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9. ABSTRACT

Most of the people living in poverty in developing countries are in rural areas and have not been reached by development programs directed primarily toward increasing the Gross National Product. This paper is a comprehensive overview of the problems of unemployment and underemployment in these countries, with a description of approaches intended to alleviate this situation. The long-term solution is increased job opportunities; however, short-term solutions are not obvious. The capacity of a country's agricultural sector to absorb labor is affected substantially by land-holding patterns, level of technology employed, physical resources, markets for agricultural commodities, and government agricultural policies. Existing studies suggest that most forms of mechanization tend to reduce on-farm employment. However, better information is needed concerning the long-term impacts of mechanization on cropping patterns, land-use intensity, total output, and net employment under specific social, cultural, and economic conditions. The "green revolution" technology generally increases labor requirements per unit of land. Institutional constraints on increased employment include factor price distortions due partly to tax and/or trade policies that tend to 'underprice' capital, and some aspects of labor legislation that have the effect of 'overpricing' labor. Some approaches to increasing rural employment include more investment in rural infrastructure; investment in labor-intensive rural public works programs; industrial decentralization; and promotion of cottage industries.

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*UNEMPLOYMENT AND UNDEREMPLOYMENT IN THE
RURAL SECTORS OF THE LESS DEVELOPED COUNTRIES*

by

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and

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January, 1977

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EXECUTIVE SUMMARY

The following general comments and conclusions appear in this paper. Some are substantiated by studies in one or more countries, while others represent hypotheses requiring additional study:

1. Unemployment and underemployment constitute a serious and growing problem, the magnitude of which can only be roughly estimated due to scarcity and limited reliability of statistical data. Definitions and estimating procedures vary widely among countries, making inter-country comparisons risky.

2. Most of the people living in poverty in the LDCs are in rural areas. Development programs directed primarily towards increasing GNP have failed to generate adequate employment opportunities or to significantly improve living levels of the rural poor.

3. The long-term solution to employment and income problems probably must be sought through increased job opportunities in the modern sector, both agricultural and non-agricultural, but the approaches to address these problems in the short run are still not clearly specified nor are their ramifications fully understood.

4. Given the rapid rate of population increases, the numerical predominance of the rural sector, the low employment elasticity of the manufacturing sector, and the pressures on limited public services resulting from heavy rural-urban migration, increased efforts must be mounted to generate substantially increased employment opportunities in rural areas in the short run.

5. The capacity of a country's agricultural sector to absorb labor may be affected substantially by land-holding patterns, the kind of technology employed, physical resource endowment, markets for agricultural commodities, and government agricultural policies.

6. Agricultural mechanization can take on many forms, and each form affects employment differently. Although somewhat fragmentary, existing studies and surveys suggest that most forms of mechanization tend to reduce on-farm employment. However, the strong interrelationships between mechanization and other forms of technological modernization make generalizations dangerous. Better information concerning the long-term impacts of mechanization on cropping patterns, land-use intensity, and total output are needed in order to assess *net* employment impacts under specific social, cultural, and economic conditions.

7. The 'green revolution' technology of improved seeds, chemical fertilizers, insecticides, and better cultural practices (particularly when coupled with good water management) generally increases labor requirements per unit of land, while reducing labor needed per unit of product. Since these practices are commonly associated as a 'package', it is difficult to assess the impact of individual components.

8. A number of policy and institutional constraints to increased employment exist in most LDCs. Among these are factor price distortions due in part to tax and/or trade policies which tend to 'underprice' capital, and some aspects of labor legislation which have the effect of 'overpricing' labor.

Some alternative approaches to increasing rural employment, in both agricultural and non-farm activities, include the following:

1. Stepped up investment in rural infrastructure, institutional development, and the creation of public services is essential to generate additional rural employment. The increased rural investment should include both agricultural and non-agricultural activities, as appropriate, and should be designed where possible to have maximum impact on the rural poor.

2. Among the agricultural approaches showing potential for increased rural employment are diversification of production to more labor intensive crops, multiple cropping, expansion of cultivated areas through colonization or shifting to more land intensive farming, land redistribution, adopting technology appropriate to existing physical and biological conditions and factor endowments, and increased attention to the needs of small farmers.

3. Among the more important non-farm approaches are investment in labor intensive rural public works programs, emphasis upon irrigation projects, industrial decentralization to rural areas, and the promotion of cottage industries where appropriate.

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PREFACE

The objectives of this paper are: 1) to present a comprehensive overview of the problems of unemployment and underemployment that most of the less developed countries of the world are facing today, and 2) to identify alternative approaches that have been used in attempting to alleviate some of the more serious consequences of inadequate employment opportunities. While particular attention is directed toward the rural sector, it is neither feasible nor reasonable to study a single sector in isolation. The complex inter-relationships of the market, governmental policies, access to productive resources, labor flows, and a host of other variables necessitate viewing the rural sector as part of the total economy.

This paper is a synthesis of existing information on the subject gleaned from an intensive review of both published and unpublished materials. It is presented in a non-technical form, insofar as possible, and is intended for use by a wide range of policy makers and development specialists.

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A number of persons provided detailed critiques of an earlier version of this paper. The authors would like to acknowledge these contributions and express appreciation for the time and effort involved. Listed in alphabetical order are Kurt R. Anshel, A. Frank Bordeaux, Peter Dorner, William Merrill, G. Edward Schuh, Eldon D. Smith, Richard Suttor, William C. Thiesenhusen, and V. S. Vyas. Janice Lec Brannon and Hillary Appelbaum provided useful editorial assistance, and Somporn Songlin typed the manuscript.

I. INTRODUCTION

The Legacy of Economic Development Models.

Many development models which achieve ascendancy in the literature, and subsequently in the minds of development planners and practitioners, often persist even when strong empirical evidence suggests that they are ill-suited to accomplish the tasks to which they are being applied. The Marshall Plan model, so successful in rehabilitating the war-torn economies of Europe, for example, continued to receive strong support for a considerable time as a tool for addressing the very different economic and social problems of the less developed countries. Recognition that the cultural and institutional setting, the natural and human resource endowment, and the social and physical infrastructural base among the less developed countries differed greatly from that of Western Europe came slowly.

Similarly, the development prescription which calls upon agriculture to finance industrial development, provide cheap labor, and eventually be pulled into modernization by a dynamic manufacturing sector, continues to have its strong adherents.^{1/} The policies commonly used to implement such a strategy -- cheap urban food prices, heavy export taxes on agricultural products, protective tariffs against foreign manufacturers, import substitution, overvalued exchange rates, emphasis on heavy industry, concentration of government investment in urban centers, subsidization of credit to large industries and for agricultural mechanization -- frequently have led to intolerable social, political, and economic situations in terms of employment, income distribution, rural-to-urban migration, and the provision of basic services to the population.

^{1/} There has been a tendency to accept some of the basic premises of the two-sector models without observing the caveats regarding the mutual inter-dependence of the sectors and the inherent dangers of undue imbalance. For a detailed discussion of early two-sector models, see W. Arthur Lewis "Economic Development With Unlimited Supplies of Labor" *The Manchester School* 22 (May, 1954); Gustav Ranis and John C. H. Fei "A Theory of Economic Development", *American Economic Review* 51 (September 1961). Bruce F. Johnston and John W. Mellor "The Role of Agriculture in Economic Development", *American Economic Review* 51 (September, 1961). The latter article focuses upon the mutual interdependence aspect. Subsequently, a number of highly sophisticated extensions of the earlier models have been developed. See, for example, John C. H. Fei and Gustav Ranis, *Development of the Labor Surplus Economy: Theory and Policy* (Homewood, Illinois: Richard D. Irwin, Inc., 1964) and P. Zarembka *Toward a Theory of Economic Development* (San Francisco: Holden-Day, 1972).

A final example, and one specifically apropos to the current topic, is the rather naive but long-lived thesis that if sufficient attention and resources are devoted to increase growth in GNP, employment, poverty, and other social problems automatically will be resolved. Unfortunately, this has not proven true. Total numbers of unemployed persons and those living in conditions of poverty continue to increase, and the gap between rural and urban income levels steadily widens. A recent study of Colombia reveals that the poorest sections of the population have gained little from a GNP growth rate in real terms of some five percent per annum since the mid 1950's. In fact, the poorest one-third of the rural population is not much better off than it was in the 1930's.^{2/} In the Philippines, where real GNP has more than trebled since 1950, rural unemployment remains high, income distribution has become increasingly unequal, and the share of national income of the bottom rural 60 percent of the population has declined from 32.8 percent in 1956 to 27 percent in 1971.^{3/} According to the World Bank estimate, in 1969 approximately 40 percent of the population of Asia, excluding mainland China and other centrally planned economies, lived in conditions of absolute poverty, and over 85 percent of these were found in rural areas.^{4/} Similar examples can be cited from countries representing all of the major regions of the world.

Recognition of the Employment Problem and Its Rural Component.

Despite their seriousness, official recognition of the employment and associated income distribution problems has come slowly. Not until the late 1960's did any real awareness of the necessity for a new development model begin to gain acceptance -- one which would avoid the previous excessive concentration on the modern sector, and which would attempt to address directly the problems of employment, expanded earning opportunities, and income distribution. In the 1960's, the development plans of Pakistan, Sri Lanka, and India evinced considerable concern over these problems. During the 1970's, a number of African countries have begun to identify them as major problems. Several Latin American countries are also

^{2/} ILO. *Towards Full Employment: A Program for Colombia*. (Geneva: International Labour Office, 1970), p. 14.

^{3/} ILO. *Sharing in Development: A Programme of Employment, Equity, and Growth for the Philippines* (Geneva: International Labour Office, 1974) pp. 7-9.

^{4/} World Bank (IBRD). *The Assault on World Poverty* (Baltimore: The Johns Hopkins Univ. Press for the World Bank, 1975). The World Bank defines absolute poverty as a per capita income of U.S. \$50 or less at 1971 prices. Despite the well-known limitations of such statistics, especially for inter-country comparisons, they do provide a useful measure of the magnitude of the problem.

stressing employment in their plans, and some recognition is discernible in the Middle East.^{5/}

The fact that development plans are devoting more attention to employment, welfare, income distribution, and small vs. large operators does not necessarily mean that effective ameliorative action will follow. One experienced planner from Pakistan has noted candidly that the inclusion of employment policy statements and targets are "...generally added as an after-thought to the growth target in GNP but [are] very poorly integrated in the framework of planning."^{6/} He also argues that redistribution of the fruits of growth after the fact is impossible, and that production and investment patterns must be restructured at the outset, or as in the case of Pakistan,

"....the very institutions we created for promoting faster growth and capital accumulation frustrated later on all our attempts for better distribution and greater social justiceThe distribution policies must be built into the very pattern and organization of production."^{7/}

Some modicum of optimism appears warranted in terms of attitudinal changes on the part of numerous international assistance groups. The United States Agency for International Development (USAID) increasingly is stressing programs directed toward rural areas, specifically those aimed at small farmers and low income groups.^{8/} The World Bank (IBRD), the Asian Development Bank (ADB), the International Development Association (IDA),

^{5/} For details on a country by country basis, as evidenced by their development plans, see ILO, *Time for Transition: A Mid-Term Review of the Second United Nations Development Decade* (Geneva: International Labour Office, 1975).

^{6/} Mahbub ul Haq. "Employment in the 1970's: A New Perspective", paper presented at the Society for International Development 12th World Conference, Ottawa, May 16-19, 1971. *International Development Review* 13 (1971).

^{7/} *Ibid.* p. 4. Similar expressions are being found in official USAID documents. See, for example, page 13 of the 1975 Project Paper dealing with the Expanded Program of Economic Analysis, which notes the increased priority on "...programs whose benefit will be widely distributed by the output and productivity increasing process itself, rather than deferring concern with equity objectives until adequate output levels have been achieved."

^{8/} For a discussion of these trends, see USAID Policy Background Papers, "Employment and Income Distribution Objectives for AID Programs and Policies" (Washington, D.C.: USAID Bureau for Program and Policy Coordination, October, 1972) pp. 14-23.

the Food and Agriculture Organization (FAO), the OECD Development Centre, various organizations of the United Nations, regional groups including the Organization of American States (OAS) and the Council on Asian Manpower Studies (CAMS), and several bilateral donor agencies are adopting similar policy orientations in their research and assistance programs.

The reasons for the increasing awareness and concern are diverse and complex, but some of the major factors which have contributed include the following:

1. Upward revisions of estimates of population growth rates and thus the rate of increase in the labor force.
2. Severe urban problems arising from strong rural-to-urban migration patterns and the resultant pressures on public services, as well as the increased visibility of the openly unemployed.
3. Failure of industrial development to absorb the increased flow of labor to the extent initially anticipated.
4. Rising food prices and concomitant urban unrest, which have grown out of neglect of the agricultural sector, leading in some countries to increased food imports and an offsetting impact on the favorable balance of payments generated by industrial import substitution.
5. Success of the new high yielding varieties and the accompanying package of technological inputs, strongly suggesting that the concept of industrialization as the leader and agriculture the follower in development plans may not be entirely sound.
6. The search for a new and more satisfactory approach to development following the failures of the development decade and the implicit 'trickle-down' theory.^{9/}

This heightened concern must now be capitalized upon through the implementation of soundly conceived programs and projects which focus directly upon the issues of access to earning opportunities, equity, and meaningful employment rather than relying upon the trickle-down effects of policies aimed principally at stimulating growth in the GNP. The ultimate responsibility for action resides with the governments of the less developed countries. Whether they are seriously enough concerned to channel *major resources* in this direction remains to be seen.

^{9/} Some of these points are discussed by Ronald G. Ridker. "Employment and Unemployment in Near East and South Asian Countries: A Review of Evidence and Issues", in Ronald G. Ridker and Harold Lubell (eds.) *Employment and Unemployment Problems of the Near East and South Asia*, (Delhi: Vikas Publications, 1971) pp. 6-58.

II. NATURE AND SCOPE OF THE EMPLOYMENT
AND INCOME DISTRIBUTION PROBLEMS

Growth in Labor Force.

Current rates of population and labor force growth in the less developed countries (LDCs) are approximately twice those experienced in Europe during its rapid expansion of the nineteenth century.^{10/} Furthermore, the economically active population in the LDCs has increased steadily since 1950 and projections to 2000 envision no letup. Table 1 permits interregional comparisons of growth rates in the four major regions of the less developed world and between the LDCs and the developed countries.

The rapid growth in population and labor force in the LDCs has been coupled with a much more capital intensive manufacturing technology than that which existed in today's developed countries during their period of major population growth. Thus, absorptive capacity for labor is lower and unemployment rates higher than those experienced by the developed countries.

Table 1. Economically Active Population,
Recent Years and Projections to 2000

	--Average Annual Percentage Increase(compound)--				
	<u>1950-60</u>	<u>1960-70</u>	<u>1970-80</u>	<u>1980-90</u>	<u>1990-2000</u>
Developed Market Economies	1.0	1.1	1.0	1.0	1.1
North America	1.6	1.5	1.5	1.4	1.6
Western Europe	0.4	0.5	0.6	0.7	0.8
Oceania	2.2	1.9	2.9	1.2	2.0
Eastern Europe and U.S.S.R.	1.4	1.0	1.2	0.7	0.6
Total Developed Countries	1.2	1.1	1.0	0.9	0.9
Developing Market Economies	1.6	2.1	2.3	2.5	2.6
Africa	1.6	2.0	2.2	2.4	2.7
Far East	1.4	2.1	2.3	2.5	2.5
Latin America	2.3	2.3	2.6	2.7	2.8
Near East	1.7	2.3	2.5	2.8	2.9
Asian Centrally Planned Economies	3.2	1.6	1.5	1.6	1.5
Total Developing Economies	2.2	1.9	2.1	2.2	2.2

Source: ILO. *Labour Force Projections*. (Geneva: International Labour Office 1971), p. 5. Projections are based upon the U.N. medium variant.

^{10/} David Turnham. *The Employment Problem in Less Developed Countries*. (Paris: OECD, 1971) p. 122.

Rural-Urban Population Distribution.

In most LDCs population is still concentrated in rural areas. According to U.N. estimates, the rural population constituted about 78 percent of the total population of the LDCs in 1960, 74 percent in 1970, and is expected to comprise about 68 percent by 1980.^{11/} In terms of the percentage of total population composed of persons in agriculture, a similar *relative* decline is evident, as shown in Table 2.

Table 2. Agricultural and Non-Agricultural Populations: 1962 and 1985

	<u>Non-Agricultural</u>		<u>Agricultural</u>			
	1962	1985	1962	1985	1962	1985
	[-----millions-----]		[--percent--]			
Asia and the Far East	250	591	583	880	70	60
Latin America	127	289	99	144	44	33
Africa South of the Sahara	36	107	165	250	82	70
Near East and N.W. Africa	47	140	88	114	65	45
Total	460	1,127	935	1,388	67	55

Source: FAO. *Provisional Indicative World Plan for Agricultural Development*. (Rome: FAO, 1970). Projections assume a negligible impact of population control programs.

Despite the *relative* decline in agricultural population, absolute numbers in the sector are expected to grow by almost a half billion persons between 1962 and 1985 -- an increase of almost 50 percent. This increase would be much greater if it were not for the substantial rural-to-urban migration which is occurring.

Rural-Urban Migration.

Government policies which have concentrated investments in urban areas,^{12/} coupled with highly skewed resource holding patterns in the rural

^{11/} United Nations. *Monthly Bulletin of Statistics*, 25 (11): xxxvi, 1971.

^{12/} The USAID/Latin America *Summary Economic and Social Indicators 1960 - 1970* indicate that in Latin America, central government expenditure on agriculture averaged less than 6 percent of total expenditures during the decade of the sixties and that no Latin American country averaged as high as 10 percent of total expenditure on agriculture during the decade. These data are cited by Charles Montrie in "Employment and Development Planning in Latin America", USAID Office of Development Programs, Bureau for Latin America, Oct. 15, 1971 (mimeo), p. 12.

areas of many LDCs, have created a pull and push effect which has accelerated rural-to-urban migration. The absence of adequate capacity of the non-agricultural sectors to absorb this influx of labor has resulted in a change in the form in which the unemployment problem appears "...from disguised unemployment in the rural area, to open unemployment in the urban, the latter posing more of a social threat."^{13/}

The United Nations estimates the average annual increases in urban populations among the LDCs during 1960 through 1970 as follows: the Western Hemisphere 4.4 percent; Africa 4.9 percent; Asia 4.2 percent.^{14/} At the same time *total* population growth among the LDCs was approximately 2.5 percent per year. It appears inevitable that urbanization will continue, and over time agriculture will diminish in importance as an employer. This has been the pattern of the developed countries, and a number of the LDCs (for example, Taiwan, Korea, and Malaysia) are already well along this 'structural transformation' path. Migration, however, tends to create its own 'vicious circle'. As Brannon and Anselm have noted:^{15/}

"...migrants do not, in the real world carry their 'bundle of food' with them as they leave the rural area. Transportation, storage, and other marketing facilities which are, at best, only weakly developed must cope with an additional burden at a stage in development where they are ill-equipped to do so. This is coupled, in many cases, with an agricultural sector whose output is growing only slowly The impact in an underdeveloped country, where food represents the primary wage good, is likely to be felt throughout the economy as rising food prices trigger inflationary pressures. Furthermore, any expansion of public services to meet the needs imposed by additional migrants may also have an inflationary impact. If not brought under control, the resultant inflation will tend to distort investment in favor of short-term speculative ventures and will encourage capital flight abroad. In the absence of either devaluations or a move to some form of

^{13/} Ronald G. Ridker, *op. cit.*, p. 40.

