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TRANSFERRING TECHNOLOGY IN DEVELOPING COUNTRIES

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ABSTRACT

This paper is based on the author's experiences gained during 39 years involvement in technology transfer, focussing on his work as an agricultural consultant in some 30 developing countries. It outlines the main agencies participating in this task and discusses the challenges and constraints, and finally makes some observations about ways to improve the effectiveness of aid programmes. The principal conclusions drawn are that, in general, technology cannot be effectively transferred without adaptation to local conditions, and this process must be guided by an understanding of the whole farming system environment of the target area. This includes the obvious technical, economic and financial constraints and attributes, its infrastructure and institutional capability, as well as the underlying root causes hindering uptake by producers, that are often deeply embedded in the cultural and political characteristics of the country or region.

1. INTRODUCTION.

Technology transfer is not a new concept, as it has been around since man/woman discovered things that they did not know before. Primitive mankind, one supposes, used sign language, demonstration and then verbal communication to inform and show their fellows about emerging ideas and tools, for both destructive and constructive ends. With the explosion of both technology innovations and means of communication in recent times, this transfer process has become highly sophisticated and is increasing at an almost exponential rate. No doubt this process will continue to expand the frontiers of communication methods, driven by our unsuppressable innovativeness on one hand, and an insatiable demand spurred by the need to use our limited resources more efficiently, improve quality of life and raise

human dignity on the other.

The science of farm management and its underlying economic concepts and 'tools' have emerged in the context of improving productivity and profitability from limited resources.

The perceived usefulness (value) of innovations and their (marginal) cost, in relation to the needs and wants to be satisfied, modified by constraining factors, determine the rate and extent of adoption of new technology. The time gap (lag time) between invention, awareness and application, can range from a split second to many years. In agriculture, where the producer is the main technology user, this gap tends to be longer rather than shorter. A discrete science has evolved in studying the processes of agricultural technology transfer and how to improve its rate of adoption by farmers.

2. THE TECHNOLOGY TRANSFER AGENCIES.

Technology transfer includes not only training farmers in how to improve their farming practices, but also involves the whole gamut of innovations from macro policy advice, strategic sectoral and sub-sectoral planning, institutional strengthening, formal and informal training, construction and operation of development schemes, all of which have their legitimate place in a technology transfer hierarchy.

There are many agencies involved in the 'aid' business, broadly divided into government and non-government (NG) organisations, bi-lateral and international. They provide a wide range of services, including technical assistance (TA); direct 'aid in kind' (food, medicines, equipment); peace keeping; refugee support; credit, often on concessional terms, amongst others. The GOs deal directly with governments through relevant ministries, such as agriculture, while the NGOs working with government approval and cooperation, generally operate closer to the 'grass roots' population outside the public services structure. Oxfam, Care, Peace Corps, World Vision, Red Cross, are but a few of the plethora of these vital organisations, both secular and religious, each with specific mandates, but mainly in health, education and agriculture. The international agencies include the United Nations, represented by the Rome-based FAO (technical assistance) and IFAD (credit, targeting the poorer of the poor) in the agricultural sector; the

international World Bank (Washington), and regional banks such as the Asian Development Bank (Manila), African Development Bank (Abidjan), EBRD, etc., which provide credit for all sectors. Bi-lateral agencies dealing on an individual government-to-government basis, include USAID; CIDA; SIDA; AIDAB, DANIDA and many others. Most developed world governments support the international agencies as well as their own bi-lateral agencies, and sponsor NGOs directly or indirectly, but these latter tend to rely more on donated funding. Aid budgets for all agencies measured in relation to GDP fall mainly in the range of 0.5 - 1.0%.

3. THE CHALLENGE

The ever-widening gap between rich and poor, between 'Worlds', regions, countries, and intra-country, does not have to be spelt out here, but addressing this formidable challenge is one of the main objectives of the aid programmes, of which technology transfer is a significant element. This forum is not the place to discuss the macro issues involved with why that gap continues to increase, nor is the author competent to develop the subject. However, he would offer the observation that it may be rather too glib to place the blame, even as a major culprit, on the shoulders of population growth. There is sufficient evidence, globally and regionally, that if the world's food and fibre resources would be mobilised to their productive potential using existing technology, supply would match needs if not demand. At the risk of over-simplification, self-interest motivated by protection of high living standards lies at the root of the First World pro-population control lobby and in support of political decisions against liberalising trade and increasing aid expenditures, inter alia, which could facilitate more rapid development of the Third World. The GATT agreement may improve this situation.

