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Technology and Poverty

Poor people **must** be enabled to make technology choices.

In developing countries, e.g. 65-75% of sub-Saharan Africa, most poor people do not have access to formal sector employment. They must forge their livelihoods in the private, informal sector, working in their fields, homes and small workshops, making vital decisions about the best use of their limited assets in order to survive on the tightest of margins.

They do not invest lightly in new techniques.

Which is why development practitioners should apply the three A's test to whatever they do and ask themselves if the technology they are proposing is;

1. Affordable,
2. Appropriate
3. Accessible

Elaborating on this test, the UNDP SL unit produced a paper called "**Towards a Technology Strategy for Sustainable Livelihoods**" (www.undp.org/sl/) containing a set of six principles, which should guide future technology interventions, by development agencies.

1. One technology can never offer the solution to a complex challenge such as poverty eradication. A portfolio of interconnected technology options is needed.
2. Technology options must change over time to meet new conditions.
3. There is a need to call upon science and technology which is adapted to the specific dynamics of the system and community where SL is implemented
4. SL strategies have comprehensive objectives going beyond improvements of income levels to other less quantifiable parameters: human well being/resilience to stress and capacity to overcome calamities
5. Improved productivity of material and energy sources, incorporating waste and by-products back into the system. Technology to improve efficiency and opportunities inherent to available resources
6. There is a need to transform national scientific and training infrastructure to reflect the fact that the complex needs associated with an ecosystem require a multidisciplinary approach.

So, building poor people's capacity to make technology choices is not just "bringing" new technologies to their doorstep, but addressing their organisational, management and marketing skills; opening new channels of information and knowledge and making credit and markets more accessible.

Over a decade ago a study by ITDG found that there was little explicit consideration of technology in the decision making of bilateral donors. The World Commission on Dams found it necessary to revise completely the decision making framework for large scale water management projects and to emphasise that all technology options should be considered in the first phase of the project cycle.

The livelihoods approach was developed in the context of rural development and natural resource management.

The holistic nature of the SL approach is in part a response to the increasing recognition given to the non-farm activities of rural households and how these households interact with agricultural activities.

Non-farm activities include many forms of engagement with non-agricultural enterprise, either as wage employment or as self employment.

Sustainable Livelihoods
Capital assets

The sustainable livelihoods framework developed by DFID identifies five types of capital asset: human, natural, financial, social and physical. To a limited extent these can be substituted for each other, and thus livelihood strategies involve the continuous management and modification of these substitutions, tradeoffs and draw downs on different capital assets.

Human capital comprises "the skills, knowledge, ability to labour and good health that together, enable people to pursue different livelihood strategies and achieve their livelihood objectives" (DFID). At both the household and enterprise level, human capital is determined by the amount and quality of labour available. Crucially, human capital is needed in order to make use of any of the four other types of capital asset, as well as being valued for itself. [For this reason, human capital has been regarded as the most important asset to be developed by poor women and men.]

Social capital, the social resources to which people have access, is a determinant of their ability (essential for a sustainable livelihood) to manage relationships and transactions in commercial markets, in social institutions and civil society, and with agencies of government. These may be developed through networks and social contacts, membership of more formalised groups, and relationships of trust, reciprocity and exchange that facilitate co-operation, generate trust and reduce transaction costs. The endowment of the different types of capital asset that people have affects their ability to engage with external institutions, which themselves might be a product of social capital.

Physical capital comprises the basic infrastructure (shelter, water supply, transport, communications, etc.) and manufactured goods (e.g. tools and equipment) necessary to maintain livelihoods. Access to physical capital may be by means of payment of user charges, though some infrastructure may be a public good.

Natural capital constitutes the natural resource stocks from which resource flows and services useful for livelihoods are derived. There is a wide variation in the resources that make up natural capital, from intangible public goods such as the atmosphere and biodiversity to divisible assets used directly for production (trees, land, etc.). Natural capital is clearly essential to those who derive all or part of their livelihoods from resource-based activities (farming, fishing, gathering in forests, mineral extraction, etc.). However, the key environmental services and food supplies provided by natural resources lend this type of capital particular importance for sustainable development.

