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Making Technologies Work for the Poor in Developing Countries

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Abstract
The concern of the governments of developing countries today is not only to achieve required economic growth but also to fulfill their socio-economic obligations to the people. Technology is largely created in response to market pressures and not to meet the needs of the poor. As a result, research neglects opportunities to develop technology for poor people. The question arises whether technology entrenches millions in ever-greater poverty, or can it be used to eradicate poverty and sufferings of the poor. Or can we develop a technology that really helps to solve our problems? The primary task of technology is to lighten the burden of the working man in order to stay alive and develop his potential. Governments of the developing world must formulate policies to take greatest advantage of technologies that can alleviate poverty. The efforts of these countries should be directed towards building the technological capabilities of poor people and particularly women. Appropriate technology that suits the people of these countries in the areas of information technology, biotechnology etc. is vital for their development as it provides clear direction to the needs of these countries and more so in fulfilling the main objective of poverty reduction.

1. Introduction

Countries are committed to poverty eradication as an overarching goal. UNO (1999) accepted the goal of halving absolute poverty by the year 2015. The available studies indicate very clearly that if we have historical rates of growth, which have been around 3-4% per annum, there is no way we are going to achieve this target within this timeframe. The best we can expect is that the 25% of population below $1 per day may come down to 20%. If we really want to halve absolute poverty by 2015, we need to achieve economic growth with concerns of equity and social justice built into the appropriate technology for realizing this growth. The central point of this exercise in most of the developing countries is, therefore, to show that the real issue that confronts us is not just that of revival of growth but the revival of growth in a manner that is pro-poor.

If we ask where the developments of the world's industry during the last half-century have taken us, the answer is somewhat discouraging. Everywhere the problems seem to be growing faster than the solutions. This seems to apply to the rich countries just as much as to the poor. There is nothing in the experience of the last fifty years to suggest that modern technology, as we know it, can really help us to alleviate world poverty, not to mention the problem of unemployment. Of course, unemployment has already reached levels like twenty-five percent in many so-called developing countries and now threatens to become endemic also in many of the rich countries.

Revolutionary changes in technology are driving towards globalization. Technology is largely created in response to market pressures and not to meet the needs of the poor who have little purchasing power (HRD, 2001). As a result, research neglects

opportunities to develop technology for poor people. Wealthy nations that have benefited by technological revolutions have long left the developing world behind (Brown, 2001). The largest obstacles for the development of less developed countries lie in the power of big-technology transnational corporations which make decisions based purely on profit and not on global issues like poverty and income inequalities.

It is unique in relation to the progress in science and technology that has been achieved in the last half-century. Beginning with men on the moon in 1960s, the Green Revolution in the 1970s, the information revolution of the 1980s, and the genetic revolution of the 1990s, the twentieth century ended with the mapping of the human genome. It is a defining time, as all this opens a new era of knowledge-based actions and decision-making that can put the world on a path of equity and sustainability. It is the knowledge that is available, accessible and affordable that will drive progress in the 21st century (IIASA 2001). Living at a time of rapid changes and challenges, timely actions based on credible and comprehensive knowledge become much more critical.

People all over the world have high hopes that these new technologies will lead to healthier lives, greater social freedom, increased knowledge and more productive livelihoods (HDR, 2001). An attempt is made in this paper to analyze the need for those technologies that work for the poor in developing countries.

Now the question arises whether technology entrenches millions in ever-greater poverty or it can be used to eradicate the poverty and sufferings of the people. The question arises, can we develop a technology that really helps us to solve our problems - a technology with a human face? The primary task of technology, it would seem, is to lighten the burden of the working man in order to stay alive and develop his potential. The question of what technology actually does for us is therefore worthy of investigation.

2. Technology With a Human Face

Developing countries need, in fact, a different kind of technology with a human face, which instead of making human hands and brains redundant, helps them to become far more productive than they have ever been before.

As Gandhi believed, the poor of the world cannot be helped by mass production, only production by the masses. The system of mass production, based on sophisticated, highly capital-intensive, high energy-input dependent, and human labour saving technology, presupposes that you are already rich, and a great deal of capital investment is needed to establish a single workplace. The system of production by the masses mobilises the priceless resources, which are possessed by all human beings, their clever brains and skillful hands that support them with first class tools (Gregg, 1958).

