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Projections of Manpower Requirements
in Pakistan: A Methodological Note

by

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PROJECTIONS OF MANPOWER
REQUIREMENTS IN PAKISTAN:
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INTRODUCTION

In planning for economic development the importance of manpower projections can hardly be overlooked. Labour is an important and multi-dimensional factor of production - not only the quantity of labour is significant, but also its intensity of use and quality are crucial in determining its contribution to the production of goods and services.

Projections of capital requirements are commonly used to estimate the saving and balance of payments gaps as possible serious bottlenecks in the process of development. Just like capital, projections on manpower requirements (both quantity and quality) can help identify the various kinds of shortages and surpluses which could become bottlenecks or serious economic and political problems.

Keeping in view the fact that it takes a long 'lead' time to change both the quantity and quality of manpower, timely projections are essential in identifying shortages and surpluses of various kinds and in taking proper policy and other measures to check them.

In most underdeveloped countries manpower planning and hence, projections are not given adequate attention and treatment. Somehow one of the factors of production, i.e., capital, steals

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away the attention of planners. This is an unfortunate tendency and could have very serious consequences in countries like Pakistan where manpower shortages in terms of quality, and surpluses in terms of quantity are substantial and growing.

Some work on manpower projections and planning has been done in Pakistan during the last few years. The basic aims of this paper are to review the available professional work, make some suggestions for methodological improvements, and suggest some tentative policies to overcome the foreseen problems.

The paper is organized into five parts. Part I describes sources and nature of the work done in Pakistan. Part II discusses the benchmarks and methods used in projecting manpower requirements. Parts III and IV present a critical review of the works, and make suggestions for improvements. The concluding Section broadly discusses some policy measures to solve the problems of unemployment/underemployment.

I. Sources and Nature of Manpower
Projections in Pakistan

Almost all the professional work has been done in Government and foreign-aid institutions. The main source is the ILO/UNDP Manpower Planning Project based at the Manpower Section of the Planning Commission, Islamabad. Under this project, two foreign advisers Messers. K. Ruud and R.A. Karwanski were actively engaged in the preparation of manpower projections of various kinds.

They have produced over a dozen pieces of work by using the available and generated data during the last four years.

The work by Mr. Ruud is heavily oriented towards projecting manpower requirements, whereas the work by Mr. Karwanski has been oriented towards projecting manpower availability. The projections cover five year periods, beginning 1970 upto 1990. Further, they have also been extensively involved in projecting manpower skill and educational level requirements.

Work on the lines of the ILO/UNDP Manpower Planning Project was done for East Pakistan by the Planning Department, Government of East Pakistan. This work concentrates on the estimation of the available stock of skilled manpower covering degree and diploma holders. It also makes projections of skilled manpower requirements and availability for the Fourth Five Year Plan period (1970-75).

Some work was also done by the Planning and Development Department, Government of West Pakistan, mostly estimating employment and manpower situation for the year 1968-69. This work does not deal with medium and long-term manpower projections due to certain reservations about the available data and methodology.

Outside the Government agencies, substantial work on manpower projections and its problems was done in the USAID in the form of various reports and studies by the consultants.

In the time perspective, work by the USAID is the earliest. Then come the works by the ILO/UNDP Manpower Planning Project and

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the work by the Planning Department of East and West Pakistan governments.

II. Concepts, Benchmarks and Methods used

A few words should be said on the nature of the concept of manpower 'requirements' as opposed to the 'demand' for manpower. Market approach in manpower planning focusses on the demand for and supply of manpower and the balancing of both. In short time periods the market approach is feasible. But as the time horizon is extended, projections of demand and supply become extremely uncertain and lose their usefulness.

On the other hand, for medium and long time periods manpower planning necessitates a structural approach in which the sectoral, occupational and educational structures of the labour force and employment are worked out. The structural aspects can be predicted with some reliability even for long time periods. Since it takes a long 'lead' time to influence the structural aspects of manpower, advance knowledge (projections) about them is extremely useful.

Demand and supply are economic concepts. Requirements and availabilities on the other hand, are methodological concepts and they may tend to equal demand and supply, respectively, under certain price implications. In order to work out the impact of the long-run behaviour of the economy without indulging in the price implications, requirements and availabilities, instead of demand and supply, play a useful role.

This paper is confined to projections of manpower requirements only. Most professional workers are not clear about what they mean by manpower requirements. Since the concept of manpower requirements is methodological, its meaning will vary depending on the methodology used. In general, we distinguish between two types of approaches to manpower requirements:

- i) Budgetary manpower requirements, and
- ii) Optimal manpower requirements.

The budgetary approach is based on the observed (or technologically determined) manpower requirements needed to produce a unit of output or to match with a unit of investment. Projections of manpower requirements under this approach extend the benchmark situation with or without certain minor assumptions about the budgetary relationships into the future.

Under the optimal manpower requirements approach, questions are raised as to the optimal nature of output (or investment) - labour relationships, sectoral mix of the economy, etc. If at all levels optimal relationships are used, then the manpower requirements would mean minimum requirements relative to the basic assumptions made.

After making the distinction between the market approach and the structural approach, we proceed to describe the work in Pakistan.

Most of the professional work in Pakistan concerns two aspects of manpower projections, namely, a) projections of aggregate manpower requirements for the economy and its sectoral breakdown, and b) projections of occupational pattern and educational levels implied under a).

II.a. We first begin with projections of manpower requirements for the whole economy and its sectoral distribution. The commonly used technique in this connection is to estimate the output (or gross value added) per worker for the various sectors of the economy and to apply the estimate to the projected sectorwise value added. This method can be regarded as the average output-labour ratio method. The method was used by Dr. Nicholas DeWitt [3], F.G. Seib [27], Gary G. Hufbauer [8], K. Ruud [19], and the Department of Planning, Government of East Pakistan [4].

The essential step under this method is to estimate or assume the sectoral average output-labour ratios. Dr. DeWitt, in the absence of a better alternative basis, used the Censuses of 1951 and 1961 and the data on gross value added compiled by the Central Statistical Office to estimate the output per worker for the years 1950/51 and 1960/61. By comparing the outputs per worker for the years 1950/51 and 1960/61, he observed an annual rate of productivity decline of 1.4% in agriculture, 0.6% in transportation and 0.9% in trade, utilities and services. Labour productivity increased, however, at the annual rate of 1.8% in manufacturing and mining, and at 5.7% in construction (Annexure 1).

Dr. DeWit projected employment for the year 1969/70 on the basis of the observed output per worker in 1960/61 (version I), and by assuming increased labour productivity of 20% in manufacturing and of 50% in construction (version II). The assumed increase in the sectoral labour productivity is based on the trend during the 1951-61 period. The observed labour productivity declines between the years 1951 and 1961 in the three sectors were, however, ignored [3, pp. 18-19].

Planning Department, Government of East Pakistan recognizing certain target assumptions about the growth of sectorwise value added per worker and taking the estimated sectoral value added in 1970 as the benchmark, projected employment for the Fourth Five Year Plan (1970-75) [4, pp. 38-39].

Dr. Gary Hufbauer [8] slightly deviated from the above method in arguing that single year estimates of value added (output) per worker are defective in the sense that they indicate average budgetary relationships. What is more appropriate is the marginal value added per worker and this cannot be estimated from a single year aggregative data.

Fortunately, employment and value added data on West Pakistan are available by major sectors for the years 1951, 1955, 1959, 1961, 1963/64 and 1965 which were put to regression analysis by Hufbauer. Significant relationships between employment and value added were found over time in agriculture, manufacturing, transport and communications and trade sectors. On the basis of the implied marginal

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value added per worker, employment projections were made for the years 1966/67 and 1967/68. In the case of those sectors (i.e., mining, construction, public utilities, etc.) for which the relationship between employment and value added could not be estimated due to the lack of data, single year estimates were used.