^{14/} United Nations, *World Economic Survey*, 1973. The range was from a low of 1.8 percent per year in Barbados, which had 44 percent of its population in urban areas and 77 percent in non-agricultural activities in 1970, to a high of 10.5 percent per year in Kuwait, which had 56 percent of its population in urban areas and 99 percent in non-agricultural activities in 1970.

^{15/} Russell H. Brannon and Kurt R. Anselm, "A Re-Evaluation of the Contribution of the Rural-to-Urban Labor Flow", *Southern Journal of Agricultural Economics* 3 (December, 1971).

multiple exchange rates, exports (generally agricultural products) will be slowed, foreign exchange will become increasingly scarce, and the total national development program will be impeded. Alternatively, if the government elects to follow policies designed to suppress the prices of agricultural products in order to subsidize urban consumption and retard inflation, the result will be a further disincentive to agricultural producers and an additional incentive to migrate....

[In cases where] subsidies to migrants contribute to increasing the marginal private benefit to migration, migration will be further stimulated and the cycle will repeat itself as urban population growth outstrips the provision of socially acceptable living conditions."

Many of these migrants from rural areas have neither the education nor the requisite skills to fit easily and productively into the modern urban sector. Furthermore, government investment in training and educational programs designed to develop this growing pool of human capital has been very limited in most countries.

Income Distribution and Poverty.

Many of the LDCs have achieved relatively high rates of growth in GNP, but large numbers of the poor have failed to realize any improvement in their levels of living.^{16/} Although data are scarce, it appears clear that distribution of income within the rural sector is highly skewed in most LDCs, that a substantial gap exists between income levels of the rural and the non-rural sectors, and that an overwhelming majority of those living in poverty are in rural areas.^{17/} Examples from a few of the larger LDCs

^{16/} Historically, these governments have paid little attention to the needs of the poor. Edwards states this situation succinctly, "While the circumscription of individual rights in favor of general welfare is a recognized role of government, most political processes are more responsive to the wishes of the wealthy than to the needs of the poor." Edgar Edwards, "Employment in Developing Countries", Ch. 1 in Edgar O. Edwards (ed.) *Employment in Developing Nations* (New York: Columbia University Press, 1974) p. 24.

^{17/} In 1972, at an AID Conference on Manpower, Eriksson concluded that "The empirical data on income distribution is pessimistic, inconclusive, and sparse. I know of data of changes over time in the size distribution of income for only nine countries. These data suggest a significant worsening in income distribution over time." John R. Eriksson, "Income Distribution and Employment", paper No. 5 in *Manpower: Promoting Employment and Reducing Poverty* (Washington, D.C.: USAID Office of Labor Affairs, 1972) p. 37. At a subsequent AID Conference held in 1975, the income distribution data used were those developed by Adelman and Morris in 1971, expanded by Paukert in 1973, but still relating primarily to the year 1965. See *USAID Manpower and Employment Development for Economic Growth and Social Justice* (Washington, D.C.: USAID Office of Labor Affairs, 1975) pp. 32-33.

suffice to illustrate the seriousness of the situation.

For Asia, Ahluwalia reports the following percentages of the population living below the poverty line in 1969: Bangladesh and Pakistan, 32.5 percent; Burma, 53.6 percent; India, 44.5 percent; Sri Lanka, 33.0 percent; and Thailand, 26.8 percent.^{18/}

In Brazil, Langoni finds that the average per capita income in the agricultural sector in 1970 was only one-third that in the non-farm sector.^{19/} In Iran, urban incomes were 4.6 times as great as rural incomes in 1959 and 5.7 times as great in 1969, showing a growing disparity between the sectors.^{20/} In Colombia, although physical output of agricultural products (excluding coffee) rose nearly 3.5 percent per year during the period 1960-67, real wages in the countryside are estimated to have changed little since 1935.^{21/} In the Philippines, average real wages of agricultural laborers during 1971-73 declined by 19 percent compared to 1966-68.^{22/}

Data on the distribution of income for rural households for selected Asian countries are presented in Table 3.

^{18/} Montek S. Ahluwalia. "Income Inequality: Some Dimensions of the Problem", in H. Chenery, M. S. Ahluwalia, C. L. G. Bell, J. H. Duloy, and R. Jolly, *Redistribution With Growth* (Oxford University Press, 1974).

^{19/} Carlos Langoni. *Distribuicao da Renda e Desenvolvimento Economico do Brasil* (Rio de Janeiro: Editora Expressao e Cultura, 1973) as cited by G. Edward Schuh in "General Economic Policy as a Constraint to the Development of Agriculture", Inter-American Development Bank Seminar on Agricultural Policy, Washington, D.C., March 17, 1975 (mimeo).

^{20/} ILO. *Employment and Income Policies for Iran* (Geneva: International Labour Office, 1973) p. 24.

^{21/} Unpublished materials of Albert Berry as cited in ILO, *Towards Full Employment ... Colombia*, *op. cit.*, p. 25.

^{22/} Calculated from data contained in Quintin M. Balagot and Aida R. Librero. *Analysis of Agricultural Wage Rates in the Philippines* (Bureau of Agricultural Economics/University of the Philippines Los Baños/USDA, December, 1975).

Table 3. Distribution of Income Received by Rural Households,
by Income Class, Selected Years
(percentage)

Country	Year	Lowest 20%	Lowest 40%	Middle 40-60%	Highest 20%	Highest 5%	Gini Coefficient
Bangladesh	1963/64	7.8	19.2	15.5	43.1	17.2	.35
	1966/67	8.1	19.9	16.0	41.7	16.1	.33
India ^{a/}	1960	3.9	13.8	14.9	49.6	23.8	.45
	1970/71	6.4	17.1	15.1	46.6		.38
Korea	1966	7.5	20.1	17.6	37.7	11.6	.31
	1971	8.0	20.6	17.0	39.0	13.7	.36
Malaysia	1957/58	7.2	19.1	16.2	42.2	16.9	.35
	1970	4.3	13.5	14.1	51.2	24.5	.46
Pakistan	1963/64	6.6	18.2	16.2	42.9	17.4	.36
	1970/71	8.9	21.9	16.9	38.8	14.9	.30
Philippines	1961	5.8	15.9	14.8	47.4	20.5	.41
	1971	4.3	13.1	13.7	51.5	22.9	.47
Sri Lanka ^{b/}	1963	3.7	12.5	12.1	51.0	21.7	.47
	1973	5.6	17.1	16.5	43.0	16.6	.35
Thailand	1962/63	6.2	14.9	13.1	50.9	21.8	.44
	1970	5.6	14.3	13.3	51.1	22.0	.45

Note: The Gini Coefficient is a measure of equality of income over the entire range of the population, with the lower coefficients representing greater equality.

Source: Calculated from data contained in Shail Jain, *Size Distribution of Income: A Compilation of Data* (Washington, D.C.: The World Bank, 1975).

^{a/} India data for 1970/71 are from National Council of Applied Economic Research, *Changes in Rural Income in India* (New Delhi: NCAER, December, 1975).

^{b/} Data for Sri Lanka refer to individual rural income recipient rather than to rural household.

Although not directly comparable to Table 3, because it depicts national personal income rather than rural household income, Table 4 shows a similar but even more skewed income distribution in four large non-Asian LDCs.

Table 4. Size Distribution of Personal Income
Before Tax in Selected Countries
(percentage)

Country	Year	Lowest 20%	Lowest 40%	Middle 40-60%	Highest 20%	Highest 5%
Brazil	1960	3.5	12.5	10.2	61.5	38.5
Colombia	1964	2.2	6.9	9.0	67.8	40.4
Mexico	1963	3.5	10.1	11.1	59.5	28.8
Nigeria	1959	7.0	14.0	9.0	60.9	38.4

Source: Adapted from Felix Paukert, "Income Distribution at Different Levels of Development: A Survey of Evidence", *International Labour Review* 108 (Aug.-Sept., 1973): 114-115.

Some of the implications of an income distribution that is highly skewed toward the upper income brackets are:

- 1) Concentrations of wealth generally go hand-in-hand with control of economic resources and the political decision making process. Therefore, besides the current welfare and equity concerns, there are also implications regarding the political feasibility of future change.
- 2) Consumption patterns of the wealthy in the LDCs tend to be biased toward imported products. The availability of scarce foreign exchange for productive domestic investment, which might generate additional employment, is reduced unless imports are restricted.

- 3) There is growing evidence that in terms of domestic products, consumption patterns of the wealthy are biased toward sophisticated luxury goods, manufactured under conditions of highly capital intensive technology which do not provide many jobs.^{23/}
- 4) If income redistribution were effected in favor of the poorer classes, where income elasticities of demand for food are expected to be higher than in the general population, a substantial increase in the domestic demand for agricultural products could result.
- 5) Data from the more developed countries strongly suggest that savings and investment rates are much higher at higher income levels, and thus some serious questions arise concerning economic tradeoffs between economic growth rates and employment and income distribution. For various reasons, however, increased questioning of the importance of this propensity to save and invest among the wealthy of the LDCs is now appearing in the literature.^{24/} This questioning revolves primarily around whether the wealthy in LDCs do in fact save significant amounts, in what form they do so, and what kinds of investments they make.

^{23/} See research reports from Rice University-USAID contract work, including Tuncay Sunman "Short-run Effects of Income Distribution on Some Macro-Economic Variables: The Case of Turkey", Discussion Paper No. 46; Ronald Soligo, "Factor Intensity of Consumption Patterns, Income Distribution, and Employment Growth in Pakistan", Discussion Paper No. 45; Ronald Soligo, "Consumption Patterns, Factor Usage and the Distribution of Income: A Review of Some Findings", paper presented at Southern Economic Association Meetings, November, 1974 (mimeo).

^{24/} See, for example, Uma J. Lele and John W. Mellor, "Jobs, Poverty, and the Green Revolution", *International Affairs* 48 (January 1972); ILO, *Full Employment....Colombia, op. cit.*; William Cline, "The Potential Effect of Income Redistribution on Economic Growth in Six Latin American Countries", USAID Research Paper, Document No. V-62, Washington, D.C., 1970; John R. Eriksson, "Employment and Development: The Problem and Some Policy Alternatives", USAID Research Paper, Washington, D.C., October, 1971 (mimeo).

Magnitude of Unemployment.

Reliable information on the levels of unemployment, even for urban areas, is very scarce. For *rural* unemployment, and particularly underemployment, little confidence can be placed in the available statistics.^{25/}

Among the major reasons for this dearth of information, particularly in rural areas, is the poorly developed communication system in many LDCs; the lack of a well-trained and adequately staffed government agency charged with the responsibility of collecting, maintaining and analyzing such data; and conceptual problems of measurement, including adequate techniques for data collection.^{26/} Also, until relatively recently, the problems of rural unemployment, underemployment, and the concomitant conditions of poverty have received only limited official notice.^{27/}

A number of estimates of the level of unemployment have been made, however, and these provide some 'feel' for the extent of the problem in the major LDCs. Estimates for selected Asian countries are presented in Table 5.

^{25/} Typical of the comments of experienced researchers in this field is that of Yudelman who has observed that "...most official statistics appear to be of little value in gauging the extent of the underemployment and unemployment that undoubtedly exist within the agricultural sectors of most developing countries". Montague Yudelman, Gavan Butler, and Ranadev Banerji, *Technological Change in Agriculture and Employment in Developing Countries*. (Paris: OECD, 1971) p. 22.

^{26/} Some of the problems of measurement and definition are addressed in Appendix I.

^{27/} For example, in 1970 only six of the twenty-two countries of Latin America were regularly publishing data on unemployment in any of its forms (Argentina, Chile, Colombia, Costa Rica, Panama, and Trinidad/Tobago) and of these, Argentina and Colombia confined their surveys to urban areas. See Organization of American States, "The Unemployment Problem in Latin America", Department of Social Affairs, General Secretariat of the OAS, Washington, D.C., March 3, 1970 (mimeo). Page 4 of this document presents a table which estimates unemployment levels in a number of Latin American urban areas in recent years, generally 1966-69.

Table 5. Estimates of Unemployment and Underemployment
in Selected Asian Countries
(percentage)

Country	Year	Open Unemployment ^{1/}			Underemployment ^{2/}		
		Total	Rural	Urban	Total	Rural	Urban
India	1971	3.9	4.2	2.7	8.2	8.9	5.4
Indonesia	1971	8.8	8.2	12.6			
Korea	1972	4.5	1.0	7.5	30.7	40.6	14.8
Malaysia	1974	4.6	4.0	5.8	7.3	8.9	3.5
Pakistan	1970	2.0	1.8	2.9	25.9	28.0	18.7
Philippines	1972	6.3	3.3	9.8		13.0	11.7
Thailand	1973	0.4	0.3	1.5	18.3	18.0	20.1

^{1/} Open unemployment is expressed as a percentage of the labor force.

^{2/} Underemployment is expressed as a percentage of the employed.

Sources: See Appendix II for sources and additional explanatory notes.

Examples for other regions of the world are noted below. A recent FAO publication reports total unused labor in Latin America (including underemployment converted to an unemployment equivalent) of approximately 28 percent of the labor force in 1970. Open unemployment was estimated at 8.9 percent and underemployment converted to an unemployment equivalent at 19.3 percent.^{28/} Estimates reported by Lederman of open unemployment in 1965 range from 5-10 percent for the various countries of Latin America.^{29/} Thorbecke places involuntary unemployment in Latin America in 1960 at over 9 percent, and unemployment plus underemployment at 25 percent (sixty percent of which is found in agriculture).^{30/} To arrive at this aggregate

^{28/} FAO. *Agricultural Employment in Developing Countries*, Agricultural Planning Studies No. 16 (Rome: Food and Agriculture Organization of the United Nations, 1973) citing studies by the Instituto Latinoamericano de Planificacion.../Centro Latinoamericano de Demografia, pp. 7-10.

^{29/} Esteban Lederman. *Hacia una política de los recursos humanos en el desarrollo económico y social de América Latina*. (Santiago: Instituto Latinoamericano de Planificacion Economica y Social, July 1968) p. 8.

^{30/} Erik Thorbecke. "Unemployment and Underemployment in the Developing World," Pearson Conference Document No. 29, Columbia University Conference on International Economic Development, February, 1970 (mimeo).

figure, Thorbecke estimates the labor required to produce a given output and considers any available manpower over this amount to be the 'unemployment equivalent'.

Specific examples for individual Latin American countries include a recent OAS paper citing a lack of employment opportunities in rural areas of Peru such that "...people must live off the little that can be grown and [they have] work only 80, 100, or 150 days a year...." ^{31/} An average of only slightly over 100 man/days per member of the agricultural labor force per year are thought to be used for productive purposes in Peru, and 140 man/days per year in Guatemala, thus yielding an effective employment rate of only 57 percent and 70 percent respectively for the two countries in 1965.^{32/} A 1966 CIDA study concludes that over one-third of the man hours available in Chilean agriculture either goes unutilized or is not utilized productively.^{33/}

In terms of overall numbers of unemployed persons in the LDCs (both rural and urban), censuses taken around 1970 show a worsening of the open unemployment situation, rising from over 36 million in 1960, to nearly 50 million in 1970.^{34/} This increase is occurring primarily in the poorer countries of Asia and Africa, and appears likely to worsen in the coming years. Since open unemployment is only the tip of the iceberg compared to the numbers suffering from underemployment, reliance on measures of open unemployment for policy guidance will inevitably result in underestimation of the gravity of the situation and in inadequate ameliorative actions.

Agriculture's Employment Role.

Given the sheer size of the agricultural sector *vis a vis* the other sectors of the economy, as well as the rapid rates of population growth, in the short run agriculture must somehow absorb a significant portion of the annual increase in labor supply. However, agricultural employment has failed to maintain pace with population growth, and agricultural productivity has outdistanced agricultural employment in many countries. This is illustrated in Table 6 for Latin America.

^{31/} OAS. *The Unemployment Problem in Latin America*, UP/Ser. H/VII. 79 (March 3, 1970), citing a study entitled "Informe preliminar sobre el desempleo o el subempleo en Lima Metropolitana".

^{32/} E. Thorbecke and E. Stoutjesdijk. *Employment and Output: A Methodology Applied to Peru and Guatemala*, (Paris: OECD, 1971), pages 134 and 148. Calculations are based upon the conservative assumption that every member of the economically active population in agriculture has only 200 man/days per year to devote to agricultural production.

^{33/} CIDA. *Chile: Tenencia de la tierra y desarrollo socio-económico del sector agrícola*. (Santiago, 1966).

^{34/} ILO. *Time for Transition...*, *op. cit.*, p. 18.

Table 6. Annual Growth Rates in Employment and Output
by Sector in Latin America, 1960-69

Sector	Employment (1)	Output (2)	Elasticity of Employment (1)/(2)
	-----Percentage-----		
Agriculture	1.5	4.0	0.4
Mining	2.2	4.2	0.5
Manufacturing	2.3	5.9	0.4
Construction	4.0	5.0	0.8
Transport & Public Utilities	3.4	5.4	0.6
Commerce & Finance	4.1	5.1	0.8
Misc. Services	4.0	3.9	1.0
Unspecified Services	8.2	7.3	1.1
Aggregate Employment & Output	2.8	4.8	0.6

Source: Table 3 in Edgar Edwards (ed), *op. cit.*, p. 15.

