Irrigation, Agriculture and Poverty Reduction: General Relationships and Specific Needs

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Introduction

Irrigation offers potential for large increases in agricultural production and farm incomes. These increases are generally not initially concentrated on the poorest elements of rural society. Indeed, the very poorest tend not to have much land if any, and to survive almost entirely by labor. Thus, the connection is to be drawn between rising farm incomes, driven by irrigated agriculture, and employment of those with plenty of labor and very little land and capital.

We now know that the connection is powerful. The rural poor, who dominate poverty in low-income countries, are basically the producers of rural nonfarm goods and services that are non-tradable. The demand cannot come from exports, because of high transaction costs and low quality and, therefore, growing domestic demand is required if employment is to increase. Study after study shows that the rapidly rising farm incomes provide that demand. That is why studies consistently show that agricultural growth is the primary source of poverty decline.

Especially in Asia, irrigation is the most potent source of higher farm incomes and hence it is the driving force for poverty reduction. While a number of measures can increase the efficiency of irrigation investment in reducing poverty, it must be recognized that it is the indirect effects—working through increased demand for rural nonfarm goods and services—that have the impact. Thus, measures to emphasize improvement of inefficient irrigation systems, developing the remaining low-cost irrigation sources, which may lie substantially in already disadvantaged areas, increasing the equity of water allocations are all valuable. It is counterproductive to give up irrigation productivity for emphasis on direct reduction of poverty.

The General Relationship between Economic Growth and Poverty Reduction

The traditional interpretation of basic data on economic growth led to the conclusion that in the early stages of economic growth, inequality tended to increase and decreased only during later growth stages. This pattern is often called a J curve, for its distinctive shape, or the Kuznets curve, for the data generated by Simon Kuznets that were thought to document this relationship (Kuznets 1955).

Most of the analysis that led to this conclusion was based on historical data for the currently high-income countries. But, a range of literature from 1971 to 1995, covering developing countries, seemed to support the Kuznets hypothesis about worsening of income

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distribution in early growth stages. More recent literature, based on more sophisticated data analysis, finds contrary results.

Bruno et al. (1998) reviewed 63 surveys for 44 countries spanning 1981–92 and found no support for the worsening of income distribution. They further reviewed data from 45 countries for which time series were available and found that the bulk of variation in income distribution was accounted for by differences among countries and only 7 percent was accounted for by variation over time within countries. These data show that the distribution of income is quite stable over time within countries.

A large number of other studies confirm that growth does not worsen income distribution, and therefore does decrease absolute poverty (Fields 1989; Squire 1993; Lipton and Ravallion 1995; Ravallion 1995) or the proportion of the population in poverty.

Even before the current plethora of data on poverty reduction, time series for Taiwan showed that its pattern of growth provided decreased inequality from the very beginning (Lee 1971). For example, from 1970 to 1985, the Gini coefficient fell from 0.321 to 0.277 (Thorbecke and Wan 1999). Now that the relation of agricultural growth to poverty reduction is better understood and documented, the Taiwan case is particularly important for lessons about the processes that rapidly reduce poverty.

India has the best, and perhaps the only, long-term set of comparable data on income distribution in a large developing country encompassing considerable geographic variation in the various poverty-related variables. These data give "no sign that higher growth rates in India put upward pressure on overall inequality" (Bruno et al. 1998).

Based on sophisticated analysis of the Deininger and Squire data 1996, Timmer (1997) shows that "each one percent increase in per capita income for the overall population is matched by a one percent increase in income of the bottom forty percent in the income distribution." That is, growth is neutral to the distribution of income; all income classes participate equally.

All the preceding studies calculate relations between growth and more complex definitions of poverty, in addition to the headcount measure. In every case, the impacts are roughly the same or somewhat more favorable for the very poorest.