One of the unhealthy and disruptive tendencies in virtually all the developing countries is the emergence, in an even more accentuated form, of the dual economy in which there are two different patterns as widely separated from each other as two different worlds. The social and political tensions arising from the dual economy are too obvious with its twin evils of mass unemployment and mass migration into towns and cities (Schumacher, 1973). But the present developing countries cannot function without a modern sector, particularly where they are in direct contact with the rich countries.

The starting point of all considerations is poverty, or rather, a degree of poverty, which means misery. Among the causes of poverty, the material factors are entirely secondary - such things as lack of natural resources, or lack of capital or an insufficiency of infrastructure. The primary causes of extreme poverty lie in certain deficiencies in education, organization and discipline (Schumacher, 1973).

Development does not start with goods. It starts with human resources and their

development. Without these, all resources remain latent and untapped. The link between economic growth and human development is based on two assumptions. Some thought that economic growth, by raising the demand for labour with appropriate changes in technology, upgrading the rewards and lowering the prices of goods, would 'trickle down' or 'spread' to the whole population. Alternatively, it was thought that if this does not happen, the governments of developing countries would take suitable fiscal measures and create social services, so that the benefits are spread to the poor. Trickle-down did not happen adequately where assets and economic power were concentrated (Streeten, 1997). HDR 2001 presents the causes for this failure because of disparities in the spread of technology both between the countries and within the countries. Its Technology Achievement Index (TAI) ranks countries by the level of diffusion of technology in each country. The TAI provides a country-by-country map of huge inequalities in education and skills required to use technology.

3. Work Opportunities for the Poor

Nearly all the so-called developing countries have a modern sector where the patterns of living and working are similar to those of the developed countries. But they also have a non-modern sector, accounting for the vast majority of the total population, where the patterns of living and working are not only profoundly unsatisfactory but also in the process of accelerating decay. All success in the modern sector is likely to be illusionary unless there is also a healthy growth - or at least a healthy condition of stability - among the very great numbers of people today whose lives are characterized not only by dire poverty but also by hopelessness. The poor can be helped themselves, but only by making available to them a technology that recognizes the economic boundaries and limitations of poverty.

The work opportunities for the poor in developing countries are very restricted. They are underemployed or totally unemployed and, even when they do find occasional work, their productivity is exceedingly low. Some of them have no land and no prospects of ever getting any. The open and disguised unemployment in the rural areas is often thought to be due entirely to population growth, and no doubt this is an important contributory factor. Lack of capital can explain a low level of productivity, but it cannot explain lack of work opportunities. Rural unemployment is producing mass migration into cities, leading to an increase in the rate of urban growth, which would tax the resources of even the richest societies (Gabriel, 1963).

As long as the development effort is concentrated mainly in the big cities, where it is easier to establish new industries, work opportunities will be limited for the rural poor. It is necessary, therefore, that at least an important part of the development effort should bypass the big cities and be directly concerned with the creation of an agro-industrial structure in the rural and small town areas. For a poor person the chance to work is the greatest of all needs, and even poorly paid and relatively unproductive work is better than idleness.

The task, then, is to bring into existence millions of new workplaces in the rural areas and small towns. The real task may be formulated in four propositions:

1. The work places have to be created in the areas where the people are living now and not primarily in metropolitan areas into which they tend to migrate.
2. These workplaces must be, on an average, cheap enough so that they can be created in large numbers.
3. The production methods employed must be relatively simple, so that the demands for high skills are minimized, not only in the production process itself but also in matters of organization, raw material supply, financing,

marketing, etc.

4. The production should be mainly from local materials and mainly for local use. These four requirements can be met only if there is a local approach to development and if there is also a conscious effort to develop and apply the relevant technology.

4. Is Technology the Key to Eradicate Poverty?

The answer to this question seems obvious to many. After all, science-based technological innovation has been the key to rapid and sustained growth in Europe and the United States. But many of us are skeptical, as access to technology is necessary but not sufficient to lift nations out of poverty.