As shown in Table 6, the elasticity of employment is low for both agriculture and the manufacturing sector, whereas the services sector has a high employment elasticity. Unfortunately, much of the available employment in the services sectors of the LDCs is not very productive nor is it particularly remunerative. Nevertheless, numerous studies have shown the tendency for labor released by the agricultural sector to flow directly into services rather than into modern industry as the early models had predicted. In Colombia, in the 1960s, the total active labor force was increasing by approximately 200,000 per year. Agricultural employment was expanding by about 30,000 per year and employment in the modern manufacturing sector by less than 10,000 per year. The remaining 160,000 were being absorbed by construction, handicrafts, and services -- or joining the ranks of the unemployed.^{35/}

Although the long term solution to the employment and income problem must be sought through providing increased job opportunities in the modern sector (both agricultural and non-agricultural), there is considerable question as to how to address the immediate problem in the short run. Without substantial structural changes, manufacturing can not be expected

^{35/} ILO. *Towards Full Employment.... Colombia, op. cit.*, p. 25.

to absorb a significant share of the growing labor force. For Latin America as a whole, Ramos estimates that whereas the manufacturing share of national output rose from 16 percent to 25 percent between 1940 and 1970, its share of employment remained almost constant at approximately 14 percent.^{36/}

At the present time, a great disparity exists in the absorptive capacity for labor in agriculture as evidenced by numbers of workers employed per arable hectare in various countries. Taiwan and Japan, for example, employ two agricultural workers per hectare whereas India and Pakistan average only one. Labor absorption capacity in agriculture appears to be strongly influenced by a number of factors, including technology (e.g. availability of irrigation, commercial fertilizers, improved varieties, extent and nature of mechanization), markets for labor intensive crops, land-holding patterns, cultural patterns and traditions (e.g. livestock grazing vs. crop production), soil types and rainfall distribution, and government policies -- particularly those dealing with investment, credit, import and export controls, and exchange control.

^{36/} Joseph Ramos. "An Heterodoxical Interpretation of the Employment Problem in Latin America", (mimeo). For the LDCs, as a whole, the ILO estimates that in 1970 the industrial work force constituted only about 13 percent of the total work force; thus, even very substantial annual growth rates in industrial employment would still have a relatively limited impact on the employment problem. Without employment creation in the rural sector, the problem is probably insoluble. See ILO, *Time for Transition.... op. cit.*, p. 21.

*III. POLICY AND INSTITUTIONAL CONSTRAINTS
TO INCREASED EMPLOYMENT*

A number of key policy areas and institutional arrangements that operate as constraints to increased employment in most of the LDCs become evident from a review of development patterns. Some of the more important among these are identified and briefly discussed in this section.

Factor Price Distortions

Capital Intensive Bias.

Most LDCs are characterized by the existence of fairly substantial market imperfections -- some caused by communication and transportation difficulties, but many resulting directly from government policies. Among the latter, underpricing of capital in terms of its real opportunity cost is a common tendency, thus encouraging capital intensive projects, sectors, and technologies. Artificially low capital prices may be achieved in a variety of ways, including low interest government credit policies, over-valued domestic currency and manipulation of multiple exchange systems, tax policies, trade policies, and special fiscal incentives such as direct subsidies.^{37/}

From an historical perspective, the strong move during the 1950s and 60s toward import substitution as a growth strategy explains, at least in part, the current bias toward capital intensive forms of production.^{38/} This strategy emphasized the promotion of the industrial-manufacturing sector, and was supported by a package of policies designed to accomplish

^{37/} For useful discussions of some of these areas, see Schuh, "General Economic Policy as a Constraint...", *op. cit.*, and Walter P. Falcon, "Agricultural Employment in Less Developed Countries: General Situation, Research Approaches, and Policy Palliatives", Economic Staff Working Paper No. 113, World Bank, Washington, D.C., April, 1971. Falcon cites specific examples of improper pricing policies in Pakistan and Ghana, and discusses the disruptive influences which they exerted on development, as well as the negative impacts on employment.

^{38/} The tendency towards capital intensive investment bias is identified as a major problem area by Gustav Ranis and his ILO study team in the previously cited 1974 study of the Philippines, and by the ILO mission to Colombia headed by Dudley Seers. See also Ian Little, Tibor Scitovsky, and Maurice Scott, *Industry and Trade in Some Developing Countries: A Comparative Study*, (London: Oxford University Press, for the OECD, 1970).

this objective. Distrust of the market mechanism as an effective allocative device led, in many countries, to a strong degree of public intervention designed to channel investment in the desired direction. Foreign assistance agencies contributed to the bias by aid-tying provisions and through a natural desire to be identified with visible and successful projects, which led them to favor large projects located in or near major urban centers. Individual foreign advisors and contractors also encouraged the adoption of advanced technology which relied heavily on machines and conserved labor -- a natural tendency given their training and experience in work environments where factor proportions and relative prices favor capital over labor.

Price of Labor.

Increases in wage rates have resulted from government labor legislation, often patterned after that of the more developed countries. Wages have been affected by legislation on: unionization and contracts, civil service classifications, minimum wage laws, severance and vacation pay, disability allowances, maternity leave, pensions, funeral expenses, and even free shoes and work clothing.^{39/}

Legislation is undoubtedly needed to protect labor from exploitation. One of the results of much of the legislation, however, is that a large percentage of the labor force is effectively barred from participation. The ILO mission to Colombia, for example, finds that some of these features of labor legislation have encouraged employers to rely on overtime rather than expanding their labor forces. A high percentage of the *employed* population works very long hours -- 40 percent working 48-63 hours per week -- in the presence of growing numbers of unemployed. Job protection provisions may also encourage employers to hire only on a temporary basis.

Labor legislation, for the most part, does not apply to rural areas or even to the traditional sector in urban areas. Therefore, a very substantial gap exists between the wages of those employed in the modern sector and the rest of the labor force. Todaro hypothesizes that rural labor, hearing of the wage structure in the urban modern sector, is encouraged to migrate by the *expectation* of high wages. However, having inadequate knowledge of the scarcity of openings and the barriers to entry, the average migrant may have to wait a substantial period of time before obtaining such a job.^{40/}

^{39/} David T. Geithman and Clifford E. Landers. "Obstacles to Labor Absorption in a Developing Economy: Colombia, A Case in Point", *Journal of Interamerican Studies and World Affairs* 15 (August 1973): p. 311. In a personal communication to the author, G. E. Schuh observes that payroll taxes represent an important disincentive to employment in many countries, noting that in Brazil they have the effect of doubling the cost of hiring labor.

^{40/} Michael Todaro. "A Model of Labor Migration and Urban Unemployment in Less Developed Countries", *American Economic Review* 59 (March 1969): 138-148.

Other Input and Product Price Distortions.

Efficient functioning of both factor and product markets in the agricultural sector of many LDCs has been adversely affected by government policies, and in some instances this has had a negative impact upon employment. An example of the disruptive effect which export taxes and the manipulation of multiple exchange rates can have on the marketing of agricultural products may be found in the Uruguayan case.^{41/}

The practice of granting to private individuals or government agencies monopoly distribution privileges for agricultural inputs has often resulted in prices to the producer which are substantially higher than prevailing world market prices. Tariffs are also commonly imposed against the import of such inputs from abroad, to protect an inefficient domestic industry. This tends to reduce the intensity of agricultural production and thus reduce farm labor requirements, though perhaps increasing employment in the industrial sector. Rosenstein-Rodan argues that the domestic terms of trade in the LDCs between industry and agriculture are even more unfavorable to agriculture than are the international terms of trade; thus, he views the lowering of industrial prices as the most important condition for stimulating agricultural expansion and its employment potential.^{42/}

Access to Productive Resources

Given the burgeoning populations and concentration in rural areas in the LDCs, access to arable land is likely to become an increasingly serious problem. The FAO estimates that for the LDCs as a whole arable land per economically active person in agriculture in 1961-63 was 1.7 hectares and

^{41/} See Russell H. Bramon. *The Agricultural Development of Uruguay: Problems of Government Policy*. (New York: Frederick A. Praeger, 1968) pp 224-33. Commodities affected in Uruguay have included wool, linseed, barley, sunflowers, oats, hides and skins, etc. Export taxes have been used both as a technique for generating government revenue and as a means of implementing a cheap food policy for urban consumers. Export controls on beef have supported this policy in Uruguay. The export tax on rice in Thailand appears to have played a similar role. Cheap food for urban consumers translates back to lower producer prices, reduced production, and lower employment. Falcon cites a different situation in the case of Pakistan, wherein the price of wheat was maintained at a level substantially above the world market price while cotton traded at the official exchange rate. As a result, wheat production was substituted for cotton and, since it is less labor intensive, employment was reduced. See Falcon, *op. cit.*, p. 10.

^{42/} Paul N. Rosenstein-Rodan. "Planning for Full Employment in Latin America", Ch. 6 in *Latin American Prospects for the 1970's: What kind of Revolutions*, David H. Pollock and Arch R. M. Ritter (eds.) (New York: Frederick A. Praeger, 1973).

expects this to decline to 1.6 hectares per person by 1985.^{43/} A substantial variation exists among different countries and regions. For the same time periods, estimates of land-man ratios for the various regions are as follows: *Africa* - a decline from 2.5 hectares/person to 2.3 hectares/person; *Far East* - 1.1 hectares to 0.9 hectare; *Near East* - 2.6 hectares to 2.2 hectares; *South America* - an increase from 4.7 hectares to 5.5 hectares. South America's predicted increase is expected to occur principally in Brazil, Argentina, and Uruguay as a result of expanded arable land combined with a generally low rate of growth of the agricultural labor force, particularly in the latter two countries. These figures are simply averages derived by dividing estimated arable land areas by estimated agricultural labor forces. They tell only a portion of the story, and may be quite misleading in terms of access to the land resource and in their implications for labor absorption.

Land-holding Patterns.

There is little question that a highly unequal distribution of land exists in many LDCs. A few examples suffice to illustrate the situation. Table 7 provides data for selected Asian countries.

Table 7. Pattern of Land Distribution
for Selected Countries of Asia

Country	Year	0-1 hectares		Over 10 hectares	
		<u>Farms</u> (percentage)	<u>Area</u>	<u>Farms</u> (percentage)	<u>Area</u>
Bangladesh ^{1/}	1974	66.0	24.0	2.0	11.0
India ^{1/}	1970/71	51.0	8.0	4.0	31.0
Indonesia ^{2/}	1963	70.1	28.7	0.7	12.5
Pakistan ^{2/}	1960	32.9	3.5	7.9	42.7

Source: 1. FAO, *Periodic Progress Report of the Agricultural Census Programme No. 7*, February, 1976.

2. FAO, *Report on the 1970 World Census of Agriculture*.

Distribution of land within regions of countries may represent even greater concentration than that reflected in national statistics. Griffin cites studies of rice farms in the Philippines (Bulacan and Nueva Ecija) where 10 percent of the farms control 58 percent of the land, and in the

^{43/} FAO. *Agricultural Employment in Developing Countries*, Agricultural Planning Series No. 16 (Rome: FAO, 1973) pp. 14-15. Data are cited from *Provisional Indicative World Plan..... op. cit.*

Punjab of Pakistan (the richest agricultural region) where over 20 percent of the land is owned by less than one percent of the land owners.^{44/}

In Latin America, except in those countries where major land reforms have been carried out, typically about 3-4 percent of the landowners hold 60-80 percent of the agricultural land.^{45/} The ILO mission to Colombia found that in that country 45 percent of the cultivated land and pastures was held by only 1.2 percent of the people, whereas 65 percent of the people (approximately 58 percent farmers or sharecroppers and 7 percent landless) were on 5.5 percent of the land.

In countries where 50 percent or more of the population are dependent upon agriculture for a living, this high concentration of land ownership is likely to constitute a major causal factor of unequal income distribution. It is also probable that income distribution patterns exert a strong influence on employment opportunities. As Edwards notes, this influence manifests itself primarily in terms of patterns of domestic demand, and possibly by changing the magnitude of savings, the proportion invested within the country, and the form and location of that investment.^{46/}

If the posited relationship between land ownership patterns and the present distribution of incomes is correct, and if the relationship between income and consumption patterns is one in which increased equality of income results in increased demand for labor intensive products, then land reform must inevitably be considered an important ingredient in any overall employment strategy.

Recognition of the importance of land reform increasingly appears in the literature of development and employment. The ILO study team to the Philippines identifies land reform as one of the major requirements for more equitable income distribution and subsequent increased incentives for agricultural productivity. Similarly, the ILO mission to Colombia recommends land reform as a policy tool for absorbing more of the growing labor force and for limiting expenditures of the very wealthy. The mission

^{44/} Keith Griffin. *The Political Economy of Agrarian Change: An Essay on the Green Revolution* (Cambridge, Mass.: Harvard University Press, 1974) p. 18.

^{45/} M. J. Sternberg. "Agrarian Reform and Employment with Special Reference to Latin America", in ILO, *Agrarian Reform and Employment* (Geneva: 1971).

^{46/} Edwards, *op. cit.*, p. 22. Several recent studies by FAO and others suggest that a more equal income distribution would substantially increase the domestic demand for agricultural products because of the relatively high income elasticity of demand for food at lower income levels, and would also increase demand for the less sophisticated, more labor intensive industrial products. Thus, increased employment opportunities would be generated in both the agricultural and the non-agricultural sectors.

stresses the importance of a strategy designed to provide increased opportunity for family farms to participate in commercial production both for the domestic market and for export. Most of the participants in the world-wide Ford Foundation sponsored seminars on employment in the LDCs, as reported by Edwards, feel that small family farms supported by efficient delivery systems for inputs, credit, and technical information provide the best use of the land resource. The widely prevailing system of absentee landlords is criticized as being injurious to both employment and efficient land use. Griffin argues that:

"...an unequal distribution of land ownership, a defective tenure system, and privileged access to the capital market may combine to give landowners monopsony power over labour and where this occurs the result will be lower wages and less employment than would otherwise be the case. Surplus labor -- or strictly speaking, underemployment -- in these economies is a product of land tenure and market structure and not, as is often believed, a product of high population densities".47/

Various participants in the USAID sponsored conference on employment and unemployment in the Near East and South Asia also note the need for land reform in that region, as governments address the growing employment problem.48/

Land reform is an emotionally charged issue, and one which has been surrounded by more rhetoric than effective government action. Dorner and Felstehausen note, for example, that although Colombia has had an agrarian reform program in effect for a number of years, it:

"...has not changed either the skewed distribution of land ownership or the trend toward greater subdivision of already tiny farm holdings in the mountains. The law never was designed to address the problems of unemployment or the question of more labour-intensive methods of production. Migration of surplus labour to urban areas has continued at a high rate following the agrarian reform".49/

47/ Griffin, *op. cit.*, p. 31.

48/ Ridker and Lubell, *op. cit.*

49/ Peter Dorner and Herman Felstehausen. "Agrarian Reform and Employment: The Colombian Case", *International Labour Review* 102 (1970): 224.

Feder refers to Latin America's efforts at land reform during the 1960's as:

"...an unqualified failure...Actually farmers receiving land from the governments' land reform institutes are outnumbered by new families joining the poor rural proletariat by a ratio of something like 20 to 1".^{50/}

Strong reservations towards land reform often are couched in terms of anticipated reductions in economic efficiency. In the developed countries, where both capital and land are abundant relative to labor, efficiency is measured primarily in terms of returns to the human agent. The LDC factor endowment is quite different, however. In the LDC setting of surplus and increasing labor supplies, and scarce and diminishing arable land, productivity per unit of land may well be the more relevant measure of efficiency.

Dorner and Felstehausen ^{51/} cite studies from Brazil, Colombia, and Mexico which show output per unit of land to be inversely related to farm size, and studies in Mexico, Venezuela, Chile, and Peru which suggest that agricultural employment can be increased substantially by a land redistribution program. Dorner and Kanel ^{52/} cite additional data from studies conducted by various researchers in Guatemala, Japan, Taiwan, and the Philippines which furnish further support for the existence of a negative relationship between farm size and productivity per hectare. Similar findings are reported from Indonesia, Malaysia, Thailand, and India.^{53/}

^{50/} Ernest Feder. "The Campesino is Still Waiting", *CERES* 2 (1969): 25-29. In a subsequent publication, Feder estimates that at the current rate of land re-distribution, in order to settle only 75 percent of those poor families existing in 1960, it would require 155 years in Honduras, 34,000 years in Brazil, and 1,300 years in Colombia, and these projections do not take into account annual natural increases. See Ernest Feder, *The Rape of the Peasantry* (Garden City, N.Y.; Anchor Books Inc., 1971).

^{51/} Dorner and Felstehausen, *op. cit.*, pp. 230-31.

^{52/} Peter Dorner and Don Kanel. "The Economic Case for Land Reform: Employment, Income Distribution, and Productivity", in Dorner (ed.) *Land Reform in Latin America: Issues and Cases* (Madison, Wisconsin: Land Economics, 1971). See also Peter Dorner, *Land Reform and Economic Development*, Chapter 4, "Land Reform and Agricultural Employment" (Baltimore: Penguin Books, 1972).

^{53/} Achmad T. Birowo, "Employment and Income Aspects of the Cropping System in Indonesia", *The Philippine Economic Journal* 27 (1975); the Muda River survey of 762 farms in Malaysia in 1972/73; Pan A. Yotopoulos and Kamphol Adulavidhaya, "The Green Revolution in Thailand: With a Bang or With a Whimper?", Food Research Institute, Stanford University, June, 1975 (draft mimeo); Bela Mukhoti, "Agrarian Structure in Relation to Farm Investment Decisions and Agricultural Productivity in a Low-Income Country -- the Indian Case", *Journal of Farm Economics* 48 (1966): 1211-1215.

Other recent studies, however, suggest that the impact of green revolution technology may have modified this inverse relationship somewhat.^{54/} In those cases where a positive relationship exists, the yield superiority is usually small, and may be due to superior access to the necessary inputs to exploit the yield advantages of the new technology rather than scale advantages *per se*. Furthermore, a number of studies reveal higher cropping intensities on smaller holdings, and thus greater output per unit area per year, as well as greater labor use.

Any changes in government policies which result in the improvement of the economic welfare of some members of a society at the expense of others are going to encounter strong resistance. This resistance is likely to be particularly well organized and effective when the proposed legislative changes favor the disadvantaged classes of society at the expense of the established power groups -- as is the case in the majority of land reform efforts. Thus, as Edwards has observed,

"It is precisely the problem of political feasibility which accounts for much of the observable gap between professional knowledge about employment strategies and the programs which are in fact introduced, enforced, and implemented".^{55/}

Other Resources.

Although precise quantification is difficult, observations from a number of countries suggest that access to land and to other productive resources tend to go hand in hand. Large, wealthy landowners therefore often receive a disproportionate share of the technical advice and assistance provided through government agencies, as well as favored access to institutional credit. Studies by Vyas and by the National Council of Applied Economic Research in India bear this out, as do studies in Taiwan by Yu and Lee, in Nepal by the Rashtra Bank, in West Malaysia by Williams,

^{54/} For examples of studies showing a positive relationship between farm size and productivity, see V. S. Vyas, *India's High Yielding Varieties Programme in Wheat 1966-67 to 1971-72*, CIMMYT, Mexico City, 1975; Mahmood Hasan Khan, *The Economics of the Green Revolution in Pakistan* (New York: Praeger Publishers, 1975); the Korean Office of Rural Development also reports somewhat higher yields per hectare for larger farms in a 1974 survey of 12 villages growing the HYV's.