If the distribution of income does not change with growth, then a simple calculation shows to what extent population is lifted above any given absolute income line. It is on this basis that the World Bank estimates the effect of growth on poverty reduction. As we will see later, such simple estimates ignore the substantial variance in this average relation and shift attention away from the critical policy requirements for poverty reduction. In particular, it distracts attention from the requisites of pro-poor growth and the central role of agricultural growth in pro-poor growth.

An analysis of 20 countries shows an elasticity of poverty reduction with respect to an income increase of -2.12 (Bruno et al. 1998). Ravallion estimated the elasticity of poverty reduction (proportion of the population below the poverty line) with respect to income for India as -2.2 (Datt and Ravallion 1998a) and for Indonesia as -2.1 (Ravallion and Huppi 1989). A value of -2 means that starting with 40 percent of the population below the poverty line and a one-percent rate of increase in the per capita income, the ratio would drop to 39.2 percent in the first year. It would drop to 36 percent in the first year with a 5-percent growth rate in the per capita income, and would drop by half in 7 years.

The World Bank uses these average elasticities to show the impact of growth on poverty reduction. But, variation in impact of growth on poverty reduction is so large that it is essential

to choose the structure of growth that is giving a large impact on poverty reduction. Ravallion and Chen (1989) show that using the absolute poverty measure of $1 per day of income, growth only explains 37 percent of the change in poverty. That leaves 63 percent explained by other factors. Obviously, there are other important factors at work. That is the subject of the next section.

The Structure of Growth and Poverty

It is clear from the preceding analysis that there is a large variation among countries and over time in the relation between growth and poverty reduction. That variation is largely due to variation in the rate of growth in the agriculture sector. However, the agricultural impact on poverty reduction is seen in its effect in increasing the demand for labor- intensive nonfarm goods and services produced in rural and market town areas in small-scale enterprises. These goods are of low quality, with high transaction costs in international trade, lending their market to be dependent on domestic sources, primarily agriculture. They are, in the trade parlance, non-tradable commodities.

Poverty and Agricultural Growth

The structure of growth matters very much to the extent of poverty reduction. If poverty reduction is the objective, then certain structures or sectors must conform to that growth. Two recent studies give detailed data on this issue. They confirm similar results from earlier, but much less-comprehensive, data. The two recent studies are by Ravallion and Datt (1996) for India, and by Timmer (1997) for a cross-section of a large number of countries.

The two studies differ in methodology and in source of data, but find the same striking relationship. These studies are reinforced by several individual studies for other countries. While this paper draws on all the studies and highlights the structural issues, it does draw particularly heavily from India. That is advantageous because it does allow the picture to be drawn from a single basic source without the weakness of cutting across very different countries. However, the Indian experience, like that of any one country, has specifics of its own. In any case, the data for India are confirmed by the cross-national study by Timmer, individual studies for other countries, and by theory. Thus, the data on India do end up being compelling.

Preceding the studies of Timmer and Ravallion, Montek Ahluwalia (1978) presented data showing that increased agricultural output per head of the rural population decreased poverty. Dharm Narain furthered this analysis with important conceptual additions (Mellor and Desai 1985). He too shows a major effect of agricultural growth in reducing poverty. Mellor and Desai (1985) elaborate at length on the relations, the supporting data, and alternative views.

For both Ahluwalia and Narain, the data cover a period when both agricultural growth and poverty fluctuated considerably, without any sustained agricultural growth or poverty reduction. Thus, their analyses essentially deal with a situation not of steady growth but of fluctuations in income. In practice, those fluctuations were substantially driven by the varying effect of weather on agricultural production.

The work by Ravallion and Datt (1996) on India is recent enough to include periods with far higher agricultural growth rates than the earlier studies as well as sustained growth beyond previous peaks, and declines in poverty far beyond previous troughs.