The conviction that there is link between poverty and access to technology lies behind initiatives to introduce technology into poor communities and poor countries. Schemes that provide schools or communities with computers or faster internet access are a good example. Supporters of these schemes argue that those without access to technology will be 'out of the loop' and doomed to fall further behind. But it is argued that information technology is not a high priority for poor countries. The world's poorest two billion people desperately need health care, not laptops (Bill Gates 2001). Technology may indeed be the answer to poverty, but the evidence seems to suggest that R&D in medicine and agriculture may be the best bet.

The Human Development Report (2001) issues a clarion call for the international development community to ensure that the potential benefits of technology are rooted in a pro-poor development strategy. People must be free to exercise their choices and to participate in decision-making that affects their lives. The fundamental factor to enlarge these choices is building human capabilities. How countries choose technologies and apply them has to be addressed first. Countries' technology policies and regulatory frameworks as well as economic environments will influence the choices, and it is people, not countries, who actually make technology choices. The degree to which women and men are poor (lack capabilities) determines their technology options. In general, poor people in developing countries lack technology choice.

Building the technological capabilities of countries to make and apply technology choices is important. But equally crucial is building the capabilities of the poor to manage technological change. Poor people must be enabled to make technology choices. Most people in developing countries (e.g. 65-75% of sub-Saharan Africans) do not have access to formal-sector employment (Khennas and Barnett, 2000). They must forge their livelihoods in the private informal sector, working in their fields, homes and small workshops, and making vital decisions about the best use of their limited assets in order to survive on the tightest margins.

5. The Need for an Appropriate Technology

Technology's potential for poverty alleviation needs to be exploited by devising cost-effective and appropriate technologies, not by getting caught up in either-or debates. Technology should be a force-multiplier in reducing poverty, and it needs to be made affordable and available to the common man to reduce poverty (ITDG, 2001). A suitable technology has to be evolved, if it is argued that developing countries should give preference to labour-intensive rather than capital-intensive industries. No intelligent action can follow because the choice of industry, in practice, will be determined by much more powerful factors such as raw material base, markets, entrepreneurial interest, etc. The choice of industry is one thing: but the choice of technology to be employed after the choice of industry has been made, is quite another.

The best way to make contact with the essential problem is by speaking of technology. Economic development in poverty-stricken areas can be fruitful only on the basis of what is called 'intermediate technology' - a technology that is effective and would range in some intermediate position between high and low technology. Such technology would not only be productive but also be immensely cheaper than the sophisticated and highly capital-intensive technology (Schumacher, 1973).

Intermediate technology would also fit much more smoothly into the relatively unsophisticated environment in which it is to be utilized. The equipment should be fairly simple and therefore understandable and suitable for maintenance and repair on the spot. Simple equipment is normally far less dependent on raw materials of great purity or exact specifications and much more adaptable to market fluctuations than highly sophisticated equipment. Men are more easily trained, and supervision, control, and organization are simpler.

6. Applicability of Intermediate Technology

The applicability of a particular technology is, of course, not universal. There are products that are themselves the typical outcome of highly sophisticated modern industry and cannot be produced except by such an industry. These products, at the same time, are not normally an urgent need of the poor. What poor people need most of the time are simple things - building materials, clothing, household goods, agricultural implements - and a better return for their agricultural products. Most agricultural populations would be helped immensely if they could themselves do the first stages of processing their products. All these are the ideal fields for intermediate technology.

The idea of intermediate technology does not imply simply a going back in history to methods now outdated, although a systematic study of methods employed in the developed countries, say hundred years ago could indeed yield highly suggestive results. The real achievement lies in the accumulation of precise knowledge, and this knowledge can be applied in a great variety of ways, of which the current application in modern industry is only one. The development of an intermediate technology, therefore, means a genuine forward movement into new territory, where the enormous cost and complication of production methods for the sake of labour saving and job elimination is avoided and technology is made appropriate for labour-surplus less developed economies. There are three possible approaches to the development of intermediate technology (Gadgil, 1964):