^{55/} Edwards, *op. cit.*, p. 23.

and in Pakistan by Khan.^{56/}

In Colombia, more than half of the institutionalized credit goes to fewer than 10 percent of the borrowers.^{57/} Another study in Columbia finds that small farmers would readily absorb more production credit, if available, but that the

"...close positive relationship between the farmers' assets and the credit which he can obtain, and the negative relationship between assets and the total costs of credit, together make it very difficult for farmers with little economic backing to change their technology or their present patterns of low-profit crops".^{58/}

A third study in Colombia, by Thirsk, reaches similar conclusions, and his analysis of production function data suggests further that the marginal productivity of credit is significantly higher on small farms than on large estates.^{59/}

A contributing factor to the scarcity of credit for small farmers is the inflation rates which many LDCs chronically confront. When the inflation rate is greater than the nominal interest rate on institutional credit,

^{56/} V. S. Vyas, *op. cit.*; National Council of Applied Economic Research, *Credit Requirements for Agriculture*, New Delhi, 1970/71; Terry Y. H. Yu and C. S. Lee, "Agricultural Technology and Income Distribution in Taiwan", in T. H. Shen (ed.) *Agriculture's Place in the Strategy of Development: The Taiwan Experience* (Taipei: JCRR, July, 1974); Nepal Rashtra Bank, *Agricultural Credit Survey, 1972*, Vol. IV; John C. Williams, "The Structure and Development of Rice Production in West Malaysia -- A Study of Social and Economic Interaction by Factor Analysis", unpublished Ph.D. dissertation, University of Pennsylvania, 1974; Mahmood H. Khan, *op. cit.*

^{57/} República de Colombia. "Los problemas de crédito agropecuario y el desarrollo económico en Colombia", paper presented at the Latin America Seminar on Rural Credit held in El Salvador, October, 1968 (mimeo).

^{58/} H. G. Zandstra, K. G. Swanberg, and C. A. Zulberti. "Some Experiences with Efforts to Increase Small Farm Production in Colombia", paper presented at the Canadian Agricultural Economics Society Annual Meeting, Brandon, Manitoba, June 22-25, 1975 (mimeo).

^{59/} Wayne R. Thirsk. "Agricultural Policy and Income Distribution in Colombia", University of Manitoba, February, 1975 (mimeo). Thirsk notes that his production function data were limited, and thus the results not conclusive. However, studies in other countries tend to support the hypothesis that the productivity of credit on small farms is greater. See, for example, USAID *Guatemala Farm Policy Analysis: The Impact of Small-Farm Credit on Income, Employment, and Food Production*, Analytical Working Document No. 10, Sector Analysis Division, Bureau for Latin America, April, 1975. This study finds that the average income superiority of small credit farms (0-10 hectares) was 63% in the central highlands.

the effective real interest rate becomes negative.^{60/} As Schuh points out, government credit, in such a situation, provides to those who can qualify a subsidy for capital. This encourages more capital intensive techniques than otherwise would be adopted, and results in decreased employment opportunities in agriculture. Furthermore, since the price of credit no longer acts as an effective rationing mechanism, bankers resort to nonprice rationing and allocate credit on the basis of nepotism and friendship -- with the result that most of the credit flows to large farmers and those only marginally associated with farming.^{61/}

Credit access for small farmers as a strategy for hastening modernization of the rural sector, intensification of agricultural production, and ultimately increased employment opportunities and improved income distribution patterns, is important. Without credit, widespread small farmer participation in the production-increasing new technology surrounding the green revolution may be greatly slowed or even barred, since a package of technical inputs including commercial fertilizers, pesticides, irrigation, etc. is essential to success.^{62/}

Abercrombie has concluded that, from a world-wide perspective, institutional and structural policies can be the most effective weapons for influencing technology and employment. The way in which these are altered will determine the capacity of the agricultural sector to generate employment opportunities. He shows particular concern over the need to:

"...correct the current bias in the provision of extension, credit, marketing, and other government services, and begin to concentrate them on the labour-intensive small farm sector".^{63/}

^{60/} Argentina is a case in point. During the late 1960's, interest rates on agricultural loans granted by the Bank of the Nation ranged from 12-15 percent, but the average annual rate of inflation in Argentina between 1955 and 1965 was 23.4 percent. Thus, the demand for credit was quite high, but bankers were unwilling to lend except on a short-term basis and then only to the most credit worthy of borrowers. See Darrell F. Fienup, Russell H. Brannon and Frank A. Fender, *The Agricultural Development of Argentina: A Policy and Development Perspective* (New York: Frederick A. Praeger, Publishers, 1969) pp. 332-36.

^{61/} Schuh, "General Economic Policy.....", *op. cit.*

^{62/} Gotsch reports that in Pakistan subsidized credit available for the purchase of tubewells has been heavily biased in favor of large farmers. As a result "...small farmers apply less water per acre and, among other things, lose the important physical complementarities that exist in the green revolution package". See Carl H. Gotsch, "Technical Change and the Distribution of Income in Rural Areas", *American Journal of Agricultural Economics* 54 (May 1972): 333-34.

^{63/} K. C. Abercrombie. "Population and Rural Employment", a paper presented at the Seminar on Population and Food and Agricultural Development, Rome, December 1-5, 1975 (mimeo).

Abercrombie feels that in order to accomplish this, an effective redistribution of land through agrarian reform must be carried out.

Improving access to productive resources on a more equitable basis is a key to amelioration of the worsening employment problem. However, the problem is highly complex and the major variables are strongly inter-related. Furthermore, the political feasibility of major structural changes is highly questionable, at best.

IV. TECHNOLOGICAL IMPACTS UPON EMPLOYMENT

Technological changes have the potential for exerting strong influence on employment opportunities. In a dynamic economy operating somewhere near the full employment level, having a relatively high consumer demand, and exhibiting reasonably equitable distribution of income and access to resources, technological change rarely creates any serious, widespread, and lasting unemployment. There may, of course, be severe shocks in limited areas of economic endeavor, but in a growing economy new jobs are constantly being created in other areas and -- with some adjustment time -- most of those displaced by new technology are able to find employment. In fact, the new technology often has the long-run effect of substantially expanding total employment opportunities as jobs are created in heretofore unknown fields.

However, given some of the serious problems resulting from historical land-holding patterns, large rural populations, and skewed income distributions, reinforced by entrenched institutional arrangements and complementary government policies which are commonplace, the employment impacts of new technology in the LDCs need to be weighed with a great deal more care.

Prediction of future impacts -- or even reliable *ex poste* assessments of the individual impacts of specific components of technological change -- are complicated by the close interrelationships which exist among these components. For example, in attempting to measure the employment effect of agricultural mechanization, the contributions and influences of a number of variables need to be examined and where possible separated. The more important variables include: the new high yielding varieties (HYVs); inputs of chemical fertilizers and pesticides; farm size; availability of irrigation; differing education levels and management skills of the human agent, availability of credit and technical assistance. The impact of mechanization on employment is also influenced by such factors as the *type* of mechanization (tractorization, threshers, pump-sets, etc.), the existing cropping pattern, soil type, rainfall distribution, labor availability in the particular geographic area, and whether the focus is upon the short run or the longer term. Similar problems are encountered in assessing other forms of technological change in LDC agriculture. As a result, researchers in different countries, or in different regions within the same country, often arrive at what appear to be conflicting conclusions.

No attempt is made at an in-depth study of this complex problem in this paper.^{64/} Rather, some of the major considerations are set forth, field data from selected countries are cited, and a synthesis of some generalized observations based upon available studies is made. Such observations, however, are tentative and inconclusive.

Agricultural Mechanization

Availability of Suitable Machinery and Equipment.

Historically, a high percentage of the agricultural machinery and equipment used in the LDCs has been imported from the developed countries and has been designed specifically to meet the existing needs in the countries of origin. Due to the small size of the individual LDC market, economic incentive for manufacturers in the industrialized nations to modify or adapt the machinery produced to better meet LDC needs has been inadequate. The small size of the internal market has also made it difficult for domestic LDC industry to achieve a sufficiently large output to capture potential economies of scale.^{65/} In most LDCs little money has been channeled into research and development efforts to design appropriate equipment. In this respect, Edwards notes:

"It is a fact that over 95 percent of the research and development funds devoted to the development of new technologies, to new methods of combining capital and labor, are spent in the advanced countries, usually under the instruction to save labor because capital is relatively cheap and labor is relatively expensive".^{66/}

With the advent of the international centers, more resources are being devoted to the development of machinery, equipment, and other technology specifically for the LDCs. In some countries small entrepreneurs are producing substantial numbers of small two-wheel walking tractors, irrigation pumps, and other such items. Balis cites the Krishi Power Tiller of India, the Kabota Iron Buffalo of Thailand, the various small tractors of

^{64/} For a detailed analysis, see William C. Merrill, *The Impacts of Agricultural Mechanization on Employment and Food Production*, Occasional Paper No. 1, USAID/TA/AGR/ESP, Washington, D.C., September 1975.

^{65/} In Argentina, for example, during the period 1956-63, national production of tractors averaged only 12,773 units annually, and in 1963 the price in U.S. dollars for an equivalent 50 horse power tractor was \$6,759 in Argentina and \$2,338 in England. Until 1961, manufacturers were permitted to import duty free from abroad up to 45 percent of the parts used in the tractor. See CEPAL-FAO-BID, "Investigación Sobre el Uso de Insumos en la Argentina, Maquinaria Agrícola", Santiago, March, 1965 (mimeo).

^{66/} Edwards, *op. cit.*, p. 17.

the Agricultural Machinery Company of Taiwan, and the IRRI Power Tiller as examples, and there are many others around the world.^{67/} To a large degree, however, an overwhelming dependence upon the often inappropriate technology developed in the industrial countries remains.

Tractorization.

Like the modernization pattern followed by today's more developed nations, the use of tractors in the less developed countries is steadily increasing and will no doubt continue in the foreseeable future. Table 8 provides an indication of the growth in tractor use during the period 1961/65 to 1972.

Table 8. Total Number of Agricultural Tractors
in Use in the LDCs 1961/65 and 1972

Region	Number of Agricultural Tractors in Use	
	1961/65	1972
Africa	90,809	145,800
Latin America	443,207	708,292
Near East	96,388	221,815
Far East	70,245	138,879
Other LDCs	2,763	3,834
Total LDCs	703,411	1,218,620

Source: Constructed from data contained in FAO *Production Yearbook 1973*, Vol. 27, pp. 261-65. These data do not include those countries within the less developed regions which are considered to be developed (for example, Japan, South Africa, Argentina, etc.). If these were included, the total numbers would be increased substantially.

Within a decade the number of tractors in use in the Near East has increased by 130 percent, has nearly doubled in the Far East, and has increased by approximately 60 percent in both Latin America and Africa. Over the same time span, the increased use in the developed countries was approximately 20 percent.

^{67/} John S. Balis. "An Analysis of the Options for Farm Mechanization: Appropriate Technology", USAID, June, 1975 (mimeo). See also Amir U. Khan and Bart Duff, "Development of Agricultural Mechanization Technologies at the International Rice Research Institute", in Lawrence S. White (ed.) *Technology, Employment and Development* (Manila: Council on Asian Manpower Studies, 1974).

The development and spread of other forms of technology in the LDCs, particularly those facilitating multiple cropping, are likely to support and hasten this tractorization process. There is growing conviction, and a considerable amount of supporting evidence, that some forms of tractorization may have serious adverse effects upon employment and income distribution.

Arguments For and Against Tractorization.

Acute seasonal labor shortages occur even in regions of high annual underemployment. Where such shortages are encountered at land preparation time, the use of tractors may permit expansion of the land area under cultivation in any given cropping season. Thus, total annual labor requirements may be increased in such activities as: planting, transplanting, fertilizing, weeding, spraying, cultivation, harvest, transport, and marketing. The importance of timeliness is particularly important in monsoonal regions where land preparation must wait until the coming of the little rains, and must be completed prior to the onset of the true rainy season. Lack of available power for land preparation thus may constitute a constraint on the amount of land that can be planted in a single year. Rapid land preparation with power equipment as one crop is harvested and another readied for planting in a multiple cropping scheme is land augmenting, and holds considerable potential for increasing employment.

In areas where virgin or second growth land is available for clearing, shaping, and bringing into production, power equipment can be effectively utilized to expand the cultivable area. Particular soil conditions such as a clay hard pan may also require power equipment for successful exploitation. Even under 'ordinary' conditions, some would argue that land preparation with power equipment results in significantly higher output because a superior seedbed is provided and weed competition is reduced.

Tractor power does not always substitute directly for *human* labor; it may substitute instead for animal power. Additional land previously needed for producing animal feed is thus released, though human labor to operate the machinery is still required. The argument may also be extended to off-farm employment. New employment generated in the manufacture, sales, distribution, and servicing of tractors and other forms of mechanization may in some instances be adequate to offset, in the economy as a whole, any negative employment impacts at the farm level.

Those who oppose wide-scale tractorization argue that tractors (particularly the medium to large four wheel types) reduce overall labor requirements in agriculture and displace laborers. This displaced labor finds its way to the cities, where it imposes an increasing burden on already overburdened services. Land-owners are encouraged to assume more direct personal control of the farming operation, thus converting renter-tenants to sharecroppers and laborers (i.e. less secure forms of tenure). The result is a worsening of the already highly unequal pattern of rural income distribution. It is also argued that government subsidies, credit

programs, and import policies have distorted factor prices and made tractorization economically attractive for those individuals who have access to the necessary capital, but that these prices reflect neither true resource availabilities in the economy nor efficient allocation of these resources.

Some Empirical Data on Tractorization.

A study of tractor owners in Mysore, India provides some insights as to why farmers in the LDCs purchase tractors.^{68/} In a survey of 39 tractor-owning farm households, 61.5 percent of the owners indicated that timeliness of operations was the prime reason for purchase; another 31 percent identified 'eradication of weeds', 'transportation', and 'bringing more land under cultivation' as the major motives (about 10 percent in each category); and 'scarcity of available farm laborers' was cited by the remaining 7.5 percent.

The problem of timely land preparation in periods of seasonal labor shortage is illustrated by Inukai in Thailand. He reports that although substantial unemployment in rice producing households occurs during much of the year, between the middle of June and the middle of July and during the month of December there are labor shortfalls of 30 percent and 15 percent respectively. These periods coincide with the operations of land preparation, sowing, and transplanting of the two crops grown each year in the particular area studied.^{69/} The experience of the IRRI Multiple Cropping Program indicates that the 'turnaround time' among cooperating farmers in the Philippines varies widely, with some farmers harvesting the first crop of rice and planting a second in as little as two weeks, while others require over two *months*. A long delay negates the advantage of early maturity which has been bred into the variety.^{70/} Research is underway to identify the causes of delayed turn around. If labor shortage is a major factor, this would suggest the importance of appropriate mechanization.

Studies showing favorable on-farm employment impacts of tractorization are scarce. Dawlaty suggests that the introduction of tractors in Afghanistan (all on large farms) on net has been favorable, and that the overall number of laborers employed on these farms has not been reduced as a result.^{71/} However, a down-grading of tenure status of those who had formerly been

^{68/} K. K. Sarkar and M. Prahladachar. "Mechanization as a Technological Change", *Indian Journal of Agricultural Economics* 21 (Jan. - March, 1966): 180.

^{69/} I. Inukai. "Farm Mechanization, Output, and Labour Input: A Case Study in Thailand". *International Labour Review* 101 (1970): 453-73.

^{70/} Discussions with Randolph Barber and Edwin C. Price at IRRI, September, 1976.

^{71/} Khairullah Dawlaty. "The Effects of Tractors on Farm Output, Income, and Employment During the Initial Stages of Farm Mechanization in Afghanistan", Ch. 15 in Ridker and Lubell, *op. cit.*

renters and tenants with decision-making responsibilities to sharecroppers and hired laborers has occurred. The use of the tractors has also been associated with increased irrigation, new seeds, and other changes whose contributions are unclear. The author's conclusion that the net effect of the tractors has been favorable should be viewed in this context. In a small sample study in the Ferozepur District of India, Staub was unable through regression analysis to detect any statistically significant relationship between the use of farm tractors and the quantity of labor employed. He reports that tabular analysis showed farms with tractors employing equal or greater amounts of hired labor than similar sized farms without tractors.^{72/} However, his sample of 150 farms included only 23 with tractors (all large farms), and the ownership of tractors was found to be associated with larger amounts of other purchased inputs and with greater output. Thus, the employment impact of the tractors is clouded.

Studies showing negative employment effects of tractorization are much more common. Abercrombie provides estimates for several Latin American countries, relying on computed *labor requirements* rather than field surveys of actual practice. For Colombia, he estimates that one tractor will potentially reduce employment in the production of major field crops by an average of 5.7 man years; in Guatemala 6.8 man years; and in Chile 4.1 man years. His analysis suggests that the employment impact on farms of more than 200 cultivated hectares is substantially less than for those in the 50-199 range.^{73/} In most LDCs, however, a farm with 50 cultivated hectares is well above the average size.

A study in Pakistan concludes that the use of four wheel tractors results in a labor displacement per cultivated acre ranging from 24 percent down to about 8 percent as farm sizes increase from 25-50 acres to 100-150 acres. An additional effect was the displacement of 4.2 tenant families and the elimination of five jobs per farm by each tractor.^{74/} In Uttar Pradesh (India), Singh and Singh report a 65 percent reduction in family labor use, a 25 percent decline in permanent hired labor, and a 30 percent *increase* in casual labor with the use of tractors. The estimated *net* impact is a 10 percent decline in labor input.^{75/} Another Indian study, of

^{72/} William J. Staub. *Agricultural Development and Farm Employment in India*. (Washington, D.C.: USDA/ERS Foreign Agricultural Report No. 84, January, 1973).

^{73/} K. C. Abercrombie. "Agricultural Mechanization and Employment in Latin America", *International Labour Review*, 106 (1), July, 1972.

^{74/} John B. McInerney and Graham F. Donaldson. "The Consequences of Farm Tractors in Pakistan", IBRD Working Paper No. 210, Washington, D.C., February, 1975.

^{75/} Roshan Singh and B. B. Singh. "Farm Mechanization in Western U.P.", in Herman Southworth and Milton Barnett (eds.), *Experience in Farm Mechanization in South East Asia* (New York: Agricultural Development Council, 1974).

wheat growers in four districts of Punjab, shows a male labor input of 161 hours per acre for those farms without tractor power and 109 hrs. per acre for those with tractors. Female labor was reduced from 18 hrs. per acre to 13.4 hrs. per acre, and bullock power from 61.7 hrs. per acre to 15.6 hrs. per acre.^{76/} This represents a labor displacement of some 30 percent. Assuming a work year of 225 eight hour days (1800 hours), one year of labor (combined male and female) would be displaced by a tractor in a 32 acre wheat operation.