Dr. Hufbauer's projections for the years 1966/67 and 1967/68 are based on the experience of the recent past (1951-65) and should be regarded short-term. He did not suggest the use of marginal value added-labour ratios for long-term projections even though marginal ratios are superior to the average ratios. Dr. Hufbauer is wise in doing so because the marginal ratios, though superior estimates, are only meaningful in relation to the growth behaviour and pattern during the period for which they are estimated. Unless one knows enough about the behaviour and pattern of marginal ratios in a growing economy and be reasonably sure about their reliability and stability, long-term projections based on average or marginal value added-labour ratios could be extremely inappropriate.

It is not very encouraging to see that some of the employment projections made by the Planning Commission for the Perspective Plan period (upto 1985) are based on single year value added-labour ratios and certain untested assumptions on labour productivity changes.

In fact, labour-productivity studies available so far are inadequate to provide suitable information on the elasticity of employment (or labour productivity) in developing economies.

In view of these problems, one is left with two alternatives:

i) projections of manpower requirements should only be made for short-term periods, or ii) factual information on employment behaviour in a growing economy should be obtained to form a sound basis for projecting long-term manpower requirements.

Alternative i) was chosen by Dr. DeWitt [3], Dr. Gary Hufbauer [8], and the Department of Planning, Government of East Pakistan [4].

Others have argued that alternative ii) must be pursued because of the inevitable need for projecting long-term manpower requirements [19, pp. 10-12].

Given the fact that long-term manpower projections are important but presently lacking, Mr. Ruud makes an attempt at producing a set of such projections. It may be noted that long-term projections made by Ruud are the only ones available in Pakistan outside the work done for the Perspective Plan by Wouter Timms and others at the Planning Commission.

As pointed out earlier, the knowledge about employment behaviour in a growing economy is a prerequisite for projecting long-term manpower requirements. For this purpose, the Pakistan experience is limited and not very clear due to the lack of proper data. Hence, Mr. Ruud is tempted to use the results of an inter-country analysis developed by Yves Sabolo [26]. Sabolo's work includes 40 developed and developing countries and estimates the

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relationship between the sectoral employment pattern and economic growth through regression equations (Annexure 2). The results of the analysis are in the following [19, pp. 13-14].

	<u>Sectors</u>	<u>Estimated Functions</u>	<u>R</u>
(1)	$\log \frac{100 E_0}{N}$	$= 1.783 - 0.106 (\log Y/N)^2$.712
(2)	$\log \frac{100 E_{2-3}}{N}$	$= -0.014 + 0.105 (\log Y/N)^2$.825
(3)	$\log \frac{100 E_4}{N}$	$= -6.045 + 4.206 (\log Y/N) - 0.676 (\log Y/N)^2$.826
(4)	$\log \frac{100 E_5}{N}$	$= -2.193 + 0.581 (\log Y/N)$.810
(5)	$\log \frac{100 E_6}{N}$	$= 0.046 + 0.072 (\log Y/N)^2$.827
(6)	$\log \frac{100 E_7}{N}$	$= -1.124 + 0.487 (\log Y/N)$.800
(7)	$\log \frac{100 E_8}{N}$	$= -0.142 + 0.344 (\log Y/N)$.800

Where,

- N = Population.
- Y = GDP in 1960 US dollars.
- E_0 = Employment in Agriculture, Forestry and Fishing
- E_{2-3} = Employment in Manufacturing and Mining.
- E_4 = Employment in Construction.
- E_5 = Employment in Gas, Water and Electricity Services.
- E_6 = Employment in Commerce.

E_7 = Employment in Transport and Communication.

E_8 = Employment in Services.

Regression equations (1) - (7) are based on a non-linear function in the following general form:

$$Y = cx (b + a \log x) + \dots \dots \dots (8)^{1/}$$

$$\log Y = \log c + b \log X + a (\log x)^2 + \dots \dots \dots (9)$$

In the context of sectoral employment distribution it is given the form:

$$\log \frac{100 E_i}{N} = b_0 + b_1 (\log Y/N) + b_2 (\log Y/N)^2 + \dots (10)$$

The explained variable is sectoral employment as a percentage of population in logarithmic form. The explanatory variables are per capita income and per capita income square, both in logarithmic form. The model essentially relates the relative employment in each of the major sectors to per capita national income. Since the countries included in the model are at different per capita income levels, the estimated coefficients are supposed to reflect a relationship between the pattern of sectoral employment and economic growth. Moreover, the sectoral employment distribution is expressed in terms of population—this helps to estimate the employment distribution as well as the level of employment at various income levels. If the employment distribution were expressed in terms of labour force, then the level of employment could not be estimated.

^{1/} Chenery proposed similar relationships for the manufacturing sector [2].

On the basis of the estimated relationships of sectoral employment and per capita income growth, and by taking 1961 as the benchmark, projections for the years 1970, 1975, 1980, 1985 and 1990 were made. The procedure followed for each sector is as follows:

- i) by inserting the value of independent variables for all years of projection including the base year 1961, estimates of the dependent variables, i.e., $100 E_i/N$ (sectoral employment as a % of population) were obtained;
- ii) estimates obtained under i) were adjusted by a constant factor which is equal to the difference between the unadjusted estimate of $100 E_i/N$ for the base-year and its actual (Census) value;
- iii) by multiplying the adjusted $100 E_i/N$ estimates under ii) by the population estimates, employment projections are obtained; and
- iv) by adding the unemployment estimates to iii) estimates of labour force requirements are obtained.

Adjustments under ii) show that the application of Sabelo's intercountry model aims at projecting changes rather than levels of sectoral employment.

By adding up the projected sectoral manpower requirements, the total requirements come to 64.7 millions in 1990 against the projected manpower availability of 75.7 millions for the same year^{2/}. This leaves a manpower surplus of 11 million (East Pakistan: 6.6 million, West Pakistan 4.4 million) which Mr. Ruud adds to the agricultural sector which being the traditional sector is expected to retain surplus manpower in the form of underemployment/unemployment [25, pp. 2-5].

^{2/} Manpower (labour force) availability is projected by Dr. R.A. Karwanski [11, 13].

It was estimated that after 1970 if the population growth is reduced from 3.0% to 2.25%, there would be no manpower surplus.

The surpluses are also sensitive to the growth of the economy. Mr. Ruud has used the following growth rates for East and West Pakistan.

	<u>1961-65</u>	<u>1965-70</u>	<u>1970-90</u>
East Pakistan	4.5%	5.0%	7.0%
West Pakistan	6.5%	6.5%	6.0%

In the light of the past growth experience of the Pakistan economy, it seems that the assumed growth rates are quite reasonable. However, a sensitivity analysis could have been useful in showing how far the acceleration of economic growth can reduce the projected manpower surpluses in both the wings. But such an analysis was not done by Mr. Ruud.

II.b. Occupational Pattern and Educational Levels

In order to project the manpower requirements with occupational distribution and educational levels, the usual procedure has been to begin with manpower projections for the economy/sectors and to apply the occupational/educational coefficients.

For example, Dr. DeWitt, after projecting the manpower requirements for the years 1964 and 1970, applies the number of matriculates, graduates and post-graduates per thousand employment in various sectors to estimate the manpower educational level requirements. The educational level coefficients are estimated from

the 1951 and 1961 Censuses (Annexure 3). Similarly, the occupational pattern by a few categories is also estimated.

The Department of Planning, East Pakistan has used more than one method for projecting the manpower occupational pattern and educational levels during the Fourth Five Year Plan. The first method used is to breakdown manpower into educational levels on the basis of the experience of the Second and Third Plans. For example, in the case of engineers, both the marginal investment-employment ratio and the marginal employment-output ratio for the Second Plan were tried. On the basis of the projected engineers, requirements for diploma engineers and certificate technicians were estimated at the ratio of 1:3:10 for the manufacturing sector. In the case of teachers and doctors, teacher-student ratio and population-doctor ratio were applied, respectively. In the case of agricultural personnel, ideal requirements for an administrative unit, i.e., Thana, were applied. In the case of accountants the ratio of accountants to the gross domestic product was used.