- One approach may be to start with existing techniques in traditional industry and to utilize knowledge of advanced techniques to transform them suitably. Transformation implies retaining some elements in existing equipment, skills, and procedures. This process of improvement of traditional technology is extremely important, particularly for that part of the transition in which a holding operation for preventing added technological unemployment appears necessary.
- The second approach would be to start from the end of the most advanced technology and to adapt and adjust to special local circumstances.
- A third approach may be to conduct experimentation and research in a direct effort to establish intermediate technology. However, for this to be fruitfully undertaken it would be necessary to define, for a scientist and technician, the limiting economic circumstances. These are chiefly the scale of operations aimed at, and the relative costs of, capital and labour and the scale of their inputs -possible or desirable.

The new technology has options to the three A's test from the point of view of poor people:

- Affordable - to people living on US $1 day
- Accessible - to people in marginal communities in developing countries
- Appropriate - to adopt, keeping in view the social, economic and cultural needs of the people and must be environmentally sustainable and also can be made, developed and managed by local people and their institutions.

The new technologies developed for and within rich countries are not easily affordable or accessible to poor people surviving on $1 a day. They may require extensive existing infrastructure such as power, transport and communications, which do not exist in poor communities. The new technologies presuppose a high level of education, skills and training in the user. Technology developed at a great distance and for other markets is unlikely to meet the local needs of poor and rural communities.

The debate over biotechnology occurs in places where the voices of the poor are hardly heard (ITDG, 2001). Of course, biotechnology has the promise of precision tools to deal with drought resistance, water stress, soil tolerance and increasing nutritional content for sustainable agriculture and food security and human diseases and ailments for a healthy population. Climate changes and global warming in the near future will make the above issues much more urgent to the plight of poor resource-constrained countries. But agricultural biotechnology is mostly targeted at medium or large-scale commercial farmers. By encouraging dependence on single seed varieties, it might drastically undermine the livelihoods of small farmers who need a range of locally adapted varieties as a hedge against specific risks such as rain failure or pest infestation.

Even appropriate technology, where it has not been actively developed in partnership with the users, will fail. Solar cookers, for example, are simple, efficient and low-cost alternatives to traditional biomass fuels. But the majority of people have not adopted them. So the technologies may be adaptable. If technology is to benefit poor people, what is really required is new thinking on all technologies which they can potentially use.

7. Need for a Realistic Approach

With the decline in economic and political power of nations, countries rarely can choose appropriate technologies, except in a general policy sense. It is people, not countries, who make technology choices. The focus of the 21st century technology debate, therefore, should not be falsely restricted to new technologies, but should include all technologies of use to poor people (ITDG, 2001).

A realistic approach is needed. The following should receive special attention while making technology choices:

1. 1.3 billion poor people in the world, lacking adequate shelter, could benefit from appropriate building technologies.
2. 800 million poor people working in agriculture cannot afford biotechnology. They can benefit from low external input sustainable agriculture, a proven set of technologies useful for agriculture.
3. 2 billion people lack efficient energy supply - they can benefit both from improved technologies for using biomass fuels and from small-scale decentralized renewable energy services.
4. Up to 75 per cent of the population in developing countries does not have formal sector employment. Most of them work as small-scale producers and traders in their fields and workshops, in their homes and on the streets, and can

benefit enormously from incremental improvements to their manufacturing and processing techniques.

5. Hundreds of millions of people who are living in marginal or remote communities without decent transport facilities and also lacking access to the markets and services should benefit.

These are the issues that need the attention of planners and policy makers most immediately to make the technology accessible to the poor.

8. Building the Capacities of the Poor

Any opening of technology movement (old or new) requires technology to be seen not only as a resource, but as a process comprising other variables such as information and knowledge, skills and training, organizational and management capacity and the use of markets.

The technologies and other existing technologies can be adapted and improved, if there is:

- genuine partnership with poor people and their local institutions.
- participation of poor people in identifying their technical needs and solutions
- research, testing and analysis of technology options by poor women and men; and
- a considerable strengthening of the capacities of poor people and their institutions to control and manage technologies to be sustainable over time.