3.1 Resource Use

Given that the over riding goal of technology transfer is to improve the well being and quality of life of the target group, usually the disadvantaged people of the developing world, especially urban fringe and rural communities, scarce resources should be used where they will achieve the maximum impact. Since the scarce resources are money and skilled manpower, this means using 'experts' in the hierarchy where their

knowledge and communications skills can benefit the most people. In theory the further up the hierarchy such resources can be located the greater the impact spectrum. From this perspective the use of skilled people at an individual or even community level when they could have more impact if deployed in training community leaders, or even training the trainers of community leaders, must be questioned. In general, transfer of technology at the grass roots level is best undertaken by local leaders, not by foreigners.

A typical example of this principle is the use of foreign experts to carry out extension work, albeit working with local extensionists. The same skills applied in the graduate and undergraduate training institutions would have greater impact, probably more efficiently. Some NGOs do not always use their skilled manpower resources to best advantage for this reason. While working directly with the needy, where the results of TT can be experienced at first hand, may be personally satisfying, it can be an expensive (in terms of human effort) way of achieving (limited) results.

3.2 The social:economic development balance

One of the basic dilemmas facing governments, especially in developing countries, is the conflict between economic and social objectives, and how to achieve the appropriate balance in allocating resources. This is best illustrated in the agricultural sector by the fact that not all farmers are equally productive or contribute equally to national income or export income. Most, usually the minority better farmers, partly because of favourable resource base but also because of superior managerial capacity, contribute the majority of sectoral income. Generally they are the first to take up new technology, manage the larger farms, respond quickly to changes in the economic and policy environment, and register the highest levels of productivity and production. For these reasons they are 'cheap' and relatively easy to service, through credit, extension and research support.

In contrast, the majority of farmers share the minor part of the economic 'cake', and tend to be among the economically and socially disadvantaged group, have lower managerial acumen, possess smaller, less productive farms, are slow to take up new technology, and consequently are more difficult and costly to service. In the developed world this group has mostly retired from farming into industry, although in the EU this natural process is

being retarded by the massive CAP subsidy network. In the developing countries this group is the vast majority and has nowhere to move to because of lack of industrialisation, and so has to be sustained in agriculture. In developing countries, with a high economic dependence on agriculture and limited financial resources, the problem of satisfying both the social and economic demands of the sector is acute.

4. DEVELOPMENT CONSTRAINTS

4.1 Political constraints - donors.

A significant limitation to more effective support in the developing countries are the restrictions imposed by political considerations of donor countries, especially in bi-lateral programmes. The need to retain electoral popularity at home can divert aid support to high-profile projects, or into programmes driven by domestic ideological factors, irrespective of priority need in the specific country. Environmental issues, while technically important, and politically very topical, may not always be the current priority need. Similarly, fear of diluting project kudos also restricts inter-agency cooperation.

4.2 Political factors - beneficiaries

National governments do not necessarily share the same values or political agendas as the donor countries, often resulting in a different perception of needs and wants. Common among ex-colonial countries is the entrenched belief that as they were the victims of injustice while under colonial rule their former 'masters' now have to compensate. Moreover, political leadership is often seen as merely a means of gaining access to the privileges and trappings of high office rather than as an opportunity to serve the constituency. This attitude fuels corruption, a phenomenon common enough in developed as well as developing countries, which can result in the diversion of aid funds into the pockets of community leaders as a right of office. In addition, pursuit of national independence and maintaining national integrity are seen as more important development objectives than (more rapid) creation of wealth through international investment and perceived surrender of national heritage to multi-national companies.

The political need to balance social and economic objectives often means

that study report recommendations, which are made in good faith by the consultants usually from an economic perspective, are not always palatable and may be rejected completely or only the easy options implemented. This situation occurs because of an incomplete understanding of the political agendas of the country by the consultants, together with the professional desire to propose only the technically best solutions. The number of reports moulding unused on ministry shelves because of this can be imagined.

Another problem that may be encountered in this context is an unreceptive working environment. A minister's signature on a project document does not guarantee support at lower levels of the administration. This attitude can result in use of the foreign expert to provide a technical input without the transfer component.

In addition, the administrations in many developing countries are often over staffed (to soak up skilled manpower in the absence of a private sector) but suffer the legacies of their previous colonial management in being overly 'bureaucratised', compartmentalised and excessively centralised and regulated. This syndrome hampers inter-ministry/disciplinary cooperation, and delays decision making and project implementation.

4.4 Tied Aid

A significant limitation to effective technology transfer are the politically inspired tied aid policies of bi-lateral agencies. Their basic strategy is to ensure as much of the aid budget is actually returned to the donor countries' economies, for various obvious reasons. This, usually rigid, policy means that only nationals may be employed on aid funded projects, and that equipment and other services have to be procured only in the donor countries. While laudable in principle, the result is that inappropriate goods and services may be provided to the country. The supply of LHD vehicles in RHD countries, or vehicles inappropriate for the task, or electrical appliances which do not conform with the national grid, low quality products and untimely delivery, are typical examples the results of this policy. Lack of relevant in-country service facilities and spare parts only add to the litany of problems and consequent wasted resources resulting from this policy.