In the Philippines, a small sample survey of rice farmers by Bautista and Wickham reports a reduction of over 45 percent in the human labor required for land preparation (primary and secondary tillage), with the introduction of small two-wheel tractors. The use of rented four-wheel tractors reduced total labor use somewhat more -- approximately 52 percent -- representing a decline of 54 percent in family labor used and 30 percent in hired and exchanged labor.^{77/} Another survey of Filipino rice farmers in Laguna and Central Luzon-Laguna reveals that labor required for land preparation in those areas was reduced by 40 percent and 60 percent respectively as the operation was mechanized.^{78/}

Little firm evidence can be found in the literature to support the argument that, under ordinary conditions, land preparation with power equipment results in significantly higher yields. Multiple interacting variables (improved seeds, fertilization, irrigation, etc.) seriously cloud findings in this area. To the extent that tractorization facilitates the adoption of these other inputs, its contribution to improved yields may be significant.

The argument that the replacement of animal power by tractors frees up additional cultivable land (as well as reducing grain consumption) requires further investigation.^{79/} In Asia, the carabao (water buffalo) seldom is

^{76/} B. Singh. "Economics of Tractor Cultivation: A Case Study", *Indian Journal of Agricultural Economics* 23 (January-March, 1968).

^{77/} Fe Bautista and T. Wickham. "The Tractor and the Carabao: A Socio-Economic Study of the Choice of Power Source for Land Preparation in Nueva Ecija, Los Baños", Philippines, IRRI, July, 1974.

^{78/} R. Barker and V. Cordova. "Labor Utilization in Rice Production", Los Baños, Philippines, IRRI, December, 1976.

^{79/} Increasing costs of purchasing and maintaining draft animals may also be a factor in some countries. The rapid cost increase in the Philippines in recent years is documented in R. Barker, W. Meyers, C. Crisostomo, and B. Duff. "Employment and Technological Change in Philippine Agriculture", *International Labour Review*, August-September, 1972. The even more rapid rise in energy prices in the past few years may exert offsetting pressure.

fed grain. During the cropping season it grazes in areas bordering the rice paddies, on the bunds, and in waste areas under the close supervision of children assigned the task of herding. In the dry season it grazes uncultivated areas and its diet is generally supplemented only with rice straw. Thus, the degree of competition for land and food may not be very great. The situation may differ considerably in other regions of the world -- particularly in temperate zones. Additional empirical field work will be required before a definitive conclusion can be reached.

Few studies have been conducted of off-farm employment generation resulting from agricultural mechanization. Abercrombie suggests that negative employment effects are unlikely to be adequately offset by employment created in the agricultural machinery industry, supporting services, and other linkages. His estimates (which he admits are rather rough) for the eleven countries of the Latin American Free Trade Area are that only about 140,000 people were employed:

"...in the manufacture, distribution, maintenance, and repair of agricultural machinery, including the backward-linked industries producing intermediate goods".^{80/}

Merrill calculates that in 1968 (the year referred to in Abercrombie's data), these 140,000 persons represented only 0.2 percent of total employment, and 0.5 percent of agricultural employment in the countries considered.^{81/} Thus, the negative employment impacts of tractorization would have to be rather small to have been fully offset by tractor manufacture and related activities.

Balis, by contrast, estimates that a *small* tractor mechanization program in Uttar Pradesh, India would result in a *net increase* of 247,000 jobs.^{82/} This program is expected to mechanize some 720,000 farms of the 10-50 acre size range in the region, with an estimated labor displacement of 360,000 agricultural workers. These workers (or more precisely this *number* of workers) plus an additional 247,000 are expected to find jobs in the modern sector. Key assumptions in reaching these conclusions are: a 50 percent increase in grain marketings from the region will result from the increased use of the small tractors; a larger volume of other inputs will be required; growth will occur in consumer goods industries (and thus employment) due to the induced expansion of the economy; the 10-50 acre farms are not large employers of labor, and therefore will not replace their permanent laborers upon purchasing a tractor. How these various estimates have been reached, or how the impact of the tractorization has been analytically separated from the effect of other inputs that presumably will be required to achieve the assumed 50 percent increase in marketed output, is unclear.

^{80/} Abercrombie, *op. cit.*

^{81/} Merrill, *op. cit.*, p. 26.

^{82/} Balis, *op. cit.*

Citing data from manufacturers and users of small two-wheel tractors in the Philippines, Merrill calculates that, at a minimum, the creation of one man-year of non-agricultural employment in the production, sales, and servicing of tractors results in a reduction in on-farm employment of 20-30 man-years.^{83/}

This review of field studies from several LDCs illustrates the paucity of comparable data, the tentative nature of the estimates, and in some cases the questionable nature of the conclusions regarding the employment impact of tractorization. On balance, however, the evidence suggests that the introduction of tractors will have a significant negative effect.

Other Forms of Mechanization.

When the issue of agricultural mechanization is raised, the initial tendency is to think only of tractorization. Mechanization encompasses much more than this, however, and each different form introduces a different effect upon employment. Other forms of mechanization are rapidly being adopted, and some of the employment consequences as reported by researchers in selected countries merit discussion.

A projection of labor requirements by Billings and Singh indicates that, as a result of mechanization, labor requirements in the Punjab of India will be reduced by over 17 percent between 1968-69 and 1983-84 *compared to what would have been needed if conventional practices had been followed.* The greatest labor displacement is expected to occur during the harvest season of April and May, with a decreased labor demand of 25 and 44 percent respectively in these two months -- primarily as the result of the introduction of power reapers and threshers. Calculations assume use of the high yielding varieties and adequate irrigation availability. The authors find that tractors also cause substantial labor displacement during the year, but make the interesting observation that this will prove less socially disruptive because traditionally the farmer and his family prepare the land themselves (thus displacing only their own labor) whereas mechanization of reaping and threshing displaces landless laborers.^{84/}

^{83/} Merrill, *op. cit.*, p. 28. He derives his estimates from data contained in Gordon R. Banta "Comparison of Power Sources in Multiple Cropping", IRRI, Los Baños, Philippines, August, 1973 (mimeo); and Bert Orcino, "Economic Aspects of Hand Tractor Ownership and Operation" a paper presented at the ADC Seminar on Farm Mechanization in Southeast Asia, Penang, Malaysia, December, 1972 (mimeo).

^{84/} Martin H. Billings and Arjan Singh. "The Effect of Technology on Farm Employment in India: A Long Term Perspective", USAID/New Delhi, 1970 (mimeo). The authors estimate that the mechanical wheat threshers are 4-5 times as fast as the traditional threshing practices and thus will be rapidly adopted.

In Pakistan, Lawrence finds that the use of stationary threshing machines using electric motors can reduce the labor required for threshing and winnowing by over 90 percent (i.e. from 55 man days to only 4 man days).^{85/} He suggests that the speedup of this operation may enable farmers to effectively pursue a double-cropping cycle with wheat and cotton which otherwise would have been impossible because of the crucial nature of the timing of the harvest - planting sequence. In West Malaysia, Omar projects a reduction in harvest labor equivalent to 32 percent of the total rural labor force if combine harvesters take over the entire harvest operation.^{86/}

In the Punjab of India, Billings and Singh have estimated the labor reducing impacts of several forms of mechanization as follows: reapers require only 1/5 the man-hours of traditional practices; corn shellers 1/7 the amount; wheat threshers 1/4 the labor; and pump sets 1/4 that used with a Persian wheel.^{87/}

From Indonesia, Timmer reports that in Java a rapid replacement of traditional hand-pounded milling of rice by mechanical processing facilities has occurred. As a result, some 100,000 jobs may have been 'lost' in recent years, in that the return to milling is transferred from the family to the miller.^{88/} To some extent this transfer of activity from the farm to the commercial processor will result in the creation of new jobs in processing, thus mitigating the employment impact.

A sample survey conducted in Rajasthan, India, by Acharya, indicates that irrigating wheat with the use of a pump set, rather than the traditional water lifting device, reduces labor requirements by roughly 35 percent.^{89/} In both India and Pakistan, the spread of tubewells and either diesel or electric powered pumps is having a profound effect upon cropping practices. This form of technology can potentially have a substantial *net* favorable effect upon employment by facilitating more intensive land use,

^{85/} R. Lawrence. "Some Economic Aspects of Farm Mechanization in Pakistan", August, 1970 (mimeo).

^{86/} Afiffudin Bin Haji Omar. "Social Implications of Farm Mechanization in the Muda Scheme", in Southworth and Barnett, *op. cit.* He reports that in 1974 there were only nine combine harvesters in the Muda area, but these machines replaced over 2,000 workers at harvest time.

^{87/} Martin H. Billings and Arjan Singh. "Farm Mechanization and the Green Revolution 1968-1984: The Punjab Case", USAID/New Delhi, April, 1970.

^{88/} C. Peter Timmer. "Choice of Technique in Rice Milling on Java", *Bulletin of Indonesian Economic Studies* 9 (July 1973), reprinted by the Agricultural Development Council in the September, 1974, Research and Training Network series.

^{89/} S. S. Acharya. "Comparative Efficiency of HYVP: Case Study of Udaipur District", *Economic and Political Weekly* 4 (November 1, 1969): 1756.

and the growing of more labor intensive crops. From 1961 to 1972, the number of electric pumpsets connected in Tamil Nadu (India) increased at an average annual rate of 14.2 percent.^{90/}

Although fragmentary, these micro-level studies and surveys suggest that most forms of agricultural mechanization have the effect of reducing on-farm employment. As with tractorization, however, these other forms of mechanization must be viewed from the perspective of overall *net* impact. Some kinds of mechanization, at appropriate times and places and in conjunction with appropriate cropping patterns, permit offsetting employment increasing activities.

The public policy strategy of identifying and encouraging the implementation of only those forms of mechanization calculated to break bottlenecks (timeliness or seasonal labor constraints), augment available land resources, and increase output, while having only minor net employment impact, is known as 'selective mechanization'. This strategy holds considerable potential as decision makers grapple with the mechanization - employment problem, but requires a great deal more information derived from empirical field studies under varying conditions before it can be effectively implemented.

Green Revolution Technology

In recent years plant breeders have been quite successful in developing new high yielding varieties of food grains -- particularly wheat and rice -- which are fairly well adapted to a wide range of soil and climatic conditions. This genetic engineering has resulted in varieties which are highly responsive to commercial fertilizer, resistant to lodging, early maturing, and relatively insensitive to day length. The rice varieties are also characterized by a greater leaf surface exposed to the sunlight, which facilitates a more efficient photosynthetic process. Coupled with these genetic improvements, a complementary set of modern technology has been developed, including agronomic recommendations regarding higher plant populations, the increased use of commercial fertilizers, herbicides, and insecticides, and better control of irrigation waters. This combined package of technology, and the resulting increased foodgrain production has become popularly known as the 'green revolution'.

The various inter-related components of this technological package show quite diverse effects upon employment, some tending to expand labor requirements and others tending to reduce them. It is the purpose of this section to review findings reported by researchers in various countries regarding the impacts on agricultural employment of some of these

^{90/} C. Muthia. "Problems and Progress in Farm Mechanization in South India", in Southworth and Barnett, *op. cit.*

components.^{91/} Since the green revolution has had its major impact in Asia, the studies cited are from that region.

Irrigation.

The availability and proper management of water for crop production is one of the most important variables in terms of expanding cultivable land areas, increasing cropping intensities and yields per unit of land, and permitting the economic adoption of the other key elements of modern crop technology which may have significant impacts upon employment. Many knowledgeable observers feel that water may be the single most important factor in the effort to increase world food production in future years.

A farm level study by Donovan of a four village region in South India, using linear programming as the analytical technique, concludes that, with assured irrigation, intensification of cropping practices could expand employment by 75-100 percent and increase gross income in the region by 150-190 percent. This outcome is predicated upon the adoption of available multiple cropping technology, the provision of the required package of supplementary technical inputs, and a loosening of labor constraints at peak periods. Attempts to achieve the latter may encourage mechanization, but the author feels that it will be possible (and more desirable) to import seasonal labor from adjoining non-irrigated areas.^{92/}

The ILO mission to the Philippines concludes that an agricultural intensification program is badly needed and that expanded irrigation for rice should play an integral role in this program. Additional employment to be generated per irrigated hectare is estimated at approximately 0.5 man years annually, maintainable thereafter. These estimates are based upon a 'typical' national irrigation system project, for which the benefit-cost ratio is calculated to be between 2.0 and 3.0. The survey team has determined that both the benefit-cost ratio and the employment created per dollar of investment would be even higher for smaller irrigation projects than for the national system.^{93/} The potential is seen for creating several hundred thousand additional man years of employment throughout the Philippines, if a program were mounted to provide irrigation to two-thirds of the currently unirrigated lowland rice area. These new jobs would

^{91/} Falcon has pointed out that a number of other related social issues, in addition to the employment issue, surround the green revolution. These include equity, welfare, and the functioning of social institutions. See Walter P. Falcon, "The Green Revolution: Generations of Problems", *American Journal of Agricultural Economics* 52 (December 1970): 698-710.

^{92/} W. Graeme Donovan. "Employment Generation in Agriculture: A Study in Mandya District, South India", Occasional Paper No. 71, Cornell University, June, 1974.

^{93/} ILO. *Sharing in Development*, *op. cit.*, p. 71.

result from a combination of employment in the actual construction of the irrigation system itself, developing a multiple cropping system, and bringing previously uncultivated land into production.

Gotsch reports that in Pakistan the provision of additional irrigation water can increase net farm revenues by approximately 35 percent and increase the labor intensity of the production process even without the use of commercial fertilizer and improved seeds. Both cropping intensity and a shift to higher value and more labor-intensive crops, such as sugar cane and cotton, contribute to this result.^{94/}

Irrigation clearly permits increased intensity of production and the use of greater amounts of labor per unit of land. One potential problem, however, is the 'lumpiness' or 'indivisibility' of irrigation systems, and the strong possibility that small, limited resource farmers may be precluded from sharing equitably in this yield-increasing form of technology. This could lead to increasing income gaps between economic classes, and possibly land consolidation in some areas. Even in the case of tubewells, a pump can economically irrigate a much larger area than that contained in the average LDC farm. Vyas reports that in the Indian Punjab the command area of a tubewell is 20-25 acres.^{95/} However, 70 percent of India's farmers own less than five acres of land. In Pakistan, in 1972, more than 70 percent of all private tubewells were located on farms of greater than 12.5 acres, even though only about 30 percent of the nation's farms are that large.^{96/}

^{94/} C. H. Gotsch. "Technical Change and the Distribution of Income in Rural Areas", *American Journal of Agricultural Economics*, 54 (May 1972): 326-41. This opportunity to shift to more labor intensive crops holds considerable potential for employment generation. An FAO report notes that in Colombia labor requirements are lowest for the production of the staple cereal grains, higher for the staple root crops (potatoes and cassava), and highest for special crops such as sugar beets and sugar cane, tobacco, and bananas. See FAO, *Perspective Study of Agricultural Development for South America*, Vol. I, Rome, 1972. Research by Desai and Schluter in South India also concludes that a shift to more labor intensive irrigated crops such as vegetables, tobacco, groundnuts, and sugar cane can substantially increase employment opportunities, both on the farm and in processing activities. See Guntant M. Desai and Michael G. Schluter, "Generating Employment in Rural Areas", Department of Agricultural Economics, Occasional Paper No. 73, Cornell University, June, 1974.

^{95/} Vyas, *op. cit.*

^{96/} Mohandas K. Samuel. "Second Asian Agricultural Survey Country Profile: Pakistan", Asian Development Bank Economic Office, May, 1976 (mimeo).

Improved Seeds.

Available field data indicate that production of the improved varieties requires more labor than do the traditional varieties. This is true whether the improved varieties are the HYVs developed at the International Centers or are locally improved varieties. Farmers who plant the improved seeds also tend to adopt simultaneously other forms of modern technology, including commercial fertilizer, spraying with pesticides, controlled irrigation, and other recommended cultural practices. Therefore, the total increase in labor input cannot be attributed to the improved seeds. Since the modern seeds and other improved practices are commonly associated as a package, from the standpoint of employment policy it is not crucial that the individual contributions of the various components be isolated. Increased labor requirements are due primarily to more intensive seed preparation; additional weeding; application of fertilizer and pesticides; and tasks associated with harvesting, threshing, and transporting a larger crop.^{97/} Table 9 presents data for six Asian countries.

^{97/} In a survey of 169 farm families in two villages in Orissa, India, Pal finds significant numbers of farmers hire additional laborers when they shift to the modern rice varieties. Ninety-five percent of the farmers use more hired labor for plant protection tasks; 91 percent for fertilizer application; and 55-84 percent report additional hiring for assistance in land preparation, pulling and transplanting, weeding, harvesting, and threshing. See T. K. Pal. "India: Cuttack, Orissa", in *Changes in Rice Farming in Selected Areas of Asia* (Los Baños, Philippines: IRRI, 1975).

Table 9. Labor Input and Change in Labor Input Accompanying Adoption of High Yielding Rice Varieties and Improved National Rice Varieties

Country	Traditional Variety man-days/ hectare	H Y V		Improved Variety man-days/ hectare
		man-days	% change	
Bangladesh ^{1/} (dry season)		194	+41.6 ^{a/}	137
India ^{2/} (Orissa, dry season)		219	+26.0 ^{a/}	174
	(Orissa, wet season)	169	+17.0 ^{a/}	145
Indonesia ^{1/b/}	(Central Java)	234	-16.0	239
	(East Java)	253	+13.5	258
	(West Java)	218	+148.0	206
Korea ^{1/}	126	139	+10.0	
Philippines (Laguna) ^{1/}	86	110	+28.0	
Thailand ^{1/}	(Rai Rot, wet season)	86	+39.5	
	(Nong Sarai, wet season)	76	+51.0	

Note: Unless otherwise indicated, the percentage change in labor input refers to the number of man days of labor per hectare used with the traditional variety. Philippine data compare labor inputs in 1966 when no HYV's were grown, with 1975 when approximately 95 percent of the rice grown was HYV.

^{a/} Refers to percent change compared to improved national variety; data unavailable for labor inputs required with traditional varieties.

^{b/} Refers only to pre-harvest labor input.

Source: ^{1/} Calculated from data presented by R. Barker and V. Cordova in "Labor Utilization in Rice Production", IRRI, Los Baños, Philippines, December, 1976 (mimeo) which cited field studies by researchers in the respective countries.

^{2/} T. K. Pal, "India: Cuttack, Orissa" in IRRI *Changes in Rice Farming in Selected Areas of Asia*, Los Baños, Philippines, 1975.

