BUILDING CONSTRUCTION MATERIALS INDUSTRIES & TECHNOLOGY CHOICE:
Their Impact on Rural Employment and Income distribution.
Case study of Sahiwal District, Pakistan.

SYNOPSIS

Employment and income distribution are major objectives of most rural development projects and programs. Many such programs, espousing the approach of basic infrastructure development of small towns and rural areas, require substantial capital inputs by way of building construction. Even in the absence of such a specific commitment to rural infrastructure development, private housing and public buildings can often constitute a large portion of total rural investment. However, the link between such investment and rural employment and income distribution has yet to be systematically investigated. Housing economists have pointed out the employment generating potentials of building construction, but their studies have focused on the urban sector and are unrelated to a defined spatial unit which is the context of most rural projects.

This thesis examines rural building construction and materials industries within a rural district in Pakistan, specifically in terms of their employment and income distribution impacts. It argues that given the development and selection of more appropriate technologies such impacts could become significant while also reducing construction costs.

The appropriate technologies lie closer to the traditional end of the technology spectrum rather than the modern end. However, modern building technologies are typically adopted in rural public buildings and promoted in the private sector. This results in substantial leakage of building

investments from the rural to the urban sectors and to the upper income groups. The high costs of such technologies also restrict their coverage and affordability.

The adoption of more traditional building technologies is inhibited in several ways. These include import substitution policies favouring urban formal sector industries, weak effective demand for traditional technologies and the modernisation/demonstration effect which distorts public and private preferences away from traditional practices. Rural development programs and projects that aim to use building construction investment for employment and income distribution need to be designed to take such factors into account.

THESIS OUTLINE

1. Introduction

Relating thesis subject to relevant concepts and definitions concerning technology, employment and development and to approaches and methodologies used in previous studies on housing employment and rural development.

2. Housing, Employment, and Income Conditions in Pakistan

A discussion of the patterns and trends in rural housing, employment and income conditions, housing and rural development policies and programs in Pakistan and a description of the study area.

3. Materials Production and Supply

A comparison of industries for potentially substitutable materials (e.g., oil vs. agiculture waste-fired bricks, timber vs. steel)

Discussion of such factors as owner-manager-worker relations, inputs supply, product quality and distribution methods.

Financial ~~and~~ economic & social analysis of industries through modified cost-benefit and cash flow framework, particularly to compare such trade-offs as between profitability and income distribution.

Summary conclusions regarding industries, nature of improvements required in each and potentials for substitution.

4. Building Technologies

A comparison of the range of building technology types grouped into traditional, intermediate and modern, existing and proposed.

Comparison of such factors as technical performance and complexity of construction according to income group and whether the project is public or private, particularly to compare tradeoffs such as construction vs. maintenance cost & complexity.

Financial, and economic/social analysis of building technologies through modified CBA and cash flow framework particularly to compare such tradeoffs as least cost versus income distribution.

What is meant here?

Using input-output matrix to analyse changes in coverage, demand for inputs, and employment and income distribution which ~~through~~ result from varying the shares of each building technology type in total output in both the public and private sectors, ~~within the district~~. Particular reference to such factors as whether public sector demand shifts can significantly increase the market for traditional materials, improve employment and income distribution situation or, conversely create bottlenecks in the input supply.

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Summary conclusion regarding relative desirabilities of building technology types, identifying those which optimise least cost and employment and income impacts. with technical performance.

5. Policy

Economic and institutional factors that supress the demand for traditional building technologies and materials industries such as those considered desirable from the preceding analysis. General conclusions and suggestions for how these factors may be addressed at the national and project level and potential problems in implementation.

Issues:

1. What are perceptions (by consumers) of costs and benefits of alt. technologies? Are these perceptions realistic (from the consumer's viewpt.)?
2. What factors may be causing mkt prices to deviate from shadow prices and by how much?
3. Are such deviations of long enough probable duration to warrant special govt help for the currently disadvantaged firms?
4. What would be the quantitative impacts of alt. govt policies designed to remedy the observed situation?

Chapter One
(summary)

I. INTRODUCTION

Although building construction - private housing or public buildings - often constitute a significant portion of investment and activity in rural areas, their implications for rural employment and income distribution have yet to be systematically investigated. Consequently, no specific body of literature exists on the subject. In its absence, one is faced with the task of drawing on the main theories underlying discussions on technology, employment and development and the literature on housing and employment in relation to rural development.