4.5 National pride

One of the important factors influencing the technology transfer process and one which all foreigners working in developing countries need to be aware of is national pride. While an essential feature of the national psyche, pride can also be a deterrent to successful TT. It commonly surfaces as a fundamental belief in the capability of the national people to be able to carry out their own development programmes. "Just give us the money", they say, "we know what to do". A less apparent symptom of this attitude is a (barely disguised) tolerance of foreign experts for the sake of the hard currency, motor vehicles and equipment provided by the project. Study tours, preferably to Europe, are a favoured palatable form of 'technology transfer' by several governments, and at least one government will not approve foreign intervention unless a study tour is included in the project; the selected 'tourists' often being senior officials with little direct involvement in the project, rewarded for their dedication to the 'cause'. For political reasons the donor agencies tolerate this attitude, albeit reluctantly in some cases.

The vanity mentality is particularly acute in second world countries where many politicians and administrators believe that their only need is money, preferably in the form of debt forgiveness, freer trade with hard currency countries, and generous credit facilities. While the level of technology and industrialisation is generally better than in the Third World, it is still well behind western standards. For this reason, in the author's limited experience, it is more difficult to transfer technology in these countries than in the lesser developed countries where technology receptivity is significantly higher.

4.6 Aid mandates

As already implied above, the restricted mandates of the aid agencies coupled with an unwillingness/inability to cooperate and coordinate their activities in practice tends to restrict the effectiveness and efficiency of their programmes. The example of the extension training cited above is the result of institutional training and community development projects being divided between two (UN) agencies coupled with inadequate cooperation. Again, increasing life expectancy through disease control measures should be accompanied by a parallel effort to increase food supplies, but due to

lack of coordinated effort this did not always follow because the agencies involved are different. Lack of cooperation between NGOs and GOs was a serious constraint for a long time, but has recently improved considerably.

Religious groups' preference for direct community activities when perhaps their personnel could be better used in training local leaders and administrators, is another example of under-used scarce resources. Some countries, such as China and Japan, prefer turn-key projects in which the finished project is handed over to government after construction by expatriate labour and management working in isolation with no transfer of technology.

Moreover, while in theory and on paper governments are expected to maintain development project activities from their national budgets after the formal aid-assisted phase is complete, in practice, due to lack of money for on-going maintenance, the project momentum often declines - vehicles not replaced, operational funding cut, and personnel are transferred to other duties. Longer term (post-project) financing is resisted by the agencies.

Lack of cooperation among donor agencies also occurs through varying and inconsistent working conditions and project financing policies. The high salaries and in-country allowances, especially of the GOs, often causes resentment among the lower paid local technical people. Similarly, local staff employed by the project or by agency administrations receive (much) higher salaries and working conditions than their counterparts in national employment. Moreover, some agencies insist on a substantial local contribution to project funding (vehicle fuel, support staff, office accommodation, etc.) while others are less demanding.

4.7 Narrow project planning

Similarly, but for a different reason, many projects are conceived with very narrow bases and limited objectives. In reality few interventions stand alone. That is, their impact depends on other actions, be they supporting policies or other related activities, directly or indirectly linked. Unless the whole package of linked actions and pre-conditions are addressed, the impact of the immediate action can be limited. Thus, the effectiveness of an extension service is enhanced when adequate and timely inputs, credit, markets and

appropriate research programmes are also in place. These in turn require an functioning transport and supply network, foreign exchange resources and shipping facilities if imports/exports are involved, available consumer goods, and so on. Project planning and implementation needs to be comprehensive, an approach implicit in the broadly-based Rural Development Projects, for example, but even these do not go far enough.

It follows that the success of technical transfer should only really be measured by its impact on the quality of life at the grass roots - increased family incomes, better nutrition - rather than whether and how quickly funds are disbursed, or if the project development schedules are met. Many international agencies do not even bother to evaluate the impact of their projects beyond these restricted 'success' indicators. For many years the ultimate beneficiaries of aid projects were not consulted about the proposed actions in the planning stages and both implementation and maintenance suffered as a result. Rural community involvement is now the cornerstone of many agencies' development strategy.