Ravallion and Datt relate change in yields of crops to poverty. They show that reduction in poverty is a result of growth within sectors, not the transfer of labor from a low earning sector to a high earning sector. The latter is the basis for the Kuznets J curve. But what is truly striking is that agricultural growth and tertiary sector growth have a major effect on poverty reduction but that manufacturing growth does not. Further, the service sector growth, which has a favorable effect is the small-scale portion of that sector which, we will show later, is itself closely related to agricultural growth

The Ravallion and Datt data show that 84.5 percent of the substantial poverty reduction in India in the period of analysis was due to agricultural growth. These are truly startling data. They also show little effect of the many programs that directly target the poor.

Growth of manufacturing in India has been historically biased towards large-scale capital-intensive industry, so the manufacturing data may be somewhat biased as compared to a market-oriented structure (Mellor 1976). But, the Timmer (1997) data confirm the Ravallion Datt findings for a large cross section of countries.

The various studies show that industrial growth does reduce poverty from the direct effect of income increase but, concurrently, it has an unfavorable effect on the distribution of income thereby reducing the effect on the poor. Agricultural growth, including its indirect as well as direct effects, does not have the unfavorable distributional effect.

Ravallion and Datt show that wage rates are important to poverty reduction and that higher farm productivity is closely associated with higher wage rates. Similarly, food prices are important and higher farm productivity reduces food prices. Thus, it is farm production that drives poverty reduction. In a later section, we will elaborate on this relation of agricultural growth to nonfarm employment and hence to wage rates.

Peter Timmer (1997) uses the Deininger-Squire dataset for poverty and purchasing power for 35 developing countries and relates these data to agricultural GDP per capita. "A one percent growth in agricultural GDP per capita leads to a 1.61 percent increase in per capita incomes of the bottom quintile of the population." (p.3) Unlike Ravallion and Datt, Timmer shows a positive elasticity for industrial GDP but the agricultural elasticity is 38 percent more than the industrial elasticity.

The 27 countries and 181 observations (studies) from 1962 to 1992 in the Timmer sample of the Deininger-Squire data include 3.3 billion people in 1995 or two-thirds of the population of low- and middle-income countries as classified by the World Bank (Timmer 1997). On average, agriculture accounted for 25 percent of GDP and 51 percent of the labor force. Countries are roughly equally divided among regions of the world, with some underrepresentation of Africa.

Datt and Ravallion (1998a) do not find a declining trend in the elasticity of employment with respect to agricultural output. The power of the relationship holds true over time. Thus, the current decline in the rate of poverty reduction is due to decline in the agricultural growth rate and not due to the declining power of that variable.

Gini coefficients for subsectors of the economy tend to be unstable. However, the following data from Sharma and Poleman 1993 corroborate other evidence on the high degree of equality in specific agriculture-related subsectors. They show that increments to crop income alone skew the distribution towards the well-to-do, with a Gini coefficient of 0.86, far above

the national Gini coefficient. That finding is, of course, consistent with early critics of the Green Revolution. See also Adams 1999 on this point.

In sharp contrast to crop income, the Gini coefficient for dairy production, which is very important to the poor in India because of its labor intensity, is 0.11. This is an extraordinarily low Gini coefficient but it is quite consistent with the observation that dairy animal numbers vary little by size of farm and with the well-known impact of increased dairy production on the poor. The Gini coefficient for off-farm work in rural areas is still a low 0.22. This also reinforces the data that show off-farm income of the rural poor is an important source of poverty reduction (Adams 1999). Thus, when rising agricultural incomes are spent in these sectors they redistribute income towards the poor.

The data clearly show that it is growth of agriculture that reduces poverty, not growth in general. One misleading interpretation should be avoided. Typically, high overall growth rates are achieved when agriculture grows rapidly. This is because the resources used for agricultural growth are only marginally competitive with those of other sectors and are so fast that agricultural growth tends to be additive to growth in other sectors, as well as being a stimulant of growth in the labor surplus non-tradable sector (Mellor 1976).