Financial capital denotes the financial resources - cash, credit or other liquid assets that people use to achieve their livelihood objectives. It can include regular flows (pensions, remittances, state transfers) as well as stocks (savings, jewellery, even livestock), which can contribute to consumption as well as production.

Policies, Institutions and Processes

Livelihoods are shaped by policies, institutions and processes at all levels, from the household to the international. These determine access to the various types of capital, including the substitutability of capitals. They determine options for livelihood strategies, and they determine access to decision-making bodies and external sources of influence. Organisations, in both the public and private sectors decide and implement policies and legislation, and undertake activities, that affect livelihoods. Processes determine the way in which institutions, and individuals, operate and interact.

Vulnerability Context

People's livelihoods and the wider availability of assets are fundamentally affected by critical trends as well as by shocks and seasonality, over which they have limited or no control. The factors that make up the vulnerability context are important because they have a direct impact upon people's asset status and the options that re open to them in pursuit of beneficial livelihood outcomes. Unforeseen changes in the economic, social, political or environmental context may have the effect of converting existing assets into liabilities. For example, a major change in the ethnic make up of a governing regime can drastically affect the social capital of negatively affected ethnic groups.

Shocks can destroy assets directly, forcing people to abandon their home areas and dispose of assets prematurely as part of coping strategies.

Livelihood Strategies

Three fundamental attributes of livelihoods: the possession of human capabilities (such as education, skills, health, psychological orientation); access to tangible and intangible assets; and the existence of economic activities. The interaction between these attributes defines what livelihood strategy a household will pursue.

"**livelihood strategies** - the overarching term used to denote the range and combination of activities and choices that people make/undertake in order to achieve their livelihood goals (including productive activities, investment strategies, reproductive choices, etc.)."

"Rather, it is a dynamic process in which they combine activities to meet their various needs at different times. A common

manifestation of this at the household level is 'straddling' whereby different members of the household live and work in different places, temporarily (e.g. seasonal migration) or permanently."

Livelihood Outcomes

"**Livelihood Outcomes** are the achievements or outputs of **Livelihood Strategies**. Once again, the important idea associated with this component of the framework is that we, as outsiders, investigate, observe and listen, rather than jumping to quick conclusions or making hasty judgements about the exact nature of the outcomes that people pursue. In particular, we should not assume that people are entirely dedicated to maximising their income. Rather, we should recognise and seek to understand the richness of potential livelihood goals. This, in turn, will help us to understand people's priorities, why they do what they do, and where the major constraints lie."

Technology and Sustainable Livelihoods

Technology is now widely perceived as having four inter related constituents:-

Technique (machines and equipment)

Knowledge ('know how' and skills)

Organisation

Product.

When seen in this way it is easy to see why the discussion of technology in the sustainable livelihoods approach has been subsumed in discussion of assets/capitals, with human and social capital approximately corresponding to skills and knowledge, machinery and equipment (technique) corresponding to physical capital, and 'organisation' corresponding to social capital (as well as the interactions with exogenous institutions and processes).

Technology is, however, more the way that assets can be combined and deployed together to achieve livelihood outcomes. Technologies thus determine the livelihood strategies that people have open to them. With any particular asset endowment, a set of technology options may be available. What is available and feasible also depends on the institutions and processes that the individual engages with.

Technology change can contribute to livelihoods by raising productivity, product quality and diversity, reducing the costs of raw material and energy requirements, leading to increased sales and income; and by developing the capability, within the small enterprise sector and supporting institutions, to respond to the changing needs and opportunities as they arise, leading to sustainable development of the sector.

A change in technology entails a change in assets - technology change can be a change in one or more of these constituents. It is thus not essential for there to be a change in machinery or equipment (technique) for a technology to be considered as having changed. A change in one constituent, however, may necessitate change in one or more of the others for the technology to function properly, or it may over time bring about changes in another. Technology consequently is a variable within the development process, something which is influenced by development but at the same time can influence development processes.