4.8 Social and cultural factors

Perhaps the most difficult constraints to deal with in transferring technology are those rooted in the social and cultural behaviour and attitudes of rural people. As examples can be cited the rather widespread belief in male superiority, common in many parts of Africa where society is patriarchal by tradition, sometimes fostered by religious belief, whereby females and children are relegated to inferior, even slavish positions in family and society. The ramifications of this attitude can be serious, especially in the injustices at household level, particularly in rural areas where traditions remain very strong. Examples are many, a few will suffice, although it must be recognised that the pattern varies considerably. In parts of Bhutan, for example, society is matriarchal:

- * It is common that families may not take food until the husband has eaten and has the opportunity of selecting the choicest dishes, usually meat, which is a luxury in most households. One result is malnourishment of children (who need animal protein more than adults) and also, especially, pregnant women.
- * Likewise, women (and children) are often expected to undertake both the food production (with primitive hand tools) and domestic chores,

including fetching water, child rearing, and meal preparation. The men will take care of the cash activities (crops and animals), maybe help with land preparation, and control the household cash. 16 hour working days for women are not uncommon, and poor nutrition and health are often the inevitable result.

- * Because this life of drudgery is the expectation of rural females, girls are often not encouraged to attend school, certainly not secondary level;
- * This male attitude also means that male extension agents cannot talk to the female (food) producers, and they tend not have access to credit, or cash for inputs, and so food crop productivity remains low.
- * The high incidence of HIV virus in some parts of Africa is exacerbating these problems as young people are being encouraged into very early marriages. But that is another issue.

With education (at secondary level) these chauvanistic cultural attitudes moderate, but not completely, and educated women do not remain in the village in any case.

4.9 Economic and technical

The impoverishment of most developing governments due to a narrow and inadequate taxing base is characterised by low salaries, especially in the public sector, and high taxes which can discourage dedication and work output. As a result of heavy emphasis on (aid financed) tertiary education and training during the last 30 years or so, there now exists a good number of well trained, albeit relatively inexperienced, technical people and administrators in these countries. But the inadequate rewards offered by government results in a drain of valuable experienced skilled manpower abroad, including international aid employment. There are usually too few counterpart personnel available for project work due to this factor as well as the multiplicity of aid projects foisted on governments by enthusiastic donors anxious to spend their allocated aid funding - sometimes at any cost.

5. THE CASE OF CENTRAL (AND EASTERN) EUROPE

The technology transfer constraints in the former soviet bloc countries are significantly different to those in the lesser developed world, due mainly to the devastating lasting effect of the socialist mentality and centrally

controlled management methods on the population as a whole but especially on government administrators and enterprise managers. Space constraints permit only a brief skirmish with the issues, based on the Hungarian situation, which is fairly typical.

In essence, because of the socialist emphasis on full employment and maximum production as the main management objectives, the market economy concepts of profit, profitability, and efficiency were not generally known and never used for management. All costs (variable and fixed) were passed back to the government through the full cost accounting system, and now are passed on to the consumer through guaranteed prices set to cover 'costs'. Production decisions were based on targets set by government for an assured, undiscerning market, and only biological and social factors used to achieve them. Economic management concepts - marginality, opportunity cost, etc - and the 'tools' such as gross margins and partial budgets are as foreign as those who are now trying to introduce them, despite their incorporation in the agricultural economics curricula for over 20 years. The result is a technically and 'genetically' sound but inefficient agriculture, which is seen as an adequate justification for not changing, even for resisting this new technology.

6. CONCLUSIONS

Despite the difficulties technology is transferred and there are many remarkable success stories, largely due to the dedication and skills of the aid administrators and field workers, both national and international. Many of the donor constraints are being tackled: inter-agency cooperation, comprehensive planning, community involvement, but the author stresses that technology impact could be improved if those involved are aware of the limitations and take the trouble to minimise the 'bottlenecks' to the extent of their control. Donors are better placed to change than the recipients:

- * Freer trade between developed and under developed countries is the basic condition for creating a favourable environment in which technology transfer can flourish - cash for aid projects is not enough, indeed is hypocritical, if not accompanied by trade concessions;
- * Clearly there is room for more inter-agency cooperation;
- * Train the trainers, not the farmers!
- * Likely unpalatable recommendations should be recognised and

couched in more favourable terms, showing the cost of non-implementation, and suggesting less effective but easier options. It is necessary to understand the total environment (political, social, and cultural) of the country or sector.

- * To help overcome the problem of narrow uncoordinated unprioritised aid projects and obtain a holistic understanding of the problems in some sort of priority order, there are several techniques available which could be used more often. These include the familiar Rapid Rural Survey technique of problem identification and quantification; the Farming Systems approach to development programmes; and the use of the ZOPP logical framework method for systematically identifying the problems and their hierarchy of causes to arrive at the root causes of constraints preventing achievement of development goals. This involves the recipients in the process and helps to establish not only the important areas of intervention but also the preconditions and linked actions needed to achieve maximum impact.
- * The former socialist bloc countries require a different approach to that used in Third World countries, and the priority need after investment capital and free trade is the conversion of the management mentality to a market oriented way of thinking along with the practical use of farm management economic concepts and 'tools', and including the transformation of the accounting system. This requires a massive training programme.