The countries that grew the fastest from 1985 to 1995 experienced a narrowing of the income gap (Timmer 1997). This means that agricultural growth resulted in faster overall growth and an improvement in the income distribution, thus, emphasizing agriculture to improve income distribution does not result in slow growth. The sectors are more complementary than competitive. Conversely, leaving out the forces that accelerate agricultural growth, as has been increasingly the case in the past decade, provides slower growth and leaves out the poor.

The average elasticities cited at the beginning of this section are strongly influenced by high rates of agricultural growth. Thus, it is grossly misleading to think of those elasticities as applying to some average growth rate. Those are predominantly the elasticities when agriculture grows rapidly. In the 1990s, prior to the economic setback in East and Southeast Asia, overall growth rates were high, but agricultural growth rates had slowed, and hence the pace of poverty reduction declined.

Thus, agricultural productivity increase has a major effect in reducing poverty and the effect is relatively greater in its impact on the poorest and the distribution of income among the poor. Industrial growth has much less or even no effect in reducing poverty (Ravallion and Datt 1996; Timmer 1997). Growth in the service sector has no effect on the large-scale portion but has a substantial positive effect on the small-scale portion.

If growth occurs, leaving the agriculture sector out, two onerous burdens fall on the poor. First, the overall growth rate will be lower. Second, the part that reduces poverty will be missing. As we will show later, rapid agricultural growth is more easily achieved now than some decades ago but it does require overt actions by the government.

Agriculture-Led Nonfarm Growth

The circumstantial evidence is strong that the powerful poverty-reducing effect of agriculture comes substantially through its impact on the rural, nonagricultural, small-scale sector. According to the studies done by Liedholm and Meade (1987) there is considerable knowledge

of this sector. They conclude that this sector is large, employment-intensive, expands readily in response to increased demand and is largely driven by agricultural demand.

Nevertheless, the evidence on the size of the sector, the proportion of incremental farm income spent in this sector and the employment intensity is meager. The evidence of its links to agriculture and its importance to employment calls for intensive study. The following paragraphs summarize the current state of knowledge of this sector.

Because the agriculture sector in low-income countries is so large, accelerated growth into the 4- to 6-percent range adds immense purchasing power (Mellor 1995). This is because this growth is substantially driven by improved technology (yield-increasing crops of the Green Revolution) and mobilizes previously underutilized farm family labor resources within agriculture.

Several empirical studies cited above document that farmers spend a substantial proportion of incremental income on locally produced nonfarm goods and services. Liedholm and Meade turn that around and state that the rural nonfarm sector derives a high proportion of its demand from agriculture. Since this is a large employment- intensive sector it is logical to turn to these forces to explain the powerful effect of agriculture in increasing employment and reducing poverty.

This argument is also consistent with the lag in the effect of agricultural growth, the fact that highly skewed distribution of income from land removes the poverty-reducing effect, and the important wage-increasing effect of agricultural growth. Further, the power of this income effect causes a tightening of the labor market that cannot be explained by the agricultural growth alone. Because it is the income growth that drives the process it does not matter that the initial income effect is concentrated in the hands of the middle peasant rather than in those of the poor. The poor benefit in the next round.

Three questions arise from this process. How large is the sector that is driven by agricultural incomes and is it a tradable or non-tradable sector? How employment- intensive is this sector? And, to what extent is it driven by purchase of production goods and to what extent by consumption goods?

Size of the Agriculture-Driven Sector

There are two ways to get at the issue of the size of the agriculture-driven nonfarm sector. One is by surveys of the production pattern and source of demand for output for the sector thought to serve agriculture, and the other is through an analysis of the consumption patterns for incremental income of farmers. Neither type of information is well developed. Data on farmer expenditure rarely give a sufficient breakdown to allow analysis of the relevant parts of expenditure. Surveys of small businesses in rural and market town areas are infrequent and are usually lacking in the necessary details with respect to sources of demand.