The sustainability of technical changes needs to be viewed in terms of the capability of technology users to continue to use a technology in continuously changing circumstances. The sustainability of the use of a technology thus requires a technological capability, a capability which enables the user to innovate and adapt the technology to meet changing circumstances.

Maintaining and improving livelihoods depends on people's capabilities to cope with gradual changes and with shocks, and to create opportunities for improvement. The sustainability of technical changes needs to be viewed in terms of the capability of technology users to continue to use a technology in continuously changing circumstances. The sustainability of the use of a technology thus requires a technological capability, a capability which allows the user to innovate and adapt the technology to meet changing circumstances. In seeking to understand technological change and sustainable development, therefore, technological capabilities rather than technological options must be the focus of attention.

Assets and Capabilities

The analysis of livelihoods using the framework places emphasis on the capital assets to which people have access. It is important to understand:

- levels of assets and their distribution among individuals, households, groups, neighbourhoods and communities (gender and age disaggregation are essential throughout the investigation);
- changes in asset status over time (cycles within a year as well as longer-term changes);

- the roles assets play in livelihoods (some assets - e.g. livestock - fulfil multiple functions); and
- asset interactions.

However, Assets (or capitals) "are not simply **resources** that people **use** in building livelihoods: they are assets that give them the **capability** to be and act." Different types of capital "are at once the resources (or inputs) that make livelihood strategies possible, the assets that give people capability, and the outputs that make livelihoods meaningful and viable." (Bebbington, 1999: 2029)

The capabilities that people have as a result of the assets at their disposal. Sen (1997) has noted that the possession of human capital not only means people produce more, and more efficiently; it also gives them the capability to engage more fruitfully and **meaningfully** with the world, and most importantly the capability to **change** the world. The same is also true, in other ways, for the other types of capital. The framework thus understands these assets not only as things that allow survival, adaptation and poverty alleviation: "they are also the basis of agents' **power** to act and to reproduce, challenge or change the rules that govern the control, use and transformation of resources." (Bebbington 1999)

Amartya Sen argues that economic development should be viewed first and foremost as a process of expansion of people's capabilities. What matters, according to Sen, is what people are capable of being, or doing, with the goods to which they have access. The quality of life is seen in terms of the activities that people value and their capability to achieve these. Having the capability to accomplish valued 'doings' and 'beings', giving people the freedom to choose what to do or be, enables them to rise above the forces that control their lives. A person's 'capability' therefore refers "to the alternative combinations of functionings that are feasible for her to achieve. Capability is thus a kind of freedom: the substantive freedom to achieve alternative functioning combinations (or, less formally put, the freedom to achieve various lifestyles)." (Sen 1999: 75)

One subset of human capabilities comprises the skills and knowledge required to bring about an indigenous process of technological development in developing countries. Technical change is a complex, continuous process of interaction and iteration amongst a wide range of factors. Continuous change in technology results in a continuously changing set of technology options, highlighting the importance of **technological capabilities** in the search for new technology and pointing to the need for ever changing capabilities. In seeking to understand technological change, sustainable development, and sustainable livelihoods, therefore, technological capabilities rather than technological options must be the focus of attention.

These incremental technical changes take place continuously. Technology does not remain static, fixed over a long period of time. Technical change always entails changes in the skills and/or knowledge of the people using the technology - their human capital. To the extent that technical change is continuous, knowledge and skills learning, is continuous - and thus human capital is never static. This continuous learning is an essential dimension of technological capabilities. Capabilities are enhanced by the learning of new technical knowledge and skills which comes about through technical change. The limits to learning, and consequently to technical change, are determined by these capabilities. Continuous change in technology results in a continuously changing set of technology options.

Gender, Technology and Livelihoods

For men and women, different life experiences impact differently on their livelihood capacities and priorities with respect to the use and development of technology. The implicit undervaluing of their skills, knowledge and organisation of technology has had serious implications for the status of women as technology producers and users and for their involvement in the development process.