1. Technology, Employment & Development

The literature on technology, employment and development issues from three basic theories.

The growth theorists adopt the neo-classical model emphasising development as resulting from maximising aggregate output which, in turn, occurs through capital accumulation from profits, savings and investment. Capital-intensive technologies (often accompanied by scale and agglomeration economies) achieve capital and labor productivity and increased output. Labour is absorbed through capital accumulation (employment) and capital improvements insure higher productivity, and, therefore, wages (income distribution). However, present consumption (and employment) may have to be sacrificed for greater future consumption (and employment)(Sen, 1970).

Technology analysis centers on the two inputs (capital and labour), one output, production function with price as

the determinant insuring that the most productive proportions will be utilised (Solow, 1956). Technical advance occurs when fewer inputs can produce the same output. Inappropriate technologies result through price distortions from policies such as import substitution (Ranis, 1971 and 1979).

The capitalist countries through aid can make up the savings gap and along with the multinational corporations can transfer the most modern and appropriate (i.e., productive output maximising) technologies to the Third World. Such modern innovations will spread from the capitalist countries through urban systems finally down to the rural areas and backward regions -- with broader development "trickling down" in the same way (Hirshman, 1958, Berry, 1972). This theory favors profits over wages, and investment in large-scale, capital intensive urban industrial enterprises in the formal sector over small-scale informal sector enterprises whether urban or rural.

Employment and basic needs theorists point out that in Third World countries where capital is scarce and labour is plentiful and underconsuming, the most effective and egalitarian route to economic development is through human capital improvements. This is achieved through the provision of basic goods and services - food, health care, education and shelter, etc. - directly to the poor and by providing employment to strengthen their effective demand for these basic needs. Thus investment in basic needs and labour-intensive technologies, not necessarilly maximising output, is stressed particularly for the informal rural sector (ILO, 1975).

Dependency theorists may agree with the prescriptions of the employment exponents but emphasise that they cannot be effectively implemented until dependency ties are severed between the Third World and the capitalist countries. They argue that underdevelopment is a historical result of the domination of the capitalist (core) over the less developed (periphery) nations, implemented during colonial times through direct rule and now in partnership with the local elite. During this period, there has been a net siphoning of resources - human, natural and financial - from the periphery to the core. This has resulted in stunting the development, and, in some cases, underdeveloping the periphery. The same core-periphery relationship extends within the Third World countries, i.e., between urban and rural areas and between less and more advanced regions. Under this model, aid, trade and technology transfer from the core to the periphery, are all instruments for furthering such exploitation. Third World countries should strive for individual and collective self-reliance (Myrdal, 1957; Baran, 1957; Frank, 1970).

It is useful to keep these models in mind. A country's objectives and policies, implicitly or explicitly, often refer to all three models to varying degrees. The resulting conflicts help explain policy implementation problems. For example, Pakistan's attempts national self-reliance but through large-scale capital-intensive cement and steel industries. The import substitution policies and scale of domestic markets required for

these industries conflict with the country's attempts to provide low-cost basic rural infrastructure by fostering locally based rural materials' industries. Manifestations of the Third World countries' 'technical dependence' on capitalist countries such as resource siphoning, brain drain, and the demonstration effect, referred to in the dependency model, also operate between urban and rural areas in Pakistan.

Employment and dependency theorists have not offered an alternative economic analysis for comparing technologies and their effects. Instead, they have highlighted the limitations of a strictly neo-classical analysis particularly its emphasis on capital-labor substitutions and price.

For example, Stewart (1977), in her only building related study - on cement block manufacture - attempts to show how increasing the scope of analysis to include a range of building types, processes and products affects technology choice. However, as she acknowledges, her study is limited by also being initially set up in the neo-classical mould.

2. Building Construction, Housing & Employment in Rural Areas

Except for a passing reference in the public works literature, rural development theory and practice has been content to leave building construction to the engineers. Despite the requirements for large inputs of building capital in the various 'basic infrastructure', 'agropolitan development' (Friedman, 1979) and 'urban functions in rural development' approaches, (Rondinelli, 1976 & 1983), none of the [exponents] have discussed

proponents

Use is technically ok, but meaning is "no. 3", "proponent" is perhaps clearer.

the linkages between the building construction activity implied and the broader socio-economic objectives they espouse. Thus, while 'trickle up' in these approaches is suspected, one of its biggest sources - choice of technology - is left unidentified and unexamined.