Delgado (1998) spells out in some detail why it is the non-tradable sector that is important to the employment-increasing poverty-reducing impact of agricultural growth. The non-tradable (goods and services that do not enter international trade) sector cannot be stimulated to growth by international exports. The labor force and production systems are such that they are not employable in the short run producing goods and services for sectors other than the rural market.

Of course, in the long run, with education and gradual integration of markets, labor will move into tradable sectors. The story of low incomes is the slow pace at which that growth occurs. Meantime, rapid growth in demand for such output provides employment, expands the number of entrepreneurs and creates a favorable environment for the transition to tradables. The interaction between agriculture and this large sector is an important part of the transition to a modern economy.

Peasant farmers spend a high proportion of incremental income on low-quality goods and on non-exportable goods and services. Examples are expanded housing, personal services, increased lower-level education, increased health services, and local transport. Note that where labor is cheap, prospering farmers hire a substantial addition of labor so as to shift family labor away from farm production to education, leisure and marketing activities (Hayami and Kikuchi 1999). These are all non-tradable and are produced primarily by labor with very little capital.

Consumption studies suggest that in middle-income countries, e.g., Egypt, this sector, located in market towns and rural areas, has an initial GDP roughly equal to that of agriculture (Mellor 1999). It is striking that even at this stage of development the sector is large and non-tradable. In Africa, with very low incomes, it may be only one-fifth the size of agriculture (Delgado 1998).

In very low-income societies, with minimal commercial differentiation, as in most of Africa, the multipliers from agricultural growth to the nonfarm sector are much weaker than in more differentiated societies. However, in a careful analysis for sub-Saharan Africa, Delgado points out that marginal propensity to consume non-tradable agricultural commodities is very high.

In middle-income countries, the agriculture-driven nonfarm sector may be as large as agriculture (Mellor 1999). The incremental income in farmers' hands will be spent more than proportionately in that sector. In other words, the income elasticity of demand is well above 1.0.

Employment in the Agriculture-Driven Sector

Employment elasticity in the agriculture-driven nonfarm sectors is high, close to one. Increased output is driven by increasing demand. As long as real wages are constant, there is no incentive to increase labor efficiency. Since very little capital or land is employed in this sector, virtually all the gross income is return to labor.

Empirically, compared to farming, with half as much GDP in the sector, twice the labor intensity, the initial labor force is the same size as for agriculture. Typically, in low- income countries, about half of the base income is spent on production services and locally produced consumption goods (Bell and Hazell 1980; Hazell and Roell 1983).

With an average income elasticity of demand for these commodities of 1.5, employment expands at 1.5 percent of the base year for each percent increase in the rate of growth of agricultural income. With a 5 percent growth rate in agriculture, 2.5 percent population growth, the growth rate of the rural nonfarm sector expands at a rate of 6.25 percent and the addition to employment in the agriculture-stimulated local nonfarm sector is nearly twice that of agriculture.[2] This is the key point about the impact of agricultural growth on poverty.

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[2]With an elasticity of employment with respect to growth of 0.6 in agriculture and 0.9 in the rural nonfarm sector, then 5.0-2.5(1.5) +2.5=6.25. (5.0) 0.6=3.0. (6.25)0.9=5.6. 5.6÷3.0=1.9=close to 2 times.

Agribusiness and Consumption Goods

Fertilizer and other chemical and mechanical inputs to agriculture are in the tradable sector and tend to be imported or produced by capital-intensive processes. Increased demand for such goods does not add much to employment and that demand could have been provided from sources other than agriculture.

In contrast, the local marketing service for these inputs and for output is both labor-intensive and non-tradable, and the increase in demand from agriculture stimulates production and employment that are net additions to the economy that could not come from other sources. This will remain true as long as there is poverty representing inadequate employment opportunity for the wage-earning classes.

Studies of marketing margins suggest that the stimulus to the rural and market town non-tradable sector is equal to about 10 percent of the value of incremental agricultural production since a high proportion of incremental production depends on purchased inputs, and is marketed.