Details from studies by other researchers generally support the data in Table 9. Sulyisto, citing a study by Collier and Sayogyo, reports on Java an average of 36.8 man days of *family labor* required per hectare with the local rice varieties, 53.6 when planting the improved varieties developed in Indonesia (national improved varieties), and 43.0 when using the I.R. varieties (developed at IRRI). *Hired labor* used with local varieties averages 195.7 man days per hectare, rising to 228.2 with improved Indonesian varieties, and to 250.3 with the I.R. varieties. The use of the national improved varieties increases *total* labor requirements by approximately 21 percent over the local varieties, and the I.R. varieties require about 26 percent more labor than the local varieties. A study by Sulyisto of 200 irrigated rice farms in East Java in 1972 indicates that the HYV's require 378.7 man days (eight hour days) per hectare compared to 367 man days for the non-HYVs, a difference of only about 4 percent. The 'non-HYVs', however, included a combination of unimproved local varieties and national improved varieties. Sulyisto cites another village level study in Java, by Birowo during the 1972 rainy season, in which the I.R. rice varieties require 22 percent more labor than the local varieties, but the national improved varieties require 48 percent more labor than the local varieties.^{98/}

Various Indian studies reach similar conclusions. Research by Billings and Singh reveals that the HYVs, *by themselves*, increase the demand for human labor by six percent in Punjab, but by only slightly over one percent in Maharashtra.^{99/} In a three village study in Uttar Pradesh, modern rice varieties show a 20 percent increase in man days of labor per hectare.^{100/} The high yielding *wheat* varieties also stimulate increased labor use. Based upon a sample survey in Rajasthan, India, Acharya reports that, with fertilization, the HYVs require an average of 35 percent more labor than the local varieties.^{101/}

The impact of the HYVs on increases in *hired* labor is particularly impressive, since the employment problems of the landless are potentially the most difficult to address. A study of seven districts of India, comparing the HYVs and improved technology with local varieties and traditional practices, indicates expenditures on hired labor average 40 percent

^{98/} Sulyisto. "The Employment Aspect of Some Rural Development Programs in Java". SEADAG Indonesian Panel Seminar on Rural Development Strategies, August 11-13, 1975.

^{99/} Billings and Singh, "The Effects of Technology....", *op. cit.*

^{100/} J. S. Sharma. "India: Naintal and Varanasi, Uttar Pradesh", *Changes in Rice Farming....*, *op. cit.*

^{101/} Acharya, *op. cit.* These findings are substantiated in J. S. Sisodia, "Some Economic Aspects of the High-Yielding Varieties Programme of Indore District", *Indian Journal of Agricultural Economics* 23 (Oct. - Dec.), 1968.

higher per hectare with the HYVs.^{102/} In another area of India, interviews with agricultural laborers show a high percentage have been employed more days per year since the new HYVs were introduced. The average increase is 30 days (from 234 days to 264 days per year). Farmers surveyed in the area also confirm that the production of the modern varieties requires more hired labor.^{103/}

Herbicides.

Increased application of commercial fertilizer forms one component in the technological package accompanying the spread of the HYVs. Rising fertility levels stimulate weeds as well as crops, and effective weed control constitutes an even more formidable problem than it does under traditional practices. One solution is to turn to chemical control with herbicides. Although very limited data are available from the LDCs, because herbicides are not yet widely used, indications are that they are potentially labor replacing.

An IRRI farm survey provides interesting data regarding the increase in herbicide use in conjunction with the adoption of modern rice varieties. In two Philippine villages, the percentage of farmers using herbicides prior to the adoption of modern varieties was 19 percent in one and 68 percent in the others. During the year the modern variety was adopted, herbicide use rose to 72 percent and 95 percent respectively. While the survey was being conducted, these percentages continued to increase.^{104/} In another area of the Philippines, herbicides were used by 45 percent of the farmers in one village and 67 percent in another prior to 1967 (the year the modern varieties were first introduced), and by 1972 the user percentages had risen to 95 and 99 percent, respectively.^{105/} Three villages in another part of the country show herbicides used by much smaller percentages of the farmers, but a significant increase occurring following the introduction of the modern varieties. Herbicide use increased by eight times in one village, by over 10 times in another, and approximately doubled in the third.^{106/}

In the Philippines a far greater percentage of farmers use herbicides than in most Asian LDCs; other countries in the IRRI survey have relatively

^{102/} H. B. Shivamaggi. "The Agricultural Labour Problem: Past Misconceptions and New Guidelines", *Economic Political Weekly* 4 (March 29, 1969).

^{103/} A. N. Krishna Murthy. "India: Shimoga, Mysore", *Changes in Rice Farming....*, *op. cit.*

^{104/} Eva Kimpo Tan. "Philippines: Pigcawayan, Cotabato", *Ibid.*, Table 3, p. 334.

^{105/} James C. Stewart and Antonio B. Arellano. "Philippines: Hagonoy, Davao del Sur", *Ibid.*, Table 4, p. 313.

^{106/} Tito E. Contado and Roger A. Jaime. "Philippines: Baybay, Leyte", *Ibid.*, Table 6, p. 293.

low herbicide use. Table 10 summarizes the results obtained from 32 villages in six Asian countries.

Table 10. Percentage of Farmers Using Herbicides Prior to the Introduction of Modern Varieties and at the Time of the Survey, 1971/72

Country	No. of Villages	Users Prior to Modern Varieties (Percent)	Users at Time of Survey (Percent)
India	12	0	4
Indonesia	5	0	0
Malaysia	2	0	6
Pakistan	2	0	0
Philippines	9	33	66
Thailand	2	10	8
All Villages	32	10	21

Source: IRRI, *Changes in Rice Farming in Selected Areas of Asia*, Los Baños, Philippines, 1975, p. 29.

Scattered attempts to quantify the employment impacts of herbicide use have been made. The following examples do little more than call attention to the situation and emphasize the need for additional, and more precise, field research in this important area in the LDCs. In Nigeria, Eicher reports a private estate responded to government dictated wage increases by laying off 400 workers who had previously been employed to chop weeds with machetes -- substituting in their place a program of herbicide spraying.^{107/} Neither the number of laborers required for handling the spraying, nor the extent of previously existing underemployment on the estate is indicated, but the loss of 400 jobs on one estate is substantial. In Japan the use of herbicides reduced total labor required for weed control from 506 hours per hectare to 207 hours per hectare between 1949 and 1962, a reduction of almost 60 percent.^{108/}

^{107/} Carl Eicher, Thomas Zalla, James Kocher, and Fred Winch. "Employment Generation in African Agriculture", Michigan State University Institute of International Agriculture Research Report No. 9, July, 1970, p. 28.

^{108/} N. Yamada. "Recent Advances in Chemical Control of Weeds in Japan", paper presented at the IRRI Working Party on Rice Production and Protection, Lake Charles, Louisiana, July, 1966 (mimeo). This paper was cited by Yudelman, et. al., *op. cit.*, p. 71.

Work on herbicides is conducted on experiment stations in the U.S., and a major motive is to cut costs by reducing hand labor inputs. In one study of weed control in cotton conducted a number of years ago in the Yazoo-Mississippi Delta, the objective was to find ways to hold hand labor to a low level, and thus *reduce the need to maintain a labor reserve* on plantations to handle peak seasonal labor demands. Without herbicides hand labor for weed control accounted for 60-70 percent of the labor required to produce cotton under mechanized conditions. The researchers estimated, however, that through chemical control of weeds, one family of year-round plantation workers would be able to handle 100 acres rather than the usual 10 acres. Results of the field plot trials show that maximum hoe-labor could be reduced from 29 hours per acre to 15 hrs. per acre by the use of a post-emergent herbicide on drilled cotton that had been cross-cultivated. Further reductions to 14 hrs. per acre were possible by using both pre- and post-emergent herbicides. On cotton that had been hill planted and cultivated by conventional means, maximum hoe-labor was reduced from 53 hrs. per acre to 30 hrs. per acre with the use of a post emergent herbicide, and further reduced to 27 hrs. per acre by using both pre- and post-emergent treatments. By using multiple component practices (pre- and post-emergent herbicides plus flame treatment) reductions of hoe labor to 8-11 hrs. per acre were achieved.109/

Farm level trials with peanuts in Northeast Thailand during 1971-74 (in which this author participated) reveal the potential for using a pre-emergent herbicide to control weeds at a critical period of time, permitting farmers to plant peanuts in upland areas and still prepare for rice production on the paddy land. Although underemployment exists in the area during much of the year, farmers desiring to grow both rice and peanuts find herbicides attractive due to peak seasonal labor requirements. Without chemical weed control during this critical period, peanut fields become overgrown while family labor is fully engaged in preparing the rice fields. Farmers therefore are unwilling to grow anything but their rice.110/

Productivity Impacts of Technology

Adoption of the modern package of technology associated with the green revolution generally increases labor requirements per unit of land, but reduces them per unit of product. Typical of this pattern is Shaw's

109/ J. T. Holstun, O. B. Wootar, C. G. McWhorter, and G. B. Crowe. "Weed Control Practices, Labor Requirements, and Costs in Production", *Weeds* 8 (1960): 232-43.

110/ Research conducted by specialists from the Northeast Agricultural Center, Tha Phra, Thailand. Farm Level trials were conducted at sites in five provinces of Northeast Thailand, in cooperation with the Department of Land Development, Ministry of Agriculture and Cooperatives, and Peace Corps Volunteers.

finding that farmers in one area of the Philippines adopting the land-augmenting innovations during the wet season use 20 percent more labor per hectare than farmers in the same region who continue to use traditional practices. However, they use 20 percent *less* labor *per ton of output*.^{111/}

Increasing productivity could present a problem in the future if a number of countries approach self-sufficiency in food grains, export possibilities decline, and product prices drop. Yudelman makes the point that rice is particularly vulnerable in this respect because the international market for rice is 'thin'. In 1971, only about three percent of the world's rice output was traded in international markets.^{112/} In such a situation of falling prices, it is the limited resource farmers who are most apt to suffer, since their access to the productivity increasing inputs is limited, whereas the more affluent producers may be able to offset falling prices with increased output.^{113/}

Concluding Comments

The data cited in the foregoing sections have been derived primarily from small sample farm level surveys. The results of the individual studies may be location specific in their implications. Nevertheless, given the geographic coverage represented, some generalizations appear warranted:

1. Agricultural mechanization is increasing fairly rapidly and will probably continue to do so into the foreseeable future.
2. There are numerous forms of mechanization, with varying effects on labor use. Although the immediate job impact of most of these is probably negative, in order to ascertain the *net* employment impact, it is important to study the effect on cropping patterns, intensity of land use,

^{111/} Robert D'A Shaw. "The Impact of the Green Revolution on Jobs", Washington, D.C., Overseas Development Council, 1970. These data do not take into account the labor-intensive operations of harvesting and threshing, which are likely to require considerably more labor when using improved seeds and the accompanying modern package.

^{112/} Yudelman, et. al., *op. cit.*, p. 49. An offsetting factor is that, according to FAO projections, world demand for food will increase by approximately 68 percent between 1970 and 1985, with increased population accounting for a 48 percent increase and rising per capita incomes adding another 20 percent. See FAO, *Provisional Indicative World Plan.....*, *op. cit.*

^{113/} A USAID paper reporting on the use of modern inputs in five districts of India finds a very uneven distribution of the gains from the new technology, with the bottom 20 percent of the farmers in Ludiana experiencing a serious deterioration in their economic situation, primarily due to insufficient capital to invest in irrigation. See USAID, *Country Field Submission: India*, Washington, D.C., 1969.

and output. Landless laborers, share croppers, and others with insecure tenure arrangements and limited resources are likely to bear the brunt of the adjustment process.

3. Private and social costs and returns may diverge widely. Though attempts to halt mechanization are not warranted, where public policy has been responsible for factor price distortions, corrections should be made to reflect real resource scarcities more accurately. A strategy of selective mechanization designed to capture the benefits while minimizing the negative aspects of mechanization should be pursued. 'Labor for labor's sake' is not a sound objective; labor must be productive and real value may be found in the use of mechanical power as a substitute for some forms of human drudgery. For farm families to spend time pursuing such tasks as pounding rice, carrying water, or preparing land by hand, if neither productivity is increased nor additional *paying* jobs created, makes little economic sense.

4. The green revolution technology is a closely interwoven package of complementary inputs, and imputing a specific labor impact to any single component is difficult. Nevertheless, it appears, on the basis of the limited available evidence, that irrigation, the new seeds, and commercial fertilizers are on balance employment generating practices whereas the use of herbicides is likely to be a net displacer of labor.

5. The technological package as a whole increases labor requirements per acre, but reduces the amount of labor required per unit of output produced.

The difficulties in assessing the employment effects of alternative production strategies are apparent. It is also clear that the necessary hard quantitative data, based upon rigorous, well-conceived field studies, are scarce. Ridker's quotation assesses the situation concisely:

"Keeping in mind all the issues raised -- including the strong possibility that changes in land tenure arrangements and attitudes toward migration would significantly alter the balance in favor of more labor-intensive farming techniques -- we must conclude that the situation is extremely complex, perhaps so complex that we shall never know what the overall employment effects of the new technology and mechanization are until they have occurred.... perhaps the best policy is to correct factor price distortions and let the chips fall where they may, that is, to provide market signals reflecting true scarcities and let individual decision makers choose whatever forms and amount of mechanization they find to be in their best interests".114/

114/ Ridker, *op. cit.*, p. 31.

Despite these difficulties inherent in designing appropriate strategies, governments obviously continue to make decisions which have substantial effects upon rural employment. The better informed the decision makers are, the greater the possibility for beneficial planned change. Thus, it is evident that increased and more reliable information is needed.

The FAO has called for research which more precisely defines the nature of rural unemployment and underemployment, in relation to the social systems within which they occur, and in terms of the seasonal and regional dimensions for the various components of the labor force. Each country, as a part of its development plan, is encouraged to establish a 'technological policy' for its agricultural sector, which focusses attention upon the impacts of mechanization and yield-increasing technology.^{115/} In view of the current state of knowledge, this appears to be a very sound recommendation.

^{115/} FAO. *Agricultural Employment.....*, *op. cit.*, p. 38.

V. ALTERNATIVE APPROACHES TO INCREASE
RURAL EMPLOYMENT

Introduction

Historical evidence suggests that, as development occurs over time, the importance of the rural sector in terms of population, employment, and contribution to GNP is going to decline steadily relative to the urban. However, even a cursory examination of current population-employment statistics among the LDCs indicates that greatly increased efforts to expand rural employment opportunities must be mounted if a crisis situation is to be averted in the short-run. Years of neglect in terms of investment in rural infrastructure, institutional development, and services has meant that adequate employment opportunities have not been created in rural areas.

As the ILO mission to the Philippines concludes, a redressing of this situation requires a basic reorientation of government policies, and in the process these policies must become much more 'rural minded'.^{116/} Similar signals are being received from other study missions, international agencies, and individual researchers. A recent OAS paper urges that development strategies for Latin America emphasize rural development, focusing on increasing not only output but also job opportunities and rural incomes, and on improving general rural living conditions.^{117/} Another ILO paper stresses government policies which are designed to create employment in rural areas and develop the traditional sector. This would constitute a *major attack* on poverty rather than considering the rural sector as a mere 'residual' which can accommodate surplus labor unable to secure employment in the modern sector.^{118/} Similarly, a recommendation growing out of the Ford Foundation sponsored conference on employment in the LDCs is that future infrastructural investments should be biased toward meeting many small rural-located infrastructural needs, such as rural roads, rural electrification, small irrigation and drainage schemes, and essential health and education services.^{119/}

Although these signals indicate a growing international concern with improving low rural incomes and expanding rural employment opportunities, a consensus view as to how best to accomplish these aims has not yet developed.

^{116/} ILO. *Sharing in Development....*, op. cit.

^{117/} OAS. *The Unemployment Problem....*, op. cit.

^{118/} ILO. *Time for Transition*, op. cit.

^{119/} Edwards, op. cit.

Furthermore, no attempt to devise a single comprehensive approach or strategy is likely to be feasible. Instead, the identification of a number of strategies which are fairly location specific and conditioned by the existing social, political, institutional, and physical environment appears more useful.

In devising strategies, it must be recognized that increased emphasis upon *rural* investment does not mean exclusively *agricultural* investment. Many rural investment opportunities with high employment potential may be non-agricultural. Another point which needs emphasis is that conflict between the dual objectives of increased output and increased employment need not occur if proper investment projects are selected and appropriate policies pursued.^{120/} Some care may be required, however, to insure that employment objectives are not eclipsed by other objectives.

Agricultural Approaches

The ILO mission to the Philippines and others believe that a number of 'investment bargains' exist in agriculture because this sector has been neglected for so long. These 'bargains' may be particularly attractive if steps are taken to correct pricing distortions which have resulted from past government policies. Some of the agricultural alternatives are discussed below.

Diversification of Production.

The seasonal nature of agricultural production, particularly crop production, results in serious fluctuations in labor demand at various times throughout the year -- i.e., high labor demand at the time of land preparation and planting, and again at harvest and threshing, with lesser requirements in the interval.^{121/} This problem is particularly acute in regions where monoculture predominates.

^{120/} In a personal communication to the author, Schuh expresses the view that, "Contrary to what many believe, it is a false dichotomy to argue that there is a trade-off between growth and equity. Solving the employment problem in a rational fashion -- by reducing imperfections in the factor markets and investing more broadly in human capital -- will simultaneously make for a higher growth rate, broaden employment, and reduce income inequality". G. Edward Schuh, personal letter, Sept., 1976.

^{121/} For example, an FAO study for agricultural employment notes that in Chile labor demand in July is estimated at 63 percent of that in March; in Korea, hours worked in December are only 40 percent as high as in June; in Uruguay, labor requirements for crop production in June are only about one third as great as the peak requirement in April. See FAO, *Agricultural Employment....*, *op. cit.*

Reutlinger, et. al., have identified the major objectives of *within farm* diversification to be the more effective utilization of family labor on a year-round basis, and the provision of additional products for family consumption. Within farm diversification should also provide supplemental cash for the farm family, to the extent that production exceeds family consumption needs. *Within sector* diversification may also facilitate increased employment through the selection of labor intensive enterprises.^{122/} At the national level, movement away from overdependence on one or two major export crops has the added advantage of reducing somewhat the sometimes devastating impact of international price fluctuations.^{123/}

Crop diversification which effectively spreads production over more months of the year may be constrained by a number of factors. Important among these is the availability of adequate moisture during the off-season. In such situations investment in some form of supplemental irrigation is required. If a major aim is to expand employment opportunities among limited resource farmers, government may need to support irrigation development, though this does not necessarily imply large dam projects. A large number of investments in smaller projects such as tubewells, pumps, holding tanks, etc., may better accomplish the desired objective.^{124/}

For the foreseeable future, however, the bulk of most LDC populations will have no access to irrigation of any form. Technology must be developed which permits increased production and employment for those located in non-irrigable areas.^{125/} The work on rainfed crop production at ICRISAT in Hyderabad, India, is a step in the right direction in addressing this problem.