Mr. Ruud has done more elaborate work on projecting manpower occupational pattern and educational levels. He has used three methods. The first method is regarded as the indirect method in which projections of educational requirements are made into two steps: i) sectoral employment estimates are multiplied by the occupational patterns, i.e., relative distribution of employment by occupations within each sector, resulting into employment estimates by occupation, and ii) multiplying i) by the estimates

of educational level patterns of occupations, estimates of employment by the level of education are obtained.

Under the second method (also called the direct method) employment by the level of education can be estimated in one single step by multiplying the sectoral employment by the educational level patterns of economic sectors.

Information on the first and second method is built from the employment situation in the base year of 1961.

In order to check the estimates of labour force by the education levels, a third method was applied. This method was developed by the Netherlands Economic Institute on the basis of an intercountry analysis [16]. The estimated relationships are as follows:

$$S = 163.7 (Y \cdot 10^{-6})^{1.314} (Y/P)^{-0.655}$$

$$G = 5.2 (Y \cdot 10^{-6})^{1.202} (Y/P)^{-0.164}$$

where,

Y = GNP in 1957 U.S. dollar

Y/P = GNP per capita in 1957 U.S. dollars

S = Manpower stock educated to second level

G = Manpower stock educated to third level.

On the basis of the three methods, Mr. Ruud derives a final set of estimates as a compromise among the three basic estimates.

III. A Critical Review of Benchmarks and Methods Used in Projecting Manpower Requirements.

III.(i). The most commonly used method in projecting the short and medium term manpower requirements for the whole economy/sectors is the method of average (or marginal) value added per worker. There is no doubt that the marginal value added-labour ratios are better than the average ratios if they can be estimated.

It must be noted, however, that the sectoral value added-labour ratios are not sufficient, because in a growing economy like Pakistan sectoral distribution is expected to change. In fact, the most dynamic and growing sectors like manufacturing, transport and communications, health and education should be divided into sub-sectors in order to estimate the value added-labour ratios.

Proper sectoral distribution is an essential prerequisite, because the sectoral-labour productivity in an economy like Pakistan varies widely. For example in 1960-61, the output per worker was Rs.858 in agriculture, Rs.1136 in manufacturing and mining, Rs.2047 in construction, Rs.2693 in transportation and Rs.2181 in trade, utilities and services (Annexure 4). Since full employment, competitive markets and mobility are lacking for labour, the value added-labour ratios tend to be unequal. The average value added per worker in the non-agricultural sectors is more than twice the labour productivity in the agricultural sector.^{3/}

^{3/} This difference in labour productivity among other things could be due to the difference in the capital used on per worker basis.

Most of the research workers in Pakistan have done very little work on the sectoral distribution of the economy. For purposes of manpower projections, they have borrowed the sectoral distribution from the Planning Commission.

In connection with the value added-labour ratios, it should be observed that the work done in Pakistan is based on 1951 and 1961 Censuses and other sources like partial surveys and national income estimates. The state of data before 1960 is not very good and also the growth experience of Pakistan economy during 1950-1960 is very peculiar and different from the decade 1960-70, and the times to come after 1970. It is, therefore, essential that the estimation of the marginal value-added-labour ratios (or investment-labour ratios) should be based on very sound data. This can be achieved by conducting proper Censuses of manufacturing industries and partial surveys in other sectors. Intensive sectoral surveys may be useful in this connection.

Nevertheless, short and medium term projections can be made on the basis of properly estimated sectoral value added (or investment)-labour ratios and a proper sectoral mix of the economy.

It should be pointed out that in Pakistan the value added per head has not ^{been} estimated from production functions and as such they represent budgetary relationships. Similarly, it is not sure if the sectoral mix used is optimal. From economic point of view, the methods used are extremely crude. It is suggested that future

work on short and medium projections must be based on meaningful relationships between the sectoral value added (or investment) and employment.

III.(ii). Long-Term Projections

For the purposes of making long-term projections of manpower requirements, one needs a proper benchmark, labour productivity coefficients and their behaviour pattern, and a proper sectoral distribution of the economy.

As to the benchmarks used, most research workers make use of the 1961 Census (Volume 4) as the benchmark. It may be noted, however, that 1961 Census may not be the most reliable source for such information but due to the fact that it is the only comprehensive source available, research workers have tended to use it. Even if we assume that the Census information is correct, one should be reluctant to use it for long-term projections, because the Pakistan economy prior to the Census made progress under defective policies causing misallocation of resources. For example, in the manufacturing sector the development took place under policies of high tariff and other kinds of protection, overvaluation of the rupee, cheap capital and subsidies of many kinds. Furthermore, the industries have been operating under market conditions which lack competition. In the field of agriculture also, prices of various inputs and outputs were distorted through Government policies in such a way that they failed to reflect the relative resource scarcities.

Thus, under a general policy of non-uniform protection and distorted input and output prices, the output and input mix in the production process were bound to be non-optimal. The types of economic activities, the intensity of labour use, the skill and educational mix of the labour force cannot be regarded proper in the economic sense. Hence, to use the 1961 observed employment and its pattern as a benchmark is not very sound. The benchmarks used for long-term projections must be related to optimal resource use, because in most likelihood during the next 20 years or so, one should expect the economic policies to change towards rationality. Even if such policy adjustments do not take place in reality, the research workers should assume such adjustments in order to show the alternatives, at least.

Mr. Ruud is conscious of the non-optimal nature of the benchmark used. But he solves the non-optimality and other problems by estimating the sectoral employment with the help of Sabolo's inter-country model and by adjusting projections by the difference between the model estimates and the actual observations in the benchmark year. The correction is extended to the whole of the projection period, i.e., 1970-90. This implies that after recognising that something is wrong with the benchmark data, he identified the degree of error by the standards of Sabolo's intercountry model, and makes a correction on the assumption that whatever the degree of correction is necessary in 1961 will be sufficient and proper for the next 30 years.

Ignoring the fact that the benchmark is non-optimal as well as may have statistical deviation from the model estimates, the use of Sabolo's intercountry model is not proper in determining the degree of correction required in the benchmark. The assumption of constant correction factor is a very daring one. We think that the corrections made by Mr. Ruud are not very meaningful since the method of projections cannot shed light on the optimality of the various projections. Even if there were no difference between the observed employment in the benchmark year 1961 and the model estimates, nothing could be said about the optimality of the benchmark. The model estimates are some kind of average results observed within an intercountry model and as such it does not qualify to be optimal in any sense.

Regarding the actual method adopted by Mr. Ruud for projecting long-term manpower requirements, one needs a i) proper benchmark, ii), marginal value added-labour ratios or investment-labour ratios, iii), the long-term behaviour of ii), and iv) a proper sectoral distribution of the economy.

Mr. Ruud solves the problems of obtaining ii), iii) and iv) by borrowing the estimated employment pattern functions from a 40-country model. According to Mr. Ruud the intercountry model includes developed and developing countries and the estimated employment pattern is thought to be relevant for the Pakistan economy.

In the first instance, it should be noted that Mr. Ruud is not quite right in assuming that the intercountry model is relevant for Pakistan, because the countries included in the model have an average per capita income of \$ 748 with a range of \$ 109 to \$2295. It is obvious that countries like Pakistan which have an average per capita income of about \$ 70 at 1960-61 price level are not included in the model, since countries with per capita income under \$ 100 are altogether missing. Countries with per capita income between \$ 100 and \$150 are six in number which is only 15% of the whole sample (Annexure 2). Thus it can be said that countries like Pakistan as judged by the per capita income level are very few in the model and that the results of the model cannot be regarded as reflective of the structural changes which we are looking for.

Another point worth noting is that the population in these countries with the exception of the United States, seldom exceeds 60 million; whereas Pakistan's population at present is over 120 million. Thus the intercountry model includes very few countries which have per capita income and population size close to Pakistan. In our opinion, the model is not a relevant one and its results could be misleading in indicating the employment pattern and its behaviour for a country like Pakistan which aspires to triple its present per capita income of \$70 in the next 20 years, and will have a population of over 210 million.