Gender analysis is important in the assessment of the impact of poverty of technology focussed development projects. Employing gendered frameworks of technology use and capability allows disaggregation of areas of existing and potential technical expertise. Gender analysis also enables recognition of the gendered nature of livelihood activities within households and communities.

In their daily activities women use their technical skills and knowledge, and they continually innovate and adapt technologies in response to the changing context of their lives. Although the popular notion of an inventor or an artisan is male, it is frequently women who adapt and refine tools to fit their varying circumstances. Women often claim that they only help out while in fact supporting family business in essential ways. Male dominated institutions in the area of technical support reinforce this situation. For example, a study revealed that extension workers in Africa, in the face of overwhelming evidence to the contrary, do not think that women make significant contributions to agriculture, being tied down to domestic chores and "unprogressive" when considering innovations.

The communication of technical information in a form appropriate to women means recognising that they are more likely than men to be illiterate, uneducated, or speak only a minority language.

The development and support of technical change is often a choice influenced by access to resources which can be allocated according to the perceptions and priorities of outsiders. Firewood is an example of such biased priorities. Biomass, the most common cooking fuel, amounts to 90 % of all the energy used in poor countries. It is a woman's task to ensure cooked food is available, and it is her task to collect the fuel. Family consumption is about ten tons of wood or equivalent per family and it is estimated that poor people spend up to a third of their income and their time on accessing energy.

Such a huge demand affects other decisions: expenditure on heating and shelter, on food choice, security and nutrition, the effects of these on health and productivity imply that energy choice fundamentally affects other aspects of development. It is possible to trace energy scarcity to high fertility, low literacy rates a lack of participation and decision making ability at a local level and a lack of empowerment.

Developing appropriate energy technologies is therefore central to the conservation of women's time and health. Since it is not linked in an obvious way to income generation, however, there is a conspicuous lack of institutional support in the area of innovation in cooking fuel technology.

New technological ideas be accepted by women only if they are an obvious improvement, they do not impose an extra burden, and if they are culturally acceptable. A technique is required that will enable the invisible and silent "technologists" to find their voice and to improve their ability to inform outsiders about their needs as well as to improve their access to useful information.

Why has interest in Appropriate Technology declined?

There has been a notable lack of evidence of the widespread uptake of any AT products developed by AT organisations and the impacts that these have had. This is not to say there are no examples, and instances of successful local initiatives are quite numerous. There is nevertheless, an inherent inconsistency between universal adoption and the idea of appropriateness to local circumstances.

The emphasis on hardware by AT organisations during the 1970s and 1980s led to the neglect of the social, institutional and economic context. Any assumption that this context is unchanging has been undermined by the forces of globalisation, which has exposed weaknesses in the prescriptions for poverty alleviation from AT organisations in relation to attention to demand issues in the global market place. AT organisations have generally focussed on the micro-level application of technology, to the neglect of meso-level systems and institutions, and have absented themselves from the critical national and international forums where development decisions are being made.

There is a characteristic of AT that implies incremental change, a series of small adaptations of indigenous techniques, which might be effective for sustainable livelihoods of resource poor technology users, but are of less interest to individuals seeking rapid changes in their economic and social circumstances and agencies seeking rapid economic growth. Although appropriate technology change by the poor can raise productivity, this has not been seen by developing country governments as an effective means to ensure rapid rates of GNP growth and integration into the global economy.

The international development community has accepted the AT message in principle, if not in practice. It has become part of the conventional wisdom. DFID (formerly the ODA) has not formulated a specific Appropriate Technology policy since 1977. As with other "mainstreamed" ideas like gender, there is always the danger that without specific dedicated capacity, it will not be considered explicitly in project design.

AT organisations continue to face these challenges, but in a context that is significantly different from the days of E.F. Schumacher, thanks to globalisation of product markets and the rapid development of new technologies: biotechnology and information and communication technologies.