^{122/} Shlomo Reutlinger, G. F. Donaldson, Paul Duane, A. C. Egbert, and Tariq Husain. "Agricultural Development in Relation to the Employment Problem", Economic Staff Working Paper No. 112, IBRD and IDA, May 25, 1971.

^{123/} In Thailand, for example, the recent five year plan stresses increased production of oilseed crops (primarily soybeans and peanuts) partially in an effort to reduce dependence upon rice, kenaf, and corn.

^{124/} Preliminary research results by agricultural engineers and agronomists at the Northeast Agricultural Center in Thailand indicate that low cost, hand-dug shallow wells have potential for supplemental irrigation of paddy during the rainy season, and for production of vegetables and fruits on a small scale during the dry season. Development of technology of this nature can have significant employment impact at fairly low cost.

^{125/} In Thailand, it is estimated that some 80 percent of the farmers will not be affected by irrigation. See Freidrich W. Fuhs and Jan Vingerhoets, *Rural Manpower, Rural Institutions and Rural Development in Thailand*, Manpower Planning Division, National Economic Development Board, (Bangkok, Thailand, 1972), p. 161. Oram estimates that, on a global scale, rainfed farming represents 75 percent of all agriculture in Asia and the Near East and an even higher percentage in Africa and Latin America. See P. A. Oram, "The Employment Potential of New Agricultural Techniques" in *FAO/UNDP International Agricultural Expert Consultation on the Use of Improved Technology for Food Production in Rainfed Areas of Tropical Asia* (Rome: FAO, 1974), p. 5.

Another possibility for employment increasing diversification is in combining livestock enterprises with existing crop enterprises, but there may be special problems with this approach in tropical and sub-tropical areas if livestock become directly competitive with crops in areas where multiple cropping can be practiced.^{126/} Another problem is that livestock production may not be an efficient means of producing food in land scarce countries. Nevertheless, certain classes of land may be used most efficiently for grazing livestock, and enterprises such as poultry and swine can be operated economically even under conditions of land scarcity.

Multiple Cropping.

Multiple cropping refers to the practice of producing more than one crop on the same piece of land in a single year. Harwood and Price identify several different kinds of multiple cropping patterns, including: 1) sequences of crops grown in pure stands 2) tree crops intercropped with annuals 3) intensive tree intercropping 4) intensive vegetable production and 5) complex intercropping of annual field crops.^{127/} Within these general categories numerous combinations and variations are possible.

Multiple cropping holds considerable potential for increased output per unit of land and for enhancing farm incomes. The former is well documented in various publications of the International Rice Research Institute and other international and national agricultural research centers. Although few empirical studies relating to the *employment* impacts exist, it is likely that these impacts are both positive and substantial. Multiple cropping spreads employment more evenly throughout the year and simultaneously introduces more intensive labor requirements for the growing of each individual crop. The harvesting, threshing, storing, transporting, and marketing of the larger total crop also generates additional employment opportunities both directly within agriculture, and indirectly in the agri-business sector. Potential complementarity, as yet largely unexplored, exists through intensive livestock enterprises which rely on the confined feeding of crop residues and by-products of the intensive cropping system.

Efforts to accomplish effective programs of multiple cropping are particularly dependent upon the availability of a reliable source of irrigation water. With adequate water and appropriate management, the warm temperatures and ample sunlight of the tropics and sub-tropics make

^{126/} Reutlinger, *op. cit.*

^{127/} Richard R. Harwood and Edwin C. Price. "Multiple Cropping in Tropical Asia", paper presented to the American Society of Agronomy, Knoxville, Tennessee, August 24-29, 1975 (mimeo).

achievement of very high annual outputs per unit land area possible.^{128/}

Expansion of Cultivated Area.

Although severe population pressure on the land is found in many LDCs and little opportunity exists for expanding into new areas, some countries have considerable potential for land expansion.^{129/} These latter countries, located primarily in Africa and Latin America, can provide additional agricultural employment through programs designed to open new areas. Several are currently doing so through colonization and agrarian reform agencies.^{130/}

There is also the possibility in some countries to substantially increase the cultivated area, even in the absence of unsettled land, by encouraging a shift from land extensive to land intensive enterprises. Good examples of this alternative include Argentina and Uruguay, where large areas of land well-suited to cereal grain and cilseed production remain in extensive cattle production.^{131/}

^{128/} In addition to the potential economic problem of falling product prices as output rises substantially, there is also the biological problem of insect pests and bird damage, which in some areas have proven quite serious because of the limited areas under cultivation during the dry season and thus the high concentration of these pests. Regarding the downward pressure on product prices, the argument has been advanced by Barker, Hayami, and Herdt that in the production of subsistence crops in less commercialized economies, this pressure is felt most heavily by those farmers having a large proportion of marketed surplus (as opposed to the subsistence producer) and may thus actually promote *more equal* income distribution. See R. Barker, Y. Hayami, and R. W. Herdt, "Consequences of New Technology", IRRI, (undated mimeo).

^{129/} Abercrombie, *op. cit.*, indicates that the expansion of cultivated area accounted in 1961-71 for about 40 percent of the increase in cereal production in the LDCs as a whole, and for about 60 percent in Africa and Latin America. He notes that with the exception of the Far East, where population pressure is the greatest, total cultivated area has grown somewhat faster than the agricultural labor force.

^{130/} Examples of Latin American countries which can and are pursuing this alternative might include Brazil, Paraguay, and Colombia. The Amazon region may hold considerable potential in the future if technological problems can be solved.

^{131/} These two countries do not confront the severe rural unemployment problems which characterize many less developed countries. In Colombia, however, where unemployment is a more serious problem, Thirsk finds that small crop farms utilize 10-15 times more labor per unit of land than do large cattle ranches. Thirsk, *op. cit.*

Appropriate Technology.

Some forms of agricultural technology are clearly labor replacing, whereas other forms result in net increases in employment. Thus, it is important to identify the *appropriate* technology for the time and place, considering both physical-biological conditions and the relative availability of all necessary productive resources. The need exists for a definite government policy and supporting institutions which determine what technology is appropriate in terms of the various and sometimes competing objectives of the state (employment, productivity, equitable distribution, etc.). Where this technology is unavailable efforts should be mounted to develop and disseminate it. Experience to date suggests that the more highly divisible the technology provided, the more likely it is to be adopted on a scale which includes the large masses of limited resource farmers. Furthermore, data from many areas of the world suggest that small holdings provide both greater employment and greater output per unit of land than do large holdings, and thus the development of technology specifically designed for use by the former group may be essential for amelioration of the employment problem.

Institutional Support to Agriculture.

Efforts to generate increased employment -- particularly among limited resource peasants -- through diversification, intensification, technification, or expansion onto new lands may be effectively stymied if a strong commitment on the part of the state to the development of the agricultural sector is lacking. Without the allocation of funds, competent personnel, and supporting facilities to agricultural research, appropriate technology is unlikely to be developed. The location specificity of much agricultural technology makes it imperative that it be developed and tested *in situ*, rather than being imported from the more developed nations, international research centers, or even national centers.

Even if a high pay-off stream of agricultural technology is being locally developed and tested, a need remains for a system of effective dissemination of this technology in usable form to the small farmer.^{132/} The difficulties encountered in forging this link between research and extension have been noted by practitioners in many of the less developed countries.

^{132/} Some kind of government supported information dissemination system is particularly critical for the limited resource farmers, since the larger, generally better educated and more sophisticated producers are likely to seize fairly quickly economically attractive innovations, even in the absence of such services. As Gotsch notes, however, the local agricultural extension agent is likely, for a variety of reasons, to devote more time to the larger producers than to the small-holder class. See Carl Gotsch, "Economics, Institutions and Employment Generation in Rural Areas" in Edwards, *op. cit.*

Though mixed reports are found regarding the degree of constraint imposed by credit availability on the adoption of new technology which is of a highly divisible nature (seeds, chemical fertilizers, pesticides), in the case of more lumpy investments, such as irrigation pumps, the small farmer may be seriously disadvantaged *vis a vis* the large operator. Nevertheless, as with technical assistance provided through the extension service, institutional credit generally is most readily available to those who need it least. Other institutional changes which may be required in individual countries include: effective programs of agrarian reform which in the words of Dorner and Felstehausen, "allocate land on the basis of its ability to employ labor";^{133/} improvements in the efficiency of both input and output markets; and government pricing policies.

Rural Non-farm Approaches

Construction of irrigation and drainage systems and the building of farm to market roads address primarily the needs of the agricultural sector. However, they do not necessarily represent on-farm investments. Most forms of rural non-farm investment have a close relationship with, as well as impact upon, the farm population of the surrounding area.

Rural Public Works Programs.

Many LDCs have experimented with various forms of public works programs, including construction of roads, bridges, irrigation and drainage systems, and schools, conservation and reforestation, rural electrification, etc. These efforts have met with varying degrees of success in different countries. Thus, it is difficult to arrive at a blanket judgment as to the effectiveness of such programs. Any assessment must be based upon the objectives established for specific programs.

Some of the advantages of labor intensive public works programs, as identified by Thomas, include the following:^{134/} 1) rapid implementation 2) flexibility as to location 3) high divisibility 4) possibility of phasing to coincide with peak and slack employment seasons 5) high visibility 6) ability to employ the poorest, least skilled members of the labor pool 7) rapid payoff without visibly diminishing the benefits of any other group 8) capacity for mobilizing local resources and contributions.

^{133/} Dorner and Felstehausen, *op. cit.*

^{134/} Within the past two decades, between 15 and 18 LDCs have established special public works programs with employment generation as a primary objective. See John W. Thomas, "Employment Creating Public Works Programs: Observations on Political and Social Dimensions" in Edwards, *op. cit.* See also J. W. Thomas, S. J. Burki, D. G. Davies, and R. H. Hook, "Public Works Programs in Developing Countries: A Comparative Analysis", Harvard Institute for International Development Discussion Paper, May, 1976.

A number of approaches have been used and different experiences with public works programs have resulted in selected countries. One technique, used in Indonesia in order to assure that employment benefits are fully realized, established a set of eight major criteria for proposed development projects in rural areas.^{135/} This program, financed by the central government but allocated to lower administrative levels, includes both directly agriculturally related projects such as irrigation and market facility development, and less direct agricultural projects, such as the building of roads and bridges, reforestation, flood control, etc. The program is known as INPRES. A study by Sibero (cited by Sulyisto) of the direct employment impact of the INPRES program concludes that the projects which he studied have been quite labor intensive, in that wages represented over 60 percent of total project costs. Another study of INPRES by the faculty of Gadjah Mada University, finds that most of the labor absorbed is unskilled, but that most of it is also 'imported' from other areas of the country, thus reducing the impact upon local workers. Some of the criteria adopted for use in the INPRES program may be of value to programs in other countries which are aimed at maximizing employment impacts.

Bhatia, referring to public works programs in India, finds road construction to be an effective employment generator, with some 70 percent of the total investment being represented by wages.^{136/} By contrast, labor accounts for only 30 percent of the investment in bridge construction. Road construction techniques used in India are more labor intensive than those in most LDCs, because many small local contractors are each awarded a contract for small sections of road -- perhaps having responsibility for only 1-2 miles of construction. As a result, it is not economically feasible for contractors to invest in large equipment, so they rely heavily on hand labor.

^{135/} Sulyisto. "The Employment Aspect...", *op. cit.* The criteria on which this program in Java, known as INPRES, is based, state that each project should: 1) provide employment opportunities to those needing them irrespective of skill level, income, land ownership, or family status, though primarily to the poor and the landless 2) utilize locally procured materials and laborers to the greatest extent possible 3) stimulate the participation of local people in the development process of their region 4) facilitate the transport and distribution of agricultural products to and from markets 5) be technically sound but simple enough to rely upon local technicians and skilled laborers, preferably without outside assistance 6) pay in full at prevailing market prices for all goods and services used 7) be coordinated with other non-INPRES financed projects 8) be completed within a single budget year.

^{136/} Vir G. Bhatia. "Employment Potential of Roads", in Ridker and Lubell (eds.), *op. cit.*

Thomas, in studying the performance of public works programs in Bangladesh, Ethiopia, Mauritius, and Pakistan, finds mixed results.^{137/} In both Bangladesh and Mauritius, an average of over 60 percent of program expenditures (including food commodities) have been spent on labor. In Pakistan, however, only 30-40 percent goes to labor, and in Ethiopia less than 30 percent. In his earlier paper on the East Pakistan (Bangladesh) Works Program which relied upon PL 480 wheat, Thomas concludes that it has been a successful development program which has contributed to political stability, increased agricultural output, increased employment, and has provided a good return on investment.^{138/}

In discussing PL 480 Title II (provision of food as a payment for labor on public works and community development projects in the LDCs), Eriksson concludes that its employment generating impact has been significant in only a few countries. Among these, he includes East Pakistan, Indonesia, Morocco, and Tunisia.^{139/} In Tunisia, according to Falcon, the use of PL 480 wheat to pay for labor intensive projects enabled the government to increase employment under the program from 160,000 persons in 1960 to an estimated high of 300,000 in 1963.^{140/}

The assessment by Turnham and Hawkins is particularly bleak. In their view:

...there is a discouragingly large amount of evidence to the effect that public works, youth mobilization schemes, cooperatives, and programs of community development have absorbed considerable amounts of scarce public resources while the returns in the form of income creation or employment remain small or ill-accounted for, and sometimes trivial in relation to the overall size of the problem.^{141/}

The evaluation of the degree of success or failure of public works programs depends upon the criteria employed by the evaluator and the reliability of the available data. If the major concern is the easing of

^{137/} Thomas "Employment Creating....", *op. cit.*, p. 302. In an earlier paper reporting his study of the Works Programs of East Pakistan (Bangladesh), Thomas estimated that the program created 866,000 man years of employment over a five year period. Even so, this represented only a 3.4 percent decrease in annual agricultural unemployment. The estimated benefit-cost ratio of the program was 4.0, calculated on the basis of a 12 percent discount rate. See John W. Thomas, "Rural Public Works and East Pakistan's Development" Harvard University Center for International Affairs, 1968, pp. 74 and 89.

^{138/} Thomas, "Rural Public Works....", *Ibid.*, p. 90.

^{139/} Eriksson, *op. cit.*

^{140/} Falcon, *op. cit.*, p. 29.

^{141/} Turnham and Hawkins, *op. cit.*, p. 19.

unemployment, and the economic return on the investment is of secondary concern, the conclusions reached may be quite different than if the reverse were the case. From the standpoint of national investment policy, job creation in rural areas (even at unfavorable benefit-cost ratios) may in some instances prove to be economically sound if the alternative is expanded urban investment, necessitated by strong rural-urban migration flows. There is some evidence that there are greater opportunities for the utilization of labor intensive technology in rural projects than in urban, and that more employment can be generated per dollar invested. The fact remains, however, that at the present time insufficient detailed studies are available to permit meaningful generalizations. One conclusion is that under certain conditions (prime among these being top level administrative commitment, competence, and willingness to provide the necessary resources), and in certain countries, public works programs can and have served effectively as employment generators. As Thomas observes, their performance is "... either very good or very bad" and such programs probably are really effective only in situations where unemployment is acute and employment creation is perceived as having top priority.^{142/}

Irrigation.

While investment in irrigation systems may or may not be a part of a public works program fueled by the desire to create employment, its employment generating potential is great. The great potential for irrigation is found partially in its multiplier effect. If properly planned and administered, the initial construction phase of the system can be highly labor intensive, as can the maintenance of ditches and dikes. Once water becomes available, the employment creating potential of multiple cropping can be exploited. Stimulation is provided not only directly to producers, but also indirectly through the marketing chain as the demand for inputs expands and the greater production flows outward through the storage, transportation, and processing networks. In India, the *direct on-farm* increase in employment in crop production made possible in areas of irrigated agriculture has been estimated at 80 percent -- an increase from a weighted average of 64 man days per hectare to 115 man days per hectare.^{143/}

^{142/} Thomas, "Employment Creating...", *op. cit.*, p. 301.

^{143/} Bhagwati Committee. *Report of the Working Group on Agriculture: Government of India, Committee on Unemployment* (New Delhi, 1972) as cited by Oram, *op. cit.*, p. 5. The expansion of tubewells, and other 'minor' irrigation which has accompanied the expansion of area devoted to the high yielding varieties, makes possible an estimated increase of 700 million man days of continuing employment in India from the Fifth Plan onwards. Krishna argues that in terms of continuing investment, irrigation deserves more emphasis than any other single activity. He takes a rather pessimistic view of Indian public works programs in general, because of their frequently corrupt administration, and because the investment often does not reach the poor. See Raj Krishna, "Unemployment in India", Presidential Address to the Indian Society of Agricultural Economics, December, 1972.

Industrial Decentralization.

The tendency of many LDCs to concentrate industrial investment in only a few central metropolitan areas has had the effect of widening the income gap between rural and urban areas. It has also encouraged urban congestion with all of the accompanying problems. By moving some industries to rural areas, it should be possible to capitalize upon the large supply of underemployed and unemployed rural labor. In the initial stages of decentralization, particularly attractive candidates are those industries which process agricultural raw materials. From the standpoint of the individual entrepreneur, advantages include lower land and labor costs, and reduced shipping charges (by virtue of transporting processed goods rather than raw materials). Early industries could be meat slaughter and packing plants, oilseed processing facilities, fiber mills, fruit and vegetable processors, etc. On the agricultural input side, fertilizer mixing facilities and small equipment manufacturers are possibilities.

Additional investment in infrastructure, particularly in such things as rural electrification, sewage systems, and water purification plants, could contribute substantially to the attractiveness of the move and may in fact constitute a necessary condition to decentralization on a meaningful scale. The experience of Japan and Taiwan in achieving industrial decentralization probably has much to offer other countries contemplating such a course of action.

Cottage Industries.

Most countries have experimented with the promotion of cottage industries. Silk-weaving, pottery making, wood carving, making lacquer ware and the making of reed mats are examples of small scale cottage industries which require minimal capital investment, yet provide considerable employment in localized areas. Potential for significant employment on a regional or national basis via this route, however, is likely to be severely constrained by the limited market for the products.

Japan takes this concept a step further by actually 'farming out' the assembly of manufactured components to people who then complete the work in their homes. This approach might hold some possibility for other countries, as an adjunct to the industrial decentralization alternative. The flexibility in working hours is compatible with farming, and a substantial labor force would be available during the slack agricultural seasons.

Concluding Comments

Employment creation in rural areas can be accomplished through many alternative approaches. Some may flourish in specific economic, social, and political settings in which others would have no chance of success. The challenge to the responsible administrator is to select that approach, or combination of approaches, which seems to offer the greatest potential for success within the particular environment confronted. The single most

important prerequisite to successfully attacking the problem is the desire and will to do so on the part of those in whom the political power and the control over the necessary resources is vested. From all perspectives, the task is monumental.