It could be argued, however, that although the model does not include many countries like Pakistan but the estimated

relationships can be used to predict the relative employment pattern in the context of the growing economy of Pakistan. This argument needs a serious scrutiny, because the proficiency of a model to predict always depends on certain fundamental assumptions. To illustrate the point, the model under discussion has the following estimated functions for the relative employment in the agricultural and manufacturing sectors, respectively:

$$\log \frac{100 E_0}{N} = 1.783 - 0.106 (\log Y/N)^2 \dots \dots \dots (1)$$

$$\log \frac{100 E_{2-3}}{N} = -0.014 + 0.105 (\log Y/N)^2 \dots \dots \dots (2)$$

Now supposing that there are two countries namely Country 'A' and 'B' each having a per capita income of \$100, but the population in Country 'B' is 120 million against a population of 20 million in Country 'A'. If Equation 1 & 2 of Sabolo's model are applied, it is obvious that the employment in the agricultural and manufacturing sectors as a percentage of the population will be the same in both countries. But in absolute numbers the employment in both sectors in country 'B' will be much larger than in country 'A'.

The question arises as to the implications of larger employment in both the sectors of country 'B' in terms of its feasibility. It is obvious that larger employment in the manufacturing sector means larger production facilities in the same

sector. It is quite conceivable in view of the nature of the manufacturing activities that at a given level of per capita income, more persons can be absorbed in the sector by just increasing the number of production units. This amounts to an horizontal expansion of the sector. There will be implications of such expansion in terms of the supply of and demand for the inputs and outputs of the manufacturing sector, but the possibilities of international trade and the reproduceable nature of the inputs used make us feel that substantial horizontal expansions are feasible.

But in the case of the agricultural sector, horizontal expansion is not always feasible, because one of the main inputs is land which can be augmented but not reproduced. Thus a substantial horizontal expansion can only take place if the agricultural resource endowment permits. In a country like Pakistan which has almost 3 to 4 times the population of most countries included in Sabolo's model and one of the lowest land-man ratios, cannot achieve substantial horizontal expansion in a short time (Annexure 5). It is true that by substituting capital for land, the horizontal expansion becomes easy but given the fact that countries 'A' and 'B' both have the same per capita income, one wonders as to the source of supply of physical and human capital. The supply of capital can come from other sectors, but it would affect the expansion of those sectors. Foreign sources of supply can help to solve the problems, but the magnitude in the case of Pakistan is such that one can never be sure of a smooth and substantial horizontal expansion in

the agricultural sector to the extent the intercountry model implies.

We feel that Pakistan belongs to a unique group of countries which have low per capita income and very large populations compared to the developing countries of the Western Europe, Africa and Latin America. Proper models can only be built on the basis of the growth experience of countries which are similar to Pakistan. This does not look possible at this stage.

Regarding agricultural sector, we would like to point out another irregularity in the application of Sabolo's model by Mr. Ruud.

The model gives a separate and extensive treatment to the employment problems in the agricultural sector. He notes that upto a certain level of development the relative employment in the agricultural sector does not decrease as indicated by Equation (1) /26, Pp.17-21. Sabolo's Equation (1) only applies to those countries where with economic development the relative employment in the agricultural sector begins to decline. Mr. Ruud without investigating whether Pakistan has reached such a stage or not, applied Equation (1) in order to estimate the relative employment in the agricultural sector. This we think is a short-cut to avoid the problems involved in projecting manpower requirements of this sector.

A fundamental issue should be raised about the production relationships implied under Sabolo's model. The model is developed on the lines of Chenery's study on the patterns of industrial growth

which is based on the basic relationship.

$$V_i = f(Y, N) \dots\dots\dots (11)$$

where,

- V_i = value added in the i-th sector
- Y = per capita income
- N = population

Concentrating on manufacturing, construction and a few other sectors, Chenery found that the sectoral distribution of national product changes with economic growth generating certain common distinct patterns within the intercountry models due to the common universal factors like tastes, technology and prices of internationally tradeable goods.

Sabolo argues that if the sectoral distribution of product changes with economic growth, then the sectoral pattern of employment should also changes even if the sectoral labour productivity remains constant.

In fact the sectoral labour productivity also changes further adding to the change in the sectoral patterns of employment.

Thus he converts the sectoral relationships under (11) into:

$$\frac{E_j}{L} = f_j(Y, N) \dots\dots\dots (12)$$

where,

- E_j = Employment in sector j
- L = Total labour force.

It should be noted that whereas Sabolo recognizes per capita income growth and changes in labour productivity as the main factors

influencing the sector patterns of employment, he confines to the Chenery type model in which changes in labour productivity are not very important. Moreover, Chenery's model is based on Keynesian type analysis rather than on production functions which is quite satisfactory in the context of the problem Chenery is analysing. But the kind of problem Sabolo is analysing, production relationships become very important.

Sabolo instead of using the definition of relative sectoral employment under (12) has used employment as a percentage of population as shown in the following:

$$\frac{E_j}{N} = f_j(y) \dots\dots\dots (13)$$

The reason given for using the definition of relative sectoral employment under (13) instead of that under (12) is the lack of data on labour force. But this switch over from $\frac{E_j}{L}$ to $\frac{E_j}{N}$ may complicate the problem because the participation rates do not bear a well defined relationship with per capita income.

Since Sabolo defined the employment pattern in terms of sectoral employment as a percentage of population, Mr. Ruud was able to estimate absolute as well as relative employment in Pakistan.

But as pointed out earlier, countries like Pakistan have large populations at a low per capita income and as such may be suffering from peculiar problems like under employment.

There are problems in conceptualizing as well as measuring underemployment, but we feel that the problem is so vital and of

such a magnitude that some sort of conceptualization and measurement should be done.

For illustrative purposes, we attempt to provide in the following a conceptual and estimation framework covering the decade for which data on rural population are easily available, i.e., 1951-61.

III.(iii). Estimating Underemployment in the Agricultural Sector: Changes during 1951-61.

In the conventional theory, underemployment is supposed to exist when the marginal productivity of labour (MPL) is zero, or positive but less than the institutional wage rate. Under this concept, the measurement of underemployment is extremely difficult, because as the population grows faster than the employment opportunities in the agricultural sector and outside it, the surplus working age population gets absorbed (disguised) in the same sector and in other sectors. This absorption can take place in the form of i) reduced intensity of labour to provide room for the surplus working population, ii) reduced productivity of labour, iii) increased cultural and social activities, and iv) a movement towards cities for regular/irregular work. It may be noted that underemployment can take any or many of the above forms and with observed data it would be very difficult to find out if the MPL is zero in a sector stricken with underemployment. But if we accept the possibility that surplus working age population can mostly be found in the form of disguised unemployment rather than open unemployment in the

subsistence agricultural sector, then we must measure the extent of underemployment in reference to a time comparison. Since Censuses of population are available for the years 1951 and 1961, it is proposed to use these points of time for comparison purposes.

East Pakistan:

Let us start with the case of East Pakistan which is much more simple for measurement purposes. The rural population in 1961 was 48.20 million as compared to 40.11 million in 1951 [6, p.11-16]. This implies an increase of 20% (8.1 million). The relevant question is that whether the employment opportunities in the rural sector increased to the extent of absorbing the addition to working age population.

In East Pakistan the main occupation in the rural sector is farming. Employment opportunities can only increase if i) the area under cultivation increases, ii) cropping pattern changes in favour of labour intensive crops, iii) a shift from nonirrigated farming in favour of irrigated farming takes place, and iv) technological changes take place to make farming methods more labour intensive (use of fertilizers, pesticides, high productivity seeds, etc.).

During the decade 1951-61, we find that the area under cultivation in the peak farming season (i.e., March-September during which Aus and Aman rice crops and jute are grown) increased by 5.4%. If other crops of the same season like sugarcane, tea, cotton, maize and barley are added, then the increase in the area under cultivation comes to 6.3%. If we take the area under cultivation

for the whole year, then the increase is about 6% (Appendix A).