With out addressing these factors, no technology can be successfully applied to poor people's livelihoods. This needs a strong emphasis on local policies and services. The policies at the global level will have no relevance or effect unless accompanied by powerful new thinking on the use of technology at the local level. This will require much more investment by multilateral agencies, donor governments and the governments of developing countries in demonstration projects to assess how to build poor people's technological capacities. It will then require commitment to expand upon the best of these local lessons on a widespread scale.

HDR 2001 had drawn extensively positive examples from India arguing for the value of innovations and public-private partnership for reaching the benefits of the 'Network Age' to the poor (Tiku, 2001). The Indian 'Simputer' developed by the Indian Institute of Science, Bangalore, and priced at less than $200, finds a special mention in the Human Development Report 2001. This is used as an example for potential widening of access to the internet for rural and urban, literate and illiterate communities, as it is affordable and customized in local languages. Another best-practice Indian example in the report of a win-win public-private partnership in advancing research innovations is the low-cost, wireless internet access system devised under a collaboration between the Indian Institute of Technology and the US-based Analog Devices. The technology, which can deliver faster and cheaper access to low-income communities throughout India, is also already in use internationally in countries such as Fiji, Nigeria, Yemen and Tunisia (Tiku, 20001).

9. Technology Policy

Considerable emphasis is laid on the critical role of national and global policy in determining whether technology is applied effectively to reduce poverty and inequality, and to human development more generally. It is recognized that technology-related problems are often the result of poor policies, inadequate regulations and lack of transparency. Governments need to recognize that technology policy affects a host of development issues, including health, education and job creation (UNDP, 2001). More attention has to be paid to how technology is assimilated and changed to suit local circumstances, and how domestic technological changes are to be accomplished (Foad Shodjai, 1994). Suitable technology policies that are adopted in developing countries have to provide a more efficient mechanism for applying these new technologies effectively to areas within their society that require further development.

Obviously the development of human resources is essential for making progress in indigenous technology, which in turn is needed for economic and industrial development. This can easily be seen when comparing countries in Europe and Africa. In Europe, most of the advanced countries are resource-poor, whereas in Africa, most resource-rich countries tend to be less developed (Gilbert, 1995). A good modern education provides training in scientific and technological thinking. National technology policies should ensure widespread technological education. Without the presence of a technologically educated society, any attempt to implement modern technology, and to make use of it, will be futile.

Developing countries in Africa, Asia and Latin America have to formulate technology policy, and this should be covered in their National Development Plans. African economies need technological revolutions to bring about rapid structural changes to build up their indigenous technological capacity. Appropriate technology policy should facilitate technological learning, the right technical choices, the setting up of appropriate institutions and effective technological management. This is also needed for both the industrial and agricultural sectors, including those small and medium-sized enterprises that are now so vital for income generation and employment in the direction of combating poverty (Oyeyinka et.al, 1995).

Some African countries are too small and or too poor to create and implement technology policy or to establish a technology infrastructure. But these countries, by joining the existing international agencies, can succeed in their efforts to reduce rural poverty. The International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) in India is an example of one such agency, an organization in the area of rain-fed farming in semi-arid tropical nations. Its objective is to study ways to improve crop yields in the five basic crops of the semi-arid tropics: sorghum, pearl millet, chickpea, pigeon pea, and groundnut. It also assists in the transfer of technology to the farmer through cooperation with national agricultural research programmes (Slager, 1997).

Conclusion

All technologies of potential use to poor people have to be considered in global and national technology strategies. The most important efforts of developing countries' governments should be directed towards building the technological capacities of poor people- and particularly women, who are 70 percent of the poor, and whose technological constraints are usually overlooked. On research and development, the new international partnerships should specifically aim to create developing countries' capacity for R&D in the direction of relevant and useful technology. The local traditional knowledge that is one of the greatest technological assets of poor people should be protected. This

should be done by allowing local people to have more control over natural resources and keeping natural resources in the public domain, especially the genetic resources for food and agriculture which poor people themselves have developed. However, appropriate technology that suits the people of developing countries in the areas of information technology, biotechnology, etc. is vital for their development as it provides clear direction to the needs of these countries and more so in fulfilling the main goal of poverty reduction.

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