The literature on housing and employment has argued the following: (1) that employment multipliers in building construction can often be higher than that in manufacturing (Grimes,1976); (2) that low-income housing has higher multipliers than upper-income housing (Ganesan,1979) and (3) multipliers in provincial cities are higher than in the capital (Strassman,1976).

Shaw (1980) has proposed a migration strategy to "bend back the urban flow" to the metropolis based on residential construction programs in intermediate size cities.

None of these studies have pursued the employment possibilities down to the rural sector nor have they discussed the problems faced in making and implementing the particular technology choices they suggest, given a specific spatial unit and socio-economic context. Ganesan, for instance, concludes that Sri Lanka's required housing targets can only be met by increasing the share of traditional housing in the total output but he limits discussion to a national and quantitative level.

Rural housers have suggested using building construction as an employment generator in rural areas (Soysa,1979; UN,1977). However, apart from some calculations of the amount of employ-

ment generated for some particular housing projects, the analysis has not been carried further.

3. Methodologies

As mentioned earlier, with no alternative offered, economic analysis of technology remains rooted in the neo-classical tradition. Such studies have either been quantitative macro models at the level of country or cross-country studies or micro studies typically isolating a particular manufacturing industry, focusing on some capital equipment within it and analysing the capital-labour substitution possibilities, given price variations. To help select technologies and projects, cost-benefit analysis is used with discount rates for the time value of money (present consumption versus future consumption), shadow prices (accounting for price distortions) and weighting (for preferences).

For our purposes, these methodologies, though suggestive, are inadequate. Firstly, to analyse building construction, technology and employment for a spatial unit typical of rural development projects, a scale of analysis in between the typical macro and micro studies is required. Such a scale should permit a comparison of a range of building and materials' industries types, their particular product mixes and backward linkages. At the same time, it should also allow for detailed analysis of each type. This intermediate scale should also permit both quantitative and qualitative

analysis.

Secondly, the criticism that capital-labour substitutions and price provide too narrow a focus for technology analysis, applies particularly to buildings. Capital inputs are often insignificant relative to other inputs such as materials and, in addition to price, factors such as technical standards adopted, can strongly influence both materials manufacturing and construction techniques.

Finally, building technology choices, perhaps more than for most products, are heavily influenced by cultural considerations.

Cost-benefit analysis can be problematic in a number of ways. The data required are often unavailable or too costly to obtain, shadow prices have questionable validity and weighting suggests societal preferences are uniform and can be reduced to a numerical value. It is, nonetheless, a basis for rationalising technology choice. For example, through identifying "switching" prices and discount rates, one can get some measure of the magnitude of weighting/preference required to choose one over the other technology or project.

Similarly, Stewart's micro-approach for study of a single industry and Ganesan's macro approach, in particular his input-output matrix linking the range of industries with building types, are both highly suggestive of how analysis might proceed.

We draw on these methodologies along with cash flow studies of construction expenditures (to analyse quantitative relation-

ships between building technology, construction, materials industries and beneficiaries of income and employment). We apply these methodologies within the case study of a particular rural district and from the perspective of a local planning effort seeking to use building construction for purposes of employment and income distribution. We thus confront the socio-economic and institutional conflicts that may arise within the district and between the district and the country as a whole when attempting to make technology choices at the local level.

Chapter Six
(Summary of part one)

Factors Suppressing the Demand and Supply for Traditional Bldg. Tech.

The technologies that best combine adequate shelter standards with least cost and high employment and income generation are those near the traditional end of the technology spectrum. The task then is to increase demand for these technologies which includes mechanisms for the revitalisation of some technologies that are going out of practice and introduction of others as yet unknown in the area.

This section outlines the reasons why demand for technology at the modern end of the spectrum dominates the market and thus some of the major issues to be addressed for a demand shift to occur. These issues are discussed under three headings, reflecting the areas in which changes are required to effect changes in demand namely: economic policies/pricing, innovation and preferences.

1.0 Economic Policies/Pricing

1.1 Macroeconomic policies in Pakistan emphasise maximising economic growth and national output through savings and capital accumulation. Such policies favour profits over wages and usually, at least initially, result in an income distribution skewed towards the urban elite. This elites' effective demand for upper income goods and services, including modern building technologies, dominates the market.