It is a common knowledge that the use of fertilizers makes farming more labour intensive. In East Pakistan by the year 1961, estimated consumption of fertilizers is about 18,700 nutrient tons [3, p. 82]. We assume that 40% of the total fertilizer consumed is applied in the peak farming season (March to September) and if about 28 nutrient lbs. are applied to an acre, it results into 10% increase in labour use. On the basis of these assumptions, it is estimated that the impact of fertilizer use is equivalent to an addition of 60,000 acres to the area under cultivation. This makes the area under peak-season cultivation to increase by 6.1% instead of 5.4%.

Thus, it can be said that labour requirement in view of the increased area under cultivation and fertilizer use could have created about 6% more employment opportunities compared to the base year 1951. The population during the decade 1951-61, as noted above, increased by 20% (8 million) implying that about 14% of the working age population could not be absorbed. By assuming that the working age population is about 36% of the total rural population [7, p. 97] and for simplification, ignoring the effect of changes in the age structure on labour availability, the estimated underemployment comes to 2.9 million persons.

It may be noted that we have not yet taken into account the employment opportunities which could have been created through more labour intensive technological and other changes. In the

context of East Pakistan, we do not find any substantial changes in the cropping pattern/technological changes which may force us to believe that employment opportunities on these counts increased very much during the decade 1951-61.

Now the next question is that the estimated underemployment of 2.9 million persons could have been reduced by a movement towards other activities in the same sector and outside the sector. Our method of conceptualizing underemployment is based on the 1951 structure of employment in the rural sector and also assumes 1951 technology. If there is a change either in the pattern of employment or technology resulting into the creation of more employment opportunities, then we must make some allowances. But it seems highly unlikely that such technological and structural changes took place in the rural sector of the economy. The only outlet is employment in the nonagricultural sector.

In the urban sector there was an increase of 8 million persons of which about 30% must be regarded as the working age population. This means an addition of 2.4 million persons in the urban sector. In the light of the industrial and other developments that took place during the decade 1951-61, it seems highly unlikely that employment opportunities could have been grown so substantially as to absorb persons in excess of 2.4 million. Thus, one can safely say that approximately 2.9 million working age population, as estimated above, was added to the rural sector of East Pakistan as being underemployed.

It may also be noted that this estimate of underemployed persons is relating only to an increment in the 1951 level. In actual fact, the extent of underemployment could be higher than this number, depending on the degree of underemployment in the benchmark year of 1951.

West Pakistan:

A similar exercise was done for West Pakistan where the area under cultivation during the peak farming season (i.e., Kharif) increased by 13%. On top of it, the impact of fertilizer use and expansion in irrigation facilities took place. If both of them are taken into account then the acreage increase comes to 16.0% (Appendix B). In addition, the cropping pattern changed in favour of more labour-intensive crops like rice and sugarcane. If we make an allowance for the changes in the cropping pattern and assume that the cultivation of rice and sugarcane is about 25% more labour intensive relative to cultivation of other crops like maize, cotton, jowar and barley, then the acreage increase comes to 18.0%. There was also a modest increase in the crop yields for which we raise the area increase by 15% which will make the increase in acreage to around 20%. This means that employment opportunities increased by 20% whereas the rural population increased by 19.3%. This implies the possibility that agricultural sector expanded to an extent which could absorb the increase in the rural population.

Institutional factors like private holdings, lack of mobility, lack of information about employment opportunities and, in many cases, considerations of private profitability may reduce the possibility of absorbing the additional population in the expansion of aggregate employment opportunities. In reality, many bottlenecks and factors will prevent the underemployed/unemployed persons to be absorbed in areas where employment opportunities are relatively growing faster. This kind of possibility is very much expected in West Pakistan where areas experiencing expansion in acreage, irrigation facilities and the use of fertilizers and changes in the cropping pattern may have less population per acre. The phenomenon will result into the use of tractors and other machinery, because family labour may not be sufficiently available on farms where technology and inputs requiring more labour are being used resulting into mechanization.

In the light of these possibilities, one should be cautious to conclude on the basis of the above estimates that underemployment did not increase in West Pakistan during the decade 1951-61. In fact, due to the institutional and other obstacles mentioned above, underemployment can exist in some areas side by side with labour shortage in certain other areas.

III.b. Occupational Pattern and Educational Levels.

Objections similar to the ones mentioned above can be levied on the professional work done in connection with the long-term

projections of occupational pattern and educational levels.

Mr. Raud and others have used the population Census information as the benchmark. As pointed earlier, due to the government policies and other factors distorting the price of inputs and outputs of most economic activities, the skill and educational level mix cannot be expected to be optimal. Furthermore, the process of industrialization and agricultural development started in 1950's, but during that period manpower with the necessary education and skills was in extreme shortage due to the inherited initial endowment in this respect. Thus, in the light of the poor initial endowment of skilled and educated manpower coupled with high protection to the industrial activities and distorted prices, the educational and skill mix is nonoptimal.

The nonoptimality of the educational and skill mix of manpower can be illustrated by the fact that in 1961, 78% of all matriculates and about 87% of all degree holders were employed in the service sectors including public service, trade and utilities (Annexure 4). This, in the light of the international comparisons, means virtual starvation of the productive sectors. Mr. Raud did not make the necessary adjustments.

Similar objections can be raised on the coefficients and models used for long-term projections. Pakistan is a poor country with extreme scarcity in capital and natural resources. The economic development can only be accelerated by making investment in the physical and human capital. The factor proportions are such that

Pakistan like Japan has to make much more use of human capital compared to other developing countries of Africa and South America. The intercountry model used by the Netherlands Economic Institute [16] is not a proper guide as to the estimated coefficients for projecting educational levels. On the basis of these remarks it can be concluded that the occupational and educational level projections made in Pakistan are not very sound.

IV: Methodology For Projecting Manpower
Requirements: Some Suggestions
for Improvement

The first and foremost step is to begin with a proper benchmark. It is obvious that the 1961 Census information cannot be used as a proper benchmark. Thus, there are two alternatives: i) that the 1961 Census information should be substantially improved and adjusted for serving a sound basis, and ii) that new information should be collected/generated in such a way that it could become a proper benchmark. Since the next Census of population is due in less than a year's time, it may be a good idea to wait a little while and collect most of the information on labour force, occupations, educational and skill mix in the economy. This information should be further verified by conducting Censuses/partial surveys for the various sectors and subsectors of the economy.

As it has been pointed out earlier, the observed labour intensity, educational skill mix of those who are employed cannot be optimal due to the distorted output and input prices and other

policies. It is important that we should make adjustments and see how the optimal benchmark looks like, although it is not easy.

In order to make the 1961 or any other benchmark optimal the crucial questions are what would be the employment situation if prices of inputs/or outputs were proper in the sense of reflecting relative scarcity of resources, and technological alternatives were sufficiently rich to suit the social objectives of the society and the resource endowment of the economy. These questions are difficult questions and it may not be possible to answer them satisfactorily. Nevertheless, what we can do is to identify substantial discrepancies between the situation in Pakistan and what should have been the situation if proper prices and technological alternatives were effective.

Many improvements can be introduced by proper international comparisons. In such comparisons, adjustments should be made to allow for the differences in the factor prices, technological possibilities and social objectives.

One of the obstacles in arriving at the nature and degree of adjustments is the fact that economic development is taking place in Pakistan with borrowed modern technologies and under distorted prices. Countries like Pakistan had not made conscious effort to broaden the technological alternatives suitable for the economy, and price and other policies have been such that market forces have not forced the producers to move towards suitable technologies.