VI. RESEARCH NEEDS

In addressing the problems of rural unemployment and underemployment, neither neat separation of the agricultural sector from the rural non-farm sector, nor the separation of policies designed for the rural sector from those aimed at an urban target is possible. Attempting to focus only upon 'economic' variables to the exclusion of other important factors is not feasible either. Rather, the existing situation must be viewed as an interdependent system, where actions taken in one area are likely to have impacts on others.

The information that now exists on rural unemployment and underemployment is sketchy at best. It is based upon small and scattered survey samples and relies upon diverse definitions and methodologies which render the validity of comparisons between nations, or even within a single country, highly suspect. Using generalizations derived from such studies as a basis for public policy beyond the micro-region within which they have been conducted is risky.

It is also evident from this survey of the literature that some of the more or less generally accepted statements, many of which are laden with policy implications, may rest on rather small bases of empirical data. At this stage, perhaps they should best be regarded as hypotheses in need of testing, rather than as established facts suitable to serve as reliable guideposts for decision makers.

Rural Sector Research

1. Defining the problem. Research aimed at describing and measuring in quantitative terms the magnitude and complexity of the rural unemployment and underemployment problem is needed. This should include specification not only of how many but of *who* constitute the rural unemployed in the various countries -- by age, sex, tenure, education level, and other variables. An important objective must be to measure the severity and extent of seasonal unemployment and the degree of seasonal labor migration. Without such data, estimation of the potential supply of labor available for agricultural or other employment is not possible; nor is formulation of realistic programs for addressing the employment problem.

2. Technology. Additional research is urgently needed for the development of technology which is specifically designed to meet the needs of poor, small-scale, limited resource farmers. This effort should assign high priority to the channeling of additional research resources toward solving the problems of dry-land farming -- the situation in which some 80 percent of the farmers of the LDCs will find themselves for the foreseeable

future. The need for crop and soil scientists to devote more attention to developing high yielding varieties that are adapted to prevailing environmental conditions, as opposed to large investments designed to modify the environment, is acute. More adequate measurement of the employment impacts of the new technology, both in the long run and in the short run, and in terms of its various components, is essential.

3. The beneficiaries of modern technology. Investigate to determine who, within various socio-economic and political settings, benefits from the introduction of modern technology, who (if anyone) loses, and the extent of the trade-off.

4. Size of holding and employment/productivity. Determine the relationship between the size of agricultural holdings and per hectare productivity and employment. Small scale agriculture is generally considered to be both more productive (in terms of land utilization) and more labor intensive, but data are somewhat inconclusive. In land scarce, labor surplus economies, reliable information of this nature is essential to realistic planning where reallocation of land resources is contemplated.

5. Marginal return of capital invested. Many argue that a unit of capital invested in small holder agriculture or small rural non-farm enterprises creates more jobs and also has a more positive impact upon income distribution than it would if it were invested in larger holdings or in urban areas. If true, this has major implications for government planners concerned with employment generation and equity considerations.

6. Labor-intensive efficiency. The agricultural sector is viewed by some as having greater potential for efficient labor-intensive production than the non-agricultural sectors. Little hard comparative evidence has been compiled; yet this should be a researchable hypothesis.

7. Modification of rural service sectors. A fairly well documented phenomenon is that the delivery systems of rural public services, such as credit and agricultural extension, are biased in favor of the larger, wealthier, more influential farmers. Research is needed to determine how to modify these systems in order to provide more adequate access for limited resource farmers. Assessing the impact of such modifications on income distribution and employment is also necessary.

8. Reallocation of investments. Reallocation of investments in favor of those sectors which produce wage goods and the necessary inputs for those sectors (primarily agriculture), has been urged, in the expectation that it will slow rural-to-urban migration and increase employment. This area is inadequately researched.

9. Decentralization to rural areas. Some potential for decentralization of industry from urban centers to rural areas appears to exist, and it is commonly assumed that this would have a high payoff in terms of job creation at relatively modest capital costs. Research is needed to determine

the relative costs of creating jobs in rural vs. urban areas, including the costs of providing minimally acceptable social services and productive infrastructure. Identification of the more labor intensive industries with high potential for movement to rural areas would be necessary. A determination of what government incentives might be required (perhaps tax breaks, transportation subsidies, provision of land, etc.) is also needed. Measuring the extent to which private benefits from public investment in social overhead capital are currently subsidized in both rural and urban areas, and how the differential rates of subsidization have affected past location decisions should receive attention.

10. Rural-urban migration. Further research is needed to determine the costs and benefits and the causes and effects of rural to urban migration under varying conditions and in different countries.

11. Rural public works. The verdict of what is the overall contribution of rural public works programs towards the solution of the employment problem is unclear. Additional research is needed to determine the most labor-intensive approaches and to identify the most effective systems of organization and administration of such programs. The increase in demand for agricultural inputs and the increased marketings of agricultural outputs associated with the spread of modern technology are thought by some to have increased the rate of return to labor-intensive rural public works programs such as roads, bridges, irrigation, land leveling, and rural electrification.

More General Research

1. Trade. The employment creating potential in the LDCs of a liberalizing by developed countries of the trade restrictions on agricultural products of the third world is viewed by some as fairly substantial. Additional research is needed on the likely impact of changed import policies on employment, prices, incomes, etc., both in the developed countries and in the LDCs.

2. Factor price distortions. General consensus exists that government policies regarding import restrictions, credit, taxation, wage legislation, and a host of other actions have resulted, in many instances, in serious distortions in the factor market. This has often worked to the detriment of labor utilization. Further research is needed both to document the extent of the problem in individual countries and to devise feasible alternative policies designed to correct the existing distortions.

3. Savings and investment. The long accepted notion that individuals having higher incomes tend to save and invest larger percentages of their incomes is coming under attack within the context of the LDCs. The case is made that the investments of the wealthy often are not productive, and frequently are made overseas. By contrast, it is argued by some that the investments of low income people are generally made domestically to improve their small business enterprises and farms, with a consequent positive effect upon employment. Reliable data on the facts surrounding this issue

should be an essential prerequisite to government decisions regarding contemplated revisions in tax legislation or programs of income redistribution.

4. Consumption patterns. Consumption patterns of the wealthy are reported by some to be biased in favor of products that must be imported, and this requires the use of scarce foreign exchange that could be more productively invested. It is also sometimes argued that domestically produced products demanded by the wealthy are weighted towards luxury goods, the nature of production of which requires capital intensive methods that provide little employment. Research in this area could have strong implications regarding tax and investment programs.

5. Income redistribution. Policies aimed at redistribution of income in favor of the lower income groups constitutes a major political issue in some LDCs. Favoring such action is the argument that the lower income classes spend a high percentage of their incomes on labor intensive commodities (i.e. they have a high income elasticity of demand for such commodities as food and textiles), and therefore any increase in income levels generates increased demand for these products, and ultimately for the labor required to produce them. Reduction in purchasing power of the wealthy reduces the demand for automobiles, electronics, and other imports, thus saving foreign exchange for productive investment in the growing labor intensive agriculture and textile sectors. Detailed studies are needed to assess the impact on employment creation of alternative policies aimed at income redistribution.

6. Labor legislation. Research is needed to evaluate the employment impacts of labor legislation in the LDCs. What has been the effect of high urban wages upon rural-urban migration? How has legislation affected employers' hiring and retention practices, the use of overtime, the choice between capital intensive and labor intensive production techniques, and many other employment decisions?

7. Economic trade-offs. Some say that no trade-off is necessary between economic growth, employment generation, and income distribution. Others argue that a conflict among these objectives is unavoidable. Additional research is needed on a wide front to determine under what sets of conditions the conflicts can be minimized or avoided.

APPENDIX I. DEFINITIONAL AND MEASUREMENT PROBLEMS

The developed countries, over the years, have arrived at generally agreed upon definitions of employment and unemployment. Modern sampling procedures and computer-assisted analytical techniques have assisted in the development of sophisticated and comprehensive data banks which are updated regularly. Reliable data collection is facilitated by high literacy rates, well organized communication and transportation systems, adequate agency budgets, and the mere fact that large numbers of workers are employed as wage earners on a year-round basis. Among the LDCs, however, both the definitional problem and the measurement problems are much more complex. Further complications arise from the fact that, in large part, the concepts of employment and underemployment used in the LDCs are those developed primarily in the U.S. and Western Europe. Many of these are inappropriate to the task confronted by the LDCs.

Major Types of Labor Underutilization

Open Unemployment.

Open unemployment in the modern sector of the economy constitutes the most visible type of unemployment, and it is for this form of unemployment that the best data are available in any given country. Nevertheless, there are important statistical problems concerning the quality of the data, due in large part to collection methods. Sample surveys provide the most reliable information, but the results are greatly influenced by such things as the way in which the survey questions are phrased, the time of year the survey is conducted, and the length of the reference period. Intercountry comparisons are highly suspect.

One commonly accepted definition of open unemployment encompasses those "...unemployed persons who are willing and able to accept work on the same terms as employed persons of comparable abilities and who claim to be looking for work".^{1/} A significant problem in defining the labor force exists, however, since people not actively seeking employment might do so if they perceived that there were actual employment opportunities (i.e. the 'discouraged worker' effect).^{2/} Furthermore, substantial numbers who

^{1/} Ridker. "Employment and Unemployment in Near East....." *op. cit.*, p. 9.

^{2/} Beller points out that the labor force, defined as those employed and/or actively seeking employment, constitutes only about a third of the total population in the LDCs compared to over 40 percent in the industrialized nations. See Irv Beller, "Latin America's Unemployment Problems", *Monthly Labor Review* 93 (November, 1970): 4.

classify themselves as 'self-employed' in response to surveys would likely enter the job market if demand for labor were greater.

The category of open unemployment is sometimes further broken down to include 'voluntary' and 'involuntary' unemployment. The former refers to those unemployed individuals who exclude from consideration some jobs for which they are qualified, looking for something better to come along. This suggests the availability of some form of support while the job search continues. Persons in this category are likely among the relatively better off, perhaps students with parental support and others with some personal resources. The really poor must seize any job opportunities that arise. This phenomenon, Ridker hypothesizes, may account in part for the fact that Asian countries appear to have lower unemployment rates than Latin American countries, where per capita incomes generally are higher.^{3/}

Those most likely to be found among the openly unemployed are the young people newly entering the urban labor force - estimated to constitute roughly half of the urban unemployed - and the indigent who are unable to perform productive work because of age or ill health. Open unemployment does not appear to be a significant occurrence in the agricultural sector, due to work sharing and other cultural arrangements. Reliable data are, however, practically non-existent.

Although probably substantially fewer in number than the various other forms of labor underutilization, it is the openly unemployed who attract the major attention because of the visible threat to social and political stability.

Underemployment.

The underemployed are commonly defined as: 1) those who are working less than they would like, or less than the commonly accepted norm, in terms of hours per day, days per week, or weeks per year, and 2) those working at jobs whose productivity is less than some accepted norm.^{4/}

Problems arise in specifying what is an 'acceptable' or 'normal' work load and in attempting to build into it a measure of 'acceptable' or 'normal' levels of productivity. Worker productivity is a function not only of the time which that individual puts in, but also of the complementary

^{3/} Ridker, *op. cit.*, p. 12. He notes that open unemployment may be a luxury that only persons in richer countries, and the relatively better off in the poorer countries can afford.

^{4/} For a good discussion of a related concept, 'disguised unemployment', and some of the definitional and measurement problems associated with it in agriculture, see Charles H. C. Kao, Kurt R. Anshel, and Carl K. Eicher, "Disguised Unemployment in Agriculture: A Survey", in Carl Eicher and Lawrence Witt (eds.) *Agriculture in Economic Development* (New York: McGraw-Hill Book Co., 1964) pp. 129-44.

inputs which are available to him - for example, fertilizer, improved seeds, adequate land base, tools, pesticides, irrigation, and animal power. As these complementary inputs change, productivity norms presumably also change. Health and nutrition levels may greatly influence the number of hours per day a worker is capable of working. The seasonality of cropping patterns also substantially complicates valid measurements of agricultural employment levels.

Particularly in rural areas, employment often must be viewed in terms of a household rather than an individual. Dantwala has noted that in the LDCs a high percentage of the labor supply is self-employed or unpaid family labor engaged in household enterprises. Although earnings may be low or even nil, such persons are not considered to be unemployed.^{5/} The tendency towards work-stretching to fill the number of hours available, i.e. low intensity work for longer time periods, is an associated problem.^{6/} Household members frequently float in and out of the 'labor force', as dictated by seasonal labor requirements and off-farm employment opportunities.

Other Forms of Underutilization of Labor.

Although the categories of underemployment and open unemployment are the most significant, Edwards points out the existence of sub-categories which differ somewhat from the above, and which include persons not normally classified as either. These he refers to as the 'visibly active but underutilized', and includes within this grouping:^{7/} 1) *Disguised underemployment* - those who appear to be occupied on a full-time basis on farms, in government, household industries, etc. though the services which they render actually require less than full time. The work-stretching, low intensity forms of underemployment discussed above fit into this category. 2) *Hidden unemployment* - those engaged in 'second choice' non-employment activities such as household chores, schooling, etc. Any number of reasons may account for this, for instance: jobs may not be available at the education levels already obtained; jobs may not be open to women because of cultural mores. This sub-category overlaps with voluntary unemployment. 3) *The prematurely retired* - these persons are found primarily among the civil servants of some countries, but may also include retirees from the business world.

^{5/} M. L. Dantwala. "Definition of Unemployment and Problems of Its Measurement in Developing Countries", *The Challenge of Unemployment to Development and the Role of Training and Research Institutes in Development* (Paris: OECD, 1971) p. 30.

^{6/} Turnham cites data from Mexico and India which suggest the likelihood of work-stretching and "fringe" activities which occupy considerable time. See David Turnham, "The Definition and Measurement of Unemployment in Developing Countries" *The Challenge of Unemployment...*, *Ibid.*, pp. 46-47.

^{7/} Edwards, *op. cit.*, p. 10.

Possibilities for Modification

The complexity and constantly changing nature of the various sub-sets of underemployment has made reliable quantification of the magnitude of the problem practically impossible even in urban areas of the LDCs. The difficulties are greatly magnified in rural areas. Nevertheless, employment specialists generally agree that the less visible forms of unemployment constitute the most serious manpower waste. The study team in Colombia concluded that three generalizations can be made regarding the employment situation in rural areas: 1) the employment situation varies sharply from area to area within a country; 2) it varies considerably during the year (seasonality); 3) the nature of rural life makes overly-precise urban concepts such as 'active labor force' or even 'unemployment' meaningless.^{8/}

Despite the obvious conceptual and measurement problems, from a policy formulation standpoint a better grasp of the existing situation, particularly in rural areas, must be obtained. As Dantwala has pointed out, "For economic analysis as well as policy purposes, it is necessary to have information, not only on the overall average level of unemployment, but also on the nature of unemployment and the distinctive characteristics of the unemployed".^{9/} He and others stress the need not only for quantitative, but also for qualitative information (characteristics of age, sex, educational level, status or class of worker, race, family size, etc.) regarding who the unemployed are and where they are located.

Increased rural in-depth studies in smaller geographic areas may prove vastly more valuable than the current national estimates, both in terms of obtaining reliable qualitative information and in providing guidance for remedial action. It may also be that provisions need to be made for viewing employment in terms of earnings rather than just hours or days worked. Various country missions and other research groups have experimented with the feasibility of using some form of 'inadequate income' measure of underemployment.^{10/} In those studies where income level has

^{8/} ILO. *Towards Full Employment....Colombia, op. cit.*, p. 23.

^{9/} Dantwala, *op. cit.*, p. 38.

^{10/} See, for example, ILO, *Sharing in Development...Philippines, op. cit.*, and Turnham, who has suggested a technique whose operational procedure would be: "...(i) to calculate average income among fully employed workers; (ii) to take one half or one third of the average so defined and to identify the group of full-time (and potential full-time) workers whose income falls below this level and (iii) examine the circumstances of this group-activities (and the lack of them); status-employees/self-employed, etc.; sociological and demographic features - race, family size, sex, age and so on. A practical yardstick of the employment situation is then the size of the proportion of low paid workers and a worsening or improvement in the situation would be judged by reference to increases or falls in the proportion over time". See Turnham, *op. cit.*, p. 51.

been used as a major proxy for an underemployment measure, the estimates of the number of underemployed are invariably substantially greater than when reliance is placed only on an hours or days worked concept.

Whatever the modifications adopted, it is imperative that an expanded data collection effort be mounted, and that increased attention be devoted to developing a meaningful grasp of the true situation in rural areas -- where the bulk of the population lives and where the least reliable information on employment, income, and levels of living is currently available.

APPENDIX II. SOURCES AND NOTES ACCOMPANYING TABLE 5

Data Sources:

- India - A modification of calculations made by Krishna based upon NSS data. Raj Krishna, "Unemployment in India", *Economic and Political Weekly*, Vol. VIII, No. 9, March 3, 1973. Underemployed refers to those working less than 28 hours per week and willing to work more.
- Indonesia - Population census of Indonesia, 1971.
- Korea - Korean Bureau of Statistics, Economic Planning Board, *Annual Report on the Economically Active Population*. Rural open unemployment refers to farm households and urban open unemployment to non-farm households. Underemployment is defined as working less than 40 hours per week; rural underemployment refers to agriculture, and urban underemployment to non-agriculture.
- Malaysia - T. T. Khoo and K. K. Kwok, "The Pattern of Labour Utilization in Peninsular Malaysia", paper presented at the CAMS/ODA Seminar on Labour Supply, Philippines, June 21-25, 1976.
- Pakistan - Government of Pakistan Ministry of Finance, Planning, and Development, *Labour Force Survey, 1969/70*.
- Philippines - R. L. Tidalgo, "Philippine Experience in Labour Absorption", *Philippine Economic Journal* (forthcoming); T. Mijares and R. L. Tidalgo, "Labour Absorption in the Philippines", paper presented at Conference on Manpower Problems in East and Southeast Asia, Singapore, May, 1971; J. Encarnacion, G. Tagunigar, and R. L. Tidalgo, "Unemployment and Underemployment" in *Philippine Economic Problems in Perspective*, J. Encarnacion, et. al., 1976; Bureau of Statistics and Census *Survey of Households*. Underemployment refers to those working less than 40 hours per week.

Thailand

Government of Thailand National Statistical Office, *Final Report of the Labour Force Survey, Whole Kingdom, Round 2, July-September, 1973*. Rural unemployment and underemployment refer to non-municipal areas, and urban unemployment and underemployment to municipal areas. Underemployment refers to those working less than 40 hours per week.

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