1.2 The weak purchasing power of the rural (and urban) poor - the main consumers of traditional building technologies - results in a weak market for these technologies. This market is further weakened because the poor spend most of

their disposable income on subsistence needs, largely food, and obtain much of their housing needs, however inadequately, through self-help.

1.3 Economic growth combined with import substitution policies favour urban large-scale, capital-intensive industries in the formal sector over the small-scale, labour-intensive industries of the informal sector. While the former's inputs are subsidised through measures such as low interest rates, overvalued exchange rates, import licenses for capital equipment, etc., the latter face the true costs for their inputs. Thus, for example, the products of the cement and steel industries, whose inputs do not reflect their true scarcity values, can underprice those of the lime and timber industries.

1.4 There is an intense competition [~~for~~ alternative ~~uses~~] for the limited and dwindling rural resources which the low-income groups need and can afford. This competition results, for example, in the increasing demand for wood as fuel relative to its supply, raising its costs such that it becomes unprofitable to produce [~~it as~~] timber beams. Timber beams thus become scarce and their prices rise while those of their substitutes, steel girders, are falling.

2. Innovation

2.1 The traditional research and development system, based on [~~the~~] knowledge of the local craftsmen, the "learning by doing' apprentice system and the accumulative improvements on the

traditional technology is being eroded through migration and new skill requirements. No alternative research and development and training system that is equally low-cost and responsive to low-income needs is replacing it.

2.2 The rural elite, traditionally the main patrons of rural innovation, able to risk ~~attempting and~~ investing in newly emerging building and materials production technologies, no longer play this role since they have become consumers of modern housing technology and investors in urban property and industries.

2.3 The technology transfer and communication system is dominated by information on higher cost modern technologies with little or no access to lower cost traditional technologies. For example, while the Punjab (provincial) Building Research Centre has exact specifications to implement a concrete tile roof system developed in the U.S., it struggles unsuccessfully to reinvent a shuttering-free brick vault system that is commonplace in neighboring Iran and even some parts of Pakistan.

3. Preferences

3.1 The demonstration effect of the buildings of rural trend setters: the government, the rural elite, and the urban sector, which use modern building technology, biases the rural housing consumer towards the same.

3.2 Public building departments are dominated by engineers at all levels, from policy making to field staff. Their 'engineers bias' for the most advanced technologies, reinforced by their training makes it very difficult to introduce more traditional, albeit improved, building practices.

3.3 Building construction is often used as an instrument of patronage eliciting support and prestige for the benefactor, whether it is the government vis-a-vis the rural politician or the latter vis-a-vis his local constituency. The politicians' bias is for the more prestige giving modern building technologies.

3.4 Building codes and regulations specify modern technologies thus institutionalising the above biases and making more traditional technologies illegal.

In addition to the foregoing, there are other factors that can inhibit the development and selection of traditional technologies. In fact, the very characteristics that make such technologies appropriate under certain conditions become liabilities when those conditions change. In brief those characteristics and conditions are as follows:

1. Traditional materials production and building technologies are suitable for small-scale industries, outputs and building types which may be suitable for most rural and low-income building needs but not when large outputs, high quality standardised products and large-scale buildings are required.

2. The potential for using self-help becomes less important to the housing consumer as income and therefore the opportunity cost of personal labour and the utility value of leisure, increases.

3. For the same reasons, recurring maintenance requirements of traditional technologies, that suit the cash flow and leisure patterns of the rural low-income, become an inconvenience as income rises.

4. Cost savings that depend on self-help and collective aid operations are more easily obtained in household and community enterprises than in public projects of the same kind. It is more difficult to obtain and manage self-help when the government is part sponsor because of public distrust and the perception that in such projects the government should shoulder all responsibility.

5. On their part donors and manager - whether foreign, local government or community representatives - prefer the one-off funding and construction requirements they perceive modern building technologies offer, rather than the recurring funding and management requirements of incremental construction and maintenance that may result from the use of traditional building technologies.

6. Modern substitutes to traditional building technologies become cheaper and more attractive the closer and better linked in communication and transportation terms the rural area is to the major urban areas and industrial production centres.

All the above points need to be considered in designing policy to increase the demand and supply of traditional building technologies.