After making proper corrections in the benchmarks, one needs a basis for projecting manpower requirements. There are three alternatives left to solve the problem:

- i) Another inter-country model should be built on the basis of production relationships and by including countries which have per capita income, population and resource endowment similar to Pakistan. But this seems extremely difficult as growth experience of countries like Pakistan is not available either in the context of country experience in time or at the cross-sectional level, or
- ii) the other alternative is to build growth models about Pakistan itself in which one could project sectoral distribution on the principles of consistency and optimization and on the basis of the sectorwise marginal value added per worker and its possible future behaviour long-term projections of requirements can be made. Such models are badly needed and with some conscious and extra efforts they can be built for Pakistan. Mr. Ruud made projections for 30-year period. The kind of models suggested under (ii) may not be possible to develop for such a long period. As a solution, the period for projections can be cut to 10-15 years which is quite sufficient to bring about changes in the demand for manpower.
- iii) Still another alternative is to give up the idea of building models for the whole economy and to deal with certain sectors on individual basis and certain other sectors in the framework of an overall production model.

We prefer approach (iii) due to its workability and reasonably sound nature. Brief details are in the following:

- a) Projections of working age urban population should be made in order to compute the increase over the benchmark.
- b) Estimates of employment opportunities should be made in the non-agricultural sectors like manufacturing, construction, transport and communications, trade and other services, etc. For these sectors facts like value-added (or investment)-labour ratios, etc. can be collected. Once a proper sectoral distribution is available, estimates of employment opportunities are possible.

- c) Compare (a) with (b) and if we find (b) to exceed (a), then the non-agricultural sectors can absorb working age population other than (a).
- d) Projections of working age rural population should be made in order to compute the increase over the benchmark.
- e) Balance of (b) over (a) should be deducted from (d). This will indicate the manpower to be absorbed in the agricultural sector.
- f) Taking the same benchmark as under (d), estimates should be made for the increase in employment opportunities over the benchmark from the following sources:
 - i) increase in the area under cultivation;
 - ii) changes in the cropping pattern;
 - iii) changes in the techniques of production;
 - iv) changes in the inputs used (i.e., seeds, fertilizers, water, pesticide machines etc.); and
 - v) changes in crop yields.

The information needed for i) - v) could be easily available from the observed data and from specially designed surveys.

- g) On the basis of (e) and (f) estimates can be made on the magnitude of working age rural population that remains unabsorbed.
- h) Adjustments should be made in (g) for the institutional and other obstacles in the way of mobility and absorption of the available manpower in the farming activities.

This will provide the estimated surplus of working age population that remains unabsorbed at the benchmark level of living. But through time the level of living of the population must rise which means that the productivity of labour must be higher than the benchmark level. For this another adjustment is needed which will raise the extent of surplus.

- i) If under (h) a surplus of working age population is available, then estimates should be made about the expansion of other employment opportunities in the rural sector i.e., livestock, forestry, cottage industry, education, health, etc. The employment opportunities available under these heads should be deducted from the surplus under (h).

(This will give us the extent of unemployment/underemployment in the economy. Focussing at the outcome, development efforts should be made to minimize the extent of unemployment and underemployment.

In Pakistan, the exercise should be done on regional and broad sectoral basis: distinction between the agricultural and non-agricultural sectors is essential.

The other important aspect of manpower projections is the educational and skill mix of manpower. For this we think demand functions/or policy coefficients should be developed to form the basis for projections.

The kind of projections made by Mr. Ruud which extend to thrity years are unnecessary and hardly satisfactory. We would go along with Dr. Hufbauer's suggestions [8, 14-18] that by keeping trace of what happens to the graduates of our universities and colleges in terms of employment, one can identify the areas of manpower surplus and shortages so far as the educated personnel is concerned. Similar surveys and other sources of information can help us to identify the other areas of serious shortages for skilled manpower. On the basis of such information we can adjust our educational and training programmes in a way that shortages are removed and surpluses are reduced. It makes no sense to project that how many graduates will be needed unless we know the degree of shortages/surpluses by type of graduates. Thus, the approach should be pragmatic in this connection, specially when requirements

cannot be projected on the basis of available information and that the possibilities of substitution exist for the various types of educated and trained manpower.

V: Policy Problems: Some Observations
and Suggestions

In this part we would like to make some observations on the employment situation in the country. It is well known that there exists a high degree of underemployment in the agricultural and some of the service sectors. Open unemployment exists in some cities and take the shape of landless labour in the rural areas.

The other main problem is the surplus of educated young who, after coming out of colleges and universities, expect to be absorbed in the economy, but fail to find suitable jobs. On the other hand there are serious shortages of certain skills and types of education which the educational system has not been able to remove. Thus the main problems of Pakistan are underemployment and unemployment of unskilled workers as well as serious surpluses and shortages for the educated and skilled manpower.

In order to solve these problems, concerted efforts must be made in the agricultural sector which is the largest employment creating sector and will remain so for a couple of decades to come. This can only be done if proper price policies are taken and technological alternatives broadened. Present policies of subsidizing inputs like capital must cease and instead encouragement through price and other policies be provided to use labour to a

greater extent. It can be helped by extending irrigation facilities and changing the cropping pattern in favour of the labour-intensive crops wherever it is socially profitable. It is important to increase the area under cultivation through raising the intensity of cultivation as well as by bringing new lands under cultivation. It will be fruitful to use water within regions and seasons optimally. By making a proper and fuller use of water, cultivable land resources can be increased in the short run.

The next area of attack should be to discourage the use of machinery which displaces labour relatively more than it raises the productivity in the agricultural sector. Policies designed to bring the private profitability closer to the social profitability will help a great deal to create employment opportunities. Policies should also be designed to increase the mobility of farmers and farm labour within Pakistan.

There are two other subsectors in the agricultural sector which need special attention. Firstly, the development of livestock and poultry in areas where cultivation of crops is a poor alternative. This can help to generate income as well as employment.

Secondly, the service sector in the rural areas provides substantial potential for creating employment opportunities. Most important service subsectors are transport and communications, storage and marketing of agricultural produce, health, education, extension service, law and order, repair and maintenance of capital etc. The development in these services will require a large number

of skill and semi-skill manpower and will help to accelerate the process of development in the sector. It is our belief that enormous capacity to absorb educated and skilled manpower exists in the above mentioned sub-sectors. At present the agricultural sector is making very little use of educated and skilled manpower.

It is to be emphasized that the success in solving employment problem will only come through the success in creating employment opportunities in the agricultural sector over the next 1-2 decades. In the non-agricultural sectors, employment opportunities can be created by further growth of the manufacturing sector, services, trade and utility sectors. It is well known that due to the nature and rigidity of modern technology, employment opportunities in the large-scale manufacturing sector cannot be created to an extent sufficient to solve the employment problems of Pakistan. Uptil now, direct employment created in the large-scale manufacturing sector does not exceed 2 million persons. It is almost unimaginable that most the unemployed can be absorbed in this sector. The expansion and rationalization of this sector can, however, help to create enormous employment opportunities for the educated and skilled manpower. In order to achieve it, policies should be adopted to improve efficiency and competition within the manufacturing sector. This can be achieved by reducing and rationalizing the level of protection given to industry, and by introducing competition through open imports or through concentrating on few industries. The price policies should also be adjusted to make the market prices for

inputs to reflect relative social scarcities. Outside the large-scale manufacturing sector, substantial employment opportunities can be created in the small-scale and cottage industries. Special attention should be paid to the development of such industries, and obstacles like the lack of technical know-how and credit facilities should be removed. In the service sectors like transport, communications, trade, utilities etc., efforts should be made to create employment opportunities. This can be done again by adopting proper price policies and by making efforts to adopt labour intensive technologies. In the field of transport, such efforts are urgently needed.

Among the service sectors the most neglected one has been the social sector: education and health. Efforts should be made to extend education and health facilities wherever they are needed. Such services are badly needed in the rural areas. It is needless to say that there is a great need for adjustment and re-orientation in the education and health systems.

