardy and non-hygroscopic grains. CAP storage provides reasonable protection, but requires more care and effort to preserve stocks. The grain, largely wheat, is stored in bags on a brick plinth with wooden crates. Each unit can hold 1,500 bags 15 to 20 high, on an area of 20 ft x 30 ft (6.1 m X 9.1 m), covered with black polythene and tied with nylon ropes, to protect it against wind and storm.

The selection of appropriate storage technology for India is influenced by various factors and criteria, such as the following:

Bulk or bag handling
Period and purpose of storage and type of grain
Whether the facility is for various grain types or only one
Capital investment
Operating or recurring cost per tonne of grain handled
Storage worthiness, incidence of losses and preservation costs
Operating returns, savings achieved by curtailment of workforce
Demand time and construction period
Existing mix of facilities
Marketing, transportation and storage infrastructure, facilities and practices

The comparative economics of bag and bulk storage could broadly be discussed in relation to initial investment, construction period, suitability for storage, preservation costs, and operating costs and returns. The comparative costs of units or complexes of 50,000 t, with all infrastructural facilities such as railway sidings and ancillary buildings, will be considered. Estimates of initial capital construction costs per tonne, inclusive of engineering services, supervision and contingencies, are as follows:

Type of facility	Cost (dollars per tonne)
Conventional godown complex	50
Bulk-storage, inland concrete silos	150
High-turnover port silos	300

For silos the figures include mechanical handling equipment. Matching infrastructure for bulk storage would also, however, require huge investments in India.

Estimated construction times are two years for a conventional godown complex, including six months as a preparatory period, and 3½ to 4 years for reinforced concrete silos (6-12 months preparatory). Some godown units may become available during construction of a complex. Bulk storage is unsuitable for milled rice, some millets and pulses, for which bag storage is most appropriate. It is only for cereals and their milled products that bulk structures are suitable.

Bagged grains stored in godowns can be kept satisfactorily up to two years under the most suitable dry climatic conditions. In coastal areas, however, the period is only between 8 and 12 months. On the other hand, the shelf life of grain silos can be up to five years irrespective of location. Estimated losses are about 1 percent per year in godowns and 0.2 percent in bulk storage silos, irrespective of the time involved. Thus losses and preservation costs are much lower in bulk storage structures, rotation problems can be avoided, and operational and handling costs reduced. In fact, advanced storage technology provides the answer which is technically most feasible, except for the huge capital investments required for both the structures and parallel facilities, and the need for drastic changes in the entire food-grains marketing and handling systems.

Operating costs, which vary substantially, are also important. Bulk-storage facilities are more capital- and less labor-intensive. It might appear that operating costs would be less with godowns, given their labor requirements. But the operational economies of larger throughput with less handling costs and smaller storage losses, coupled with less preservation cost, reduce the unit costs consider-

ably with each additional turnover in silos, where handling capacity is high and there might be more than one turnover. Some advantages of the integrated system with bulk storage and equipment are quicker handling, freedom from rodents and insects, easy aeration and fumigation, and greater usable area. Bulk movement becomes cheaper, quicker and safer. More importantly, the grain can be stored for three to five years. Though initial costs are high, the operational cost is lower.

It is in the context of the country's recent shift from an era dominated by scarcities and imports to an era of surplus production, and consequent increase in the volume of transactions and stocks, that the need for advanced storage technology has been realized. Overall storage gaps have been estimated at not less than 3-4 million tonnes.

Shifting to advanced storage technology. Advanced storage technology does have disadvantages that will slow down the shift from traditional technology. These include adverse effects on employment, possible underutilization of capacity, and large initial investments. Large scale farms are rare in India; the economies of large scale operations through bulk storage may not be possible in many producing areas. When the peak marketing periods of some crops are concentrated over two to three months, failure to use the facilities during slack periods may be wasteful. Shortages of high-level operating skills or construction materials and longer construction times could also hamper a switchover. It has therefore been considered appropriate that the transformation be introduced gradually.

A few silo and bin structures have been installed experimentally, and bulk storage capacity of 383,000 tonnes exists at 12 centers. Moreover, a program for additional installations has been initiated with the financial assistance of the World Bank; five silos,each with a capacity of 20,000 t, are being constructed in Punjab and Uttar Pradesh under this project. Bulk transportation is an essential element in an integrated system of grain procurement and bulk storage, and its distribution in bulk or bag. To provide a link between producing area silos and distribution silos, and to facilitate operation of an integrated system, a pilot project is coming into operation under the World Bank program; the proposed facilities would eliminate the need for bagging grain for transfer to the centers. Alternatively, farmers may deliver direct to the procurement centers where the grain would be graded, weighed and conveyed into elevator steel hopper bins to be kept in bulk until carried to storage points. The pilot project also foresees provision of carriers to move the grain from market yards to the rail-head terminal. Improvisation of flat bulk railway wagons and the provision of special train wagons have also been envisaged.

Bulk-cum-bag storage structures are also being built at about 20 centers for the first time. Such structures could appropriately be

described as intermediate storage technology, incorporating both traditional and advanced characteristics.

Unless introduced in phases, advanced storage technology, though widely adopted in developed countries, would not be entirely appropriate to present Indian conditions. It would therefore be useful to consider a middle road providing the advantages of advanced storage technology without having to invest so much in silos and infrastructure. Such an approach involves an ideal combination of conventional and advanced storage technology, with basically wide-span structures to hold substantial quantities of grain in bulk. Initially used for bags, the capacity for bulk storage will be much greater. Mechanical handling could be incorporated later; only the warehouse portion is first needed. Since considerable progress has already been made towards developing bulk handling and transportation facilities in major states holding surplus grain, it may be appropriate to adopt intermediatate storage technology in the form of bulk-cum-bag storage structures, with complete mechanical handling facilities. Arrangements for aeration, fumigation of grain, temperature detection, etc. would be based on successful experiences in Australia over the last two decades.

The storage gap identified today is primarily due to the increased storage requirements for buffer stocks. Planning for the future should take into account not only the choice of storage techniques, but also economies of scale flowing from godowns or complexes of different capacities. Large-size units or complexes in various combinations are suggested, depending upon requirements varying from region to region.

[Extracted from Appropriate Technology for Food Storage and Processing pp. 58-74. Monograph No. 7 in the UNIDO series on Appropriate Industrial Technology, United Nations, New York,1979.]

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