Consumption studies in Asia show that about 40 percent of incremental income is spent on locally produced nonfarm goods and services. These are all highly labor-intensive in their production.

Thus, consumption goods comprise about three-quarters of incremental demand for non-tradables and about one-quarter for production services. It is the consumption expenditure that is dominant (Mellor and Lele 1973).

Rich Peasants and Income Distribution

A substantial literature on the period immediately following the Green Revolution stated that the latter concentrated incremental income in the hands of the landowning classes, including the middle peasant or kulak, to use the Marxian term. Consequently, the poor did not participate in income growth. The concentration of income led to further concentration of landownership. This was the basis for much of the anti-Green Revolution spirit of the 1970s.

This exposition points out that, in fact, increased agricultural incomes in the hands of the middle peasant or kulak have powerful employment linkages but that they take time to operationalize. The initial studies did not allow for that time and, in any case, they were only concerned with the direct effect of income growth.

The important point is that an initial skewing of the benefits of agricultural growth toward the higher income rural people is not antithetical to poverty reduction. The issue is not the initial distribution of the increased income but the expenditure patterns from that income. Middle peasants in low-income countries spend a high proportion of their income locally on non-tradables, thereby providing a stimulus to production, and particularly to employment that cannot be obtained in any other manner.

Delgado (1998) carefully documents that in Africa, incomes and commercial differentiation are so low that the nonfarm goods and services receive relatively little stimulus. However, the increment to demand for agricultural non-tradables is very large, stimulating a large increase in demand-driven production of high-value agricultural products (livestock, fruits and vegetables), and even for some non-tradable basic staples. Thus, an initial stimulus to

agricultural growth from technological change (high-yielding varieties of basic staples) has strong multipliers back to other sectors of agriculture that are highly labor-intensive. The effects are precisely as described for the rural and market town nonfarm sectors.

The Rural and Market Town Nonfarm Sector

The rural and market town nonfarm sector is studied less, with no systematic data on the sources of effective demand for the output of the sector. We do know that the sector typically represents over half of all nonfarm employment (Liedholm and Meade 1987). The sector is largely located in rural and small town areas, the effective demand comes largely from local sources, particularly from agriculture, and the sector expands readily in response to increased demand (Liedholm and Meade 1987).

The sector represents a far higher share of employment than of GDP, even more so than that of agriculture. This is because it uses both very little capital per worker and relatively unskilled labor, and pays low wages. Agriculture uses a substantial area of land per worker with a substantial return to that land. Tradable industry uses far more capital per worker and tends to use more skilled labor.

The small-scale sector is the path out of poverty for the poor who possess little education and are either underemployed or use a substantial proportion of their time in search of jobs. Experience in the small sector then prepares them for movement up to higher- paying jobs in the tradable sectors. Thus, the sector is not only large but also an important zone of transition. Development is a step-by-step process and we see in country after country that steps in the process cannot be skipped without a deleterious impact on the poor.

The growing importance given to microenterprise and microcredit in foreign assistance programs reflects a growing recognition of that importance. What is not yet recognized is that without growth in farm incomes, the demand for this sector's output does not rise and efforts to increase access of some to the sector are at the expense of others already in that sector. Agricultural growth is absolutely essential to this sector, playing its important role in lifting the poor out of poverty (Mellor 1995).

Analysis of farmer expenditure patterns shows that in middle-income countries 40 percent of incremental income is spent on locally produced nonfarm goods and services (Hazell and Roell 1983; Bell and Hazell 1980; Haggblade et al. 1989). In lower-income countries, the percent is much lower because of much higher expenditure on food and lesser differentiation of the economy. The multipliers of agricultural growth on non-agricultural growth in the references just cited are corroborated in macro studies such as those by Rangarajan (1982) for India.