At the end, we would like to make a few observations on the two important policies adopted by the Martial Law Government in the recent past. They are, namely, the education policy and the labour policy. The education policy as adopted by the government is designed to extend and improve the educational facilities to the nation. We believe that the extension of education and training facilities as envisaged in the policy is more or less satisfactory. The improvements in the educational facilities, however, have not

been up to the mark. There is a great need to increase the investment component of education in production. It is the necessity of the day that our educational system should stop producing products which are not needed by the economy. Instead the education system should be geared to make its products more productive and suitable in the kind of the environment in which they are going to live and work. We wish that the New Education Policy will succeed in producing more productive educated people and will eliminate wastes from the educational system.

The other important policy which will affect the future growth of the economy and the employment situation in the country is the New Labour Policy. Among other things, one of the important features of the New Labour Policy is the minimum wage legislation introduced in the large-scale manufacturing sector. The minimum wage level has been determined in relation to a desired subsistence level for the unskilled workers. The fact remains that the level of minimum wages has been fixed above the market wage rate as well as the opportunity cost of labour in the non-manufacturing sectors. The net results of the legislation are, obviously, to discourage the use of labour as an input. This is contrary to what we would like to see in order to solve the employment problems of Pakistan. This can, however, be prevented by raising the price of other inputs so that they reflect the social scarcities, and by compensating employers for the excess of minimum wage over the shadow price of labour. These steps have not been undertaken so far. It is hoped

that more serious attention will be given to this issue and proper policies will be designed to encourage an optimal use of all the factors of production.

There is no guarantee that even if proper policies are undertaken, the whole of the manpower in the working age group shall be gainfully absorbed in the economy. This could happen if the technological alternatives are not very rich. Technological possibilities are a serious constraint on the full absorption of available manpower.

The existing technology in most of the countries has been developed in the light of factor endowment in those countries. Countries like Pakistan, China and India are unique in the sense of having very large population. It is important that efforts should be made to develop technological alternatives which will allow the absorption of available manpower in gainful employment. It is this front at which Pakistan should make maximum efforts. Suitable technological alternatives are of great immediate importance in the agricultural sector. It may be a good idea for Pakistan to collaborate with other large population countries in developing suitable technologies. It is our belief that in the long run our success to solve employment problems depends on our success in adopting proper price and other policies, and in developing technological alternatives consistent with our resources endowment and social objectives.

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APPENDIX APart I: Area under cultivation (000 acres)

A. Major crops (Whole year):

	1950-51		1960-61	
	3-year average	% of total	3-year average	% of Total
Rice	19,945	90.31	21,333	90.84
Jute	1,684	7.63	1,651	7.03
Tea	75	0.34	79	0.34
Sugarcane	229	1.04	283	1.20
Maize	11	0.05	17	0.07
Barley	83	0.38	74	0.32
	22,082	100.00	23,483	100.00

Percentage increase in the area under major crops (whole year = 6.3%)

B. Major Crops (Peak Season: March-Nov.)

	1950-51 3-year average	1960-61 3-year average
Rice (Aus)	5,127	6,040
Rice (Aman)	13,995	14,316
Jute	1,684	1,651
Total	20,806	22,007

Percentage increase in the area under major crops (Peak Season 5.8%)

Part II: Effect of Fertilizer Use on Labour intensity

		(Nutrient Tons)
i)	Fertilizer consumption	
	1951	-
	1961	18,700
ii)	Assumed fertilizer use per acre	28 nutrient lbs.
iii)	Assumed fertilizer consumed in the peak Farming Season	40% of (i)
iv)	Assumed increase in labour intensity with fertilizer use under (ii)	10%
v)	Acreage impact compared to 1951 level.	$10\% (18,700 \times 2240 \div 28) =$ $40\% \times 2240 \div 28 =$ 60,000

A P P E N D I X BPart I: Area under cultivation (ooo acres)

A Major Crops (Kharif season)

	1950-51		1960-61	
	3-year average	% of Total	3-year average	% of Total
Rice	2294	21.37	2964	24.44
Cotton	3026	28.18	3321	27.38
Sugarcane	492	4.58	1012	8.35
Bajra	2263	21.07	1963	16.18
Maise	965	9.00	1182	9.73
Barley	452	4.21	496	4.09
Jowar	1245	11.59	1190	9.81
	10,737	100.00	12,128	100.00

Percentage increase in the area under major crops
(Kharif season) = 13.0%

Part II: Effect of Fertilizer use on labour intensity

	Nutrient tons)
i) Fertilizer consumption 1951	-
ii) Assumed fertilizer use per acre	29,400 28 nutrient lbs.
iii) Assumed fertilizer consumed in the peak farming season	50% of (i)
iv) Assumed increase in labour intensity with fertilizer use under (ii)	10%
v) Acreage impact compared to 1951 level:	10%
	$(29,400 \times 50\% \times 2240 \div 28) = 118,000$ acres

(50)

Hussain: Projections of Manpower Requirements
(000 acres)

Part III: Area Irrigated:	i) 1950-51	21,409
	1960-61	23,354
	ii) Increase in the irrigated area	1,945
	iii) Kharif season irrigated acreage	
	2/3 of (iii)	1,204
	iv) Assumed differential of labour intensity on irrigated land	25%
	v) Acreage impact	30%

ANNEXURE I

Total Output, Employment, and Output per worker in Pakistan, 1950-51 and 1960-61

Sector	1950-51			1960-61			1950/51 - 1960/61 Labour productivity Trend (Average Annual Rate)
	Gross Value Added (Million Rupees)	No. of Persons Employed ('000)	Output per worker Rupees	Gross Value Added (Million Rupees)	No. of Persons Employed ('000)	Output per worker Rupees	
Agriculture	16,140	17,124.7	942	18,465	22,644.5	815	Decline 1.4
Mfg. & Mining	1,605	1,409.4	1,122	3,307	2,477.2	1,333	1.8
Construction	240	180.0	1,333	804	346.6	2,320	5.7
Transportation	1,337	314.0	4,258	2,094	523.9	3,997	Decline 0.6
Trade, Utilities, and services (Including Public)	5,564	2,474.9	2,248	8,175	3,962.1	2,063	Decline 0.9
Gross Domestic Prod.	24,886	21,524.0	1,156	32,845	30,206.0	1,087	Decline 0.6

Notes: Exclusive of rents and other revenue from leases of housing and real estate.

Columns 2 & 5: C.S.O. New Series in 1959-60 Prices on National Accounts converted to 1960-61 prices.

Columns 3 & 6: Employment by sector from the 1951 and 1961 Censuses of Populations.

Columns 4 & 7: Computed from (4) and (7).

Source: Dewitt, N, "Pakistan's High Level Manpower and Human Resource Development Planning," A Report Submitted to U.A.I.D/Pakistan, Mimeo-graphed.

Annexure 2

Data for Sabolo's Inter-Country Analysis

Country	Year	Per Capita Income	Per Capita Investment
Morocco	1960	137	16
Mauritius	1963	215	45
Barbados	1960	119	86
Canada	1961	1,048	472
Costa Rica	1963	266	40
Chile	1960	471	59
Equador	1962	156	27
Honduras	1961	356	25
Jamaica	1960	402	90
Panama	1960	361	66
Peru	1961	183	38
Puerto Rico	1960	749	176
El Salvador	1961	136	21
Trinidad	1960	554	164
United States	1960	2,295	477
Uruguay	1963	558	78
Venezuela	1961	633	131
Cyprus	1960	481	93
Israel	1961	1,120	417
Japan	1960	404	173
Jordan	1961	193	32
Philippines	1960	109	14
Korea	1960	120	16
Thailand	1960	126	19
Austria	1961	923	228
Belgium	1961	1,212	244
Denmark	1960	1,611	326

Country	Year	Per Capita Income	Per Capita Investment
Spain	1960	365	82
Finland	1960	847	227
France	1962	1,825	374
Germany (F.R.)	1961	1,889	457
Greece	1961	364	101
Ireland	1961	766	142
Italy	1961	885	248
Luxembourg	1960	1,535	388
Norway	1960	1,487	499
Netherlands	1960	1,267	325
Portugal	1960	318	59
Turkey	1960	259	39
United Kingdom	1961	1,505	276
Australia	1961	1,580	407
Average		747.756	175.537

Source: Sabolo, Yves, "Sectoral Growth of Employment" Lineographed,
ILO, Geneva, 1968.

ANNEXURE 3

Non-Agricultural Labour Force (10 years and above)
By Industry Group and Education Levels in Pakistan 1961

Industry Sectors	Total (000)	High Level Manpower per 1000 Employees	
		Matrics	Degree Holders
(1)	(2)	(3)	(4)
Total Non-Agricultural Labour	7,764.2	67.5	13.2
Agri. Forestry and Fisheries	262.7	9.4	Negligible
Mining	23.0	52.2	5.6
Manufacturing	2,454.2	23.4	2.5
Construction	346.2	27.9	4.6
Transportation and Communications	523.9	75.8	7.4
Public Utilities	35.5	194.4	19.7
Trade	1,447.2	43.3	4.1
Finance & Insurance	27.3	461.5	128.2
Services (Total)	2,452.1	122.5	31.4
Among which			
education	216.7	345.6	117.8
Health	101.1	237.4	50.4
Religion/Arts	96.4	70.5	19.7
Post and Tele-graph	39.6	366.6	32.8
Govt. Management	421.4	280.5	64.1
Personal Services	1,204.8	4.6	Negligible
Others, Defence	363.7	154.5	42.6
Not working, but looking for work	251.6	125.9	10.3

Source: DeWitt, H. "Pakistan's High Level Manpower and Human Resources
Development Planning, Report Submitted to U.S.A.I.D./Pakistan
February 1965.

ANNEXURE 3

Non-Agricultural Labour Force (10 years & above)
By Industry Group and Education Levels
in Pakistan, 1961

Industry Sectors	Total (000)	High Level Manpower per 1000 Employees	
		Matrics	Degree Holders
(1)	(2)	(3)	(4)
Total Non-Agri. labour	7,764.2	67.5	13.2
Agri., Forestry, Fisheries	202.7	9.4	Negligible
Mining	23.6	52.2	8.6
Manufacturing	2,454.2	23.4	2.8
Construction	346.2	27.9	4.6
Transportation & Communications	523.9	75.8	7.4
Public Utilities	35.5	194.4	19.7
Trade	1447.2	43.3	4.1
Finance & Insurance	27.3	461.5	128.2
Services (Total)	2452.1	122.5	31.4
Among which			
Education	216.7	345.6	117.8
Health	101.1	237.4	50.4
Religion/Arts	96.4	70.5	19.7
Post & Telegraph	39.8	366.8	32.6
Govt. Management	421.4	280.5	64.1
Personal Services	1204.8	4.6	Negligible
Others, Defence	363.7	154.5	42.6
Not working, but looking for work	251.6	129.9	10.3

Source: DeWitt, N. "Pakistan's High Level Manpower
and Human Resources Development Planning,
Report submitted to U.S.A.I.D./Pakistan,
February 1965.

ANNEXURE 4

West Pakistan Average and Marginal Product Per Employed Worker in Major Sectors, 1951-65

Sector	Average Value Added in 1959-60 Prices					
	1951	1955	1959	1961	1963/64	1965
Agriculture	903	990	971	858	891	911
Mining	3,364	2,526	16,750	2,700	7,533	6,400
Manufacturing	938	850	986	1,136	1,442	1,381
Construction	3,339	553	1,070	2,047	3,817	1,969
Public Utilities	1,261	1,600	2,200	3,300	2,491	9,250
Transport & Communication	4,850	2,746	2,631	2,693	3,479	1,756
Trade	1,993	1,680	1,352	2,181	2,361	2,062
Services (Excluding Defence)	1,460	951	1,167	1,071	1,150	1,555
Total	1,078	1,091	1,133	1,139	1,254	1,261

Source: Hufbauer, Gary C., "West Pakistan Employment and Manpower", Occasional Paper No. 9, Planning and Development Department, Government of West Pakistan, Lahore, Sept. 1969, p.5-6.

ANNEXURE 5

Land Resources and Population for Selected Countries

Country	Agricultural Land (000 Hectares)				Population (000) (1967)	Agricultural land per person (Hectares)
	Arable Land & land under permanent crop.	Permanent Meadows & Pastures	Forested Land	Total (2)+(3)+(4)		
1	2	3	4	5	6	7
Morocco (1966)	7,858	7,650	5,337	20,845	14,140	1.47
Mauritius (1966)	92	20	45	165	794	0.21
Barbados (1960)	26	4	-	30	249	0.12
Canada (1966)	43,404	20,937	449,094	507,455	20,441	24.83
Costa Rico (1963)	622	923	2,981	4,526	1,580	2.86
Chile (1965)	4,511	10,083	20,686	35,280	8,970	3.93
Equador (1964)	2,894	2,200	14,845	19,939	5,508	3.62
Honduras (1963)	823	3,413	3,019	7,255	2,445	2.97
Jamaica (1965)	241	247	208	696	1,876	0.37
Panama (1961)	564	831	6,092	7,487	1,329	5.63
Peru (1965)	2,701	27,330	87,000	117,031	12,385	9.45
Puerto Rico (1966)	267	314	118	699	2,697	0.26
El-Salvador (1961)	648	604	226	1,478	3,151	0.47
Tobago & Trinidad (1963)	139	6	232	377	1,010	0.37
United States (1964)	176,440	259,173	296,135	731,748	199,118	3.67
Uruguay (1961)	2,252	13,847	593	16,692	2,783	5.99
Venezuela (1961)	5,219	16,706	47,970	69,895	9,910	7.05

	1	2	3	4	5	6	7
Cyprus (1966)		432	93	171	696	614	1.13
Israel (1967)		411	822	101	1,334	2,669	0.50
Japan (1967)		5,753	948	25,558	32,259	99,920	0.32
Jordan (1965)		1,140	212	67	1,419	2,080	0.68
Philippines (1966)		8,330	2,988	14,603	25,921	34,656	0.75
Korea Rep. of (1967)		2,312	6,618	6,616	28,946	29,930	0.38
Thailand (1965)		11,415	-	27,354	38,769	32,680	1.19
Austria (1967)		1,670	2,257	3,225	7,152	7,323	0.98
Belgium (1967)		895	739	601	2,235	9,581	0.23
Denmark (1967)		2,700	323	472	3,495	4,819	0.72
Spain (1967)		20,482	13,707	11,240	45,429	32,140	1.41
Finland (1967)		2,760	91	21,761	24,612	4,664	5.28
France (1966)		20,214	13,632	12,714	46,560	49,866	0.93
Germany (F.R.) (1967)		8,185	5,797	7,178	21,160	57,699	0.37
Greece (1966)		3,851	5,239	2,608	11,698	8,716	1.34
Ireland (1967)		1,194	3,589	194	4,977	2,899	1.72
Italy (1967)		15,213	5,166	6,107	26,486	52,334	0.51
Luxemburg (1967)		66	67	86	219	335	0.65
Norway (1967)		845	145	7,026	8,026	3,785	2.12
Netherlands (1967)		922	1,317	294	2,533	12,598	0.20

	1	2	3	4	5	6	7
Pertugal (1963)		4,370	530	2,500	7,400	9,442	0.78
Turkey (1967)		26,250	26,135	12,578	64,963	32,710	1.99
United Kingdom (1967)		7,416	12,127	1,790	21,333	55,068	0.39
Australia (1966)		39,797	447,208	35,151	522,156	11,751	44.44
Pakistan (1965)		28,214	-	4,185	32,399	120,185	0.27
India (1965)		162,434	14,809	61,170	238,413	511,625	0.47
Ceylon (1967)		1,875	13	3,325	5,213	11,701	0.45
Indonesia (1954)		17,681	-	90,825	108,506	110,899	0.98

Source: Columns (2), (3) and (4) : F.A.O. Production Year Book,
 Column (6) : 1968, Rome,
 Column (7): (5): (6): 1969, pp. 307 and 15-19.

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