However, Delgado (1998) shows that in such situations much of the farm production is non-tradable livestock and fruits, and vegetables are non-tradable on quality and transport grounds and even much of the grain sector is non-tradable (low quality, high transport costs, and types of grain). In such economies, the demand of farmers for these products is elastic. Thus, in both very low-income undifferentiated economies and in more advanced middle-income countries the bulk of employment growth is in sectors that depend on increments to local demand derived from agriculture, for expansion of demand, production and, hence, of employment.

A simple rhetorical question makes the point about this large, employment-intensive sector: Where else will these goods and services be demanded and what else can this massive number of people produce in the short run? Hossain (1988) shows that if agricultural incomes are not rising, credit for small-scale firms simply expands the ones receiving credit at the expense of those already existing firms not receiving the additional credit. The expansion without effective demand reduces prices and returns to labor. The process spreads the misery.

Analysis of data on Egypt is instructive about the size of this sector in a middle-income country. In a high-growth scenario for Egypt, agriculture and the agriculture-driven nonfarm sector account for 70 percent of employment growth and only 30 percent of GDP growth (Mellor and Gavian 1999). The GDP growth is largely from the tradable sector, and employment largely from the non-tradable sector. The tradable sector provides much of the effective demand for expansion of agriculture, particularly the high-employment livestock and horticultural sectors. Agriculture and its stimulus to the non-tradable sector provide the bulk of employment growth.

Thus for pro-poor growth, the old concept of balanced growth needs to be resuscitated. Yes, open up the economy, play to comparative advantage, follow-up pro-growth macro policy and let the private sector lose. But, at the same time, take the public-sector actions that are needed to move the agriculture sector to provide effective demand for the labor-intensive, non-tradable sector.

Implications for Irrigated Agriculture

The simple summary of the implications of key poverty-reduction measures to irrigation is, do not get diverted from the aspects of irrigated agriculture that result in large increases in farm incomes. It is expenditure of those incomes that drives poverty reduction by expanding demand for the labor-intensive rural nonfarm sector.

Throughout the world, the greatest impact of yield-increasing agricultural technology has been in irrigated agriculture. This is most dramatically so in Asia. Expanding irrigated areas, increasing the control of water and applying high-yield technology in irrigated agriculture have caused massive increases in the incomes of the farmers. That increase in income has been disproportionately in the hands of the larger peasant farmers. They are not the poorest of the poor (although they are generally poor by western income standards). But, it is their expenditure patterns that drive increased employment of those who are the poorest of the poor. The latter have little or no land, benefit little from even agricultural production programs directed most closely to them but they benefit from lower food prices, increased wages and growth in demand for rural nonfarm goods and services.

In the past decade there has been rapid growth in foreign assistance support for micro enterprise and associated micro-credit programs. These are well-directed programs in that these enterprises are the repository of many of the very poorest in rural areas. However, these targeted programs do little for the aggregate of poor if rising farm incomes are not increasing the aggregate demand for those goods and services. This brings us back to the need to raise farm incomes to provide effective demand for those primary sources of employment for the poor.

The first emphasis is maximizing the increase in farm incomes that come from irrigation investment. However, this must be with one important caveat. It is the peasant farmer who lives in the rural area and has locally driven expenditure patterns, which are critical to driving

employment growth and poverty reduction. Large-scale farmers, and especially absentee farmers, have capital- and import-intensive consumption patterns but do not do much for poverty reduction. However, this is more of a Latin American than an Asian or African problem.

Within the context of raising farm incomes much can be done to further impact the poverty-reduction potentials. It is not uncommon for whole geographic areas to be neglected in agricultural investment. This may be because of ethnic reasons or simple low political power associated with low incomes. Diagnosing such situations and concentrating on them obtain the benefits of large increases in incomes and emphasize poor areas. Similarly, some areas may be underemphasized in developing irrigation potentials. A recent article by Hirashima in the Economic and Political Weekly provides data for India that show such under-exploitation in very poor states, such as Orissa. Thus, emphasis on productivity does not rule out working in poor areas. An analysis needs to be made to pick out high-productivity situations.

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