Evolution and new directions using information systems for enhancing farmer partnership in NARS agricultural research

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Abstract

For many developing countries, agricultural research has been built on the models of the previous colonial rulers. The supply of technical knowledge from the outside, and the local adaptation of this knowledge, would enable technology transfer to take place via extension agents to the peasant farmer, expected to be a male between 30 and 40 years of age. It is with some regret that we must admit that many national research organizations still work like this. And it is with some regret that we can observe that there have been patterns in the behavior of international agricultural research institutions that have reinforced this historic model.

The modern peasant farmer of Latin America and many parts of Asia goes to his or her field in the morning with a transistor radio on their shoulder, blaring out the latest pop music from commercial radio stations. Most villages have a TV, fascinating its inhabitants with soap operas set in the urbanized contexts of USA, Europe, Mexico or Brazil. And most farmers are young, and in many countries, particularly in Africa, they are teenage girls trying to keep families together under the stresses of the HIV/AIDS pandemic. What we have witnessed in Sierra Leone and Liberia, in East Timor and parts of Indonesia and the Philippines, is that the lack of prospects of adequate rural livelihoods entices young men to become soldiers of fortune instead of soldiering on the farm.

How do we organize new agricultural research and extension to reach those that are about to leave the land (as they have done on a massive scale in Latin America and increasingly in Asia and Africa)? How to we make it likely that we can generate the kinds of income and settings that make it attractive to remain on the land? It can be argued that the main incentive to stay on the land must come from increased income, not from increased production. Indeed, increased production (the target of so much agricultural research) repeatedly leads to decreases in prices and little economic improvement.

There is in my view no single mechanism that can assist in achieving this. But there are indications that information technology can be applied to set agricultural research agendas that are more directly relevant to the needs of small farmers. There are also indications that there are new tools that allow research findings to reach farmers much more efficiently than through classical extension methods. And there are now many experiments to show that information technology may offer the possibility to let knowledge travel up and down that last elusive mile to the farm gate of the most distant farmer.

Information technology is often now strongly linked to Internet technology. In the context of the developing world the term must be seen as more inclusive. The traditional news media (radio, TV) may be more important than the web, and Internet access is seriously limited in many countries in Africa, although less so in Latin America and parts of Asia. Rural radio constitutes a strong communication tool. Mobile telephones are about to revolutionize contacts in the countryside, opening up for two-way contacts that were

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unthinkable only 5 years ago. New computer access services over mobile phones offer additional connectivity. Television spellbinds many, but is less interactive for the rural poor. Emails are creeping in, and will be supplemented by web services. How do we make this technology available to the truly poor, to those who live below US$1 a day, or US$2 a day, and in addition may not have access to many infrastructural services that can otherwise compensate for low cash incomes? There are at least 1.5 billion people in this category, and the number is decreasing only very slowly. There are imaginative models being tried out: the "Information Villages" of the M.S. Swaminathan Foundation in India constitute one such effort, to ensure that there is one electronic communication point in a village, operated by a daughter or son in the village, and linking in to the agricultural research and extension community.

Faced with the direct connectivity of farmers, their associations, and their extension agents to the agricultural research community, the researchers will soon become exposed to the same consumer pressure as medical doctors increasingly see. Patients may arrive at the surgery with piles of printouts of medical diagnoses downloaded from the Internet, and medical doctors may become increasingly restless about their legal liabilities if the computer expert medical system arrives at a different diagnosis or recommends alternative treatment. In industrialized countries, precision farmers hire their own research and extension communities and pay them on performance. Poor subsistence farmers are still a long way away from this. But public agricultural research in developing countries has got the same challenge waiting only a few years down the road as villagers tool up, through connectivity and knowledge, to set research agendas and tap directly into the latest advice.

In the midst of this connectivity revolution, our newly found appreciation of the value of traditional knowledge must ensure its viability. Our respect for the values of age-long learning and the wisdom of inter-generational experience must not disappear off the computer screen. Universal connectivity, to every farm everywhere, is a very long way off in developing countries, even at the village level. In this phase, it is critical to recall that the institutional structures on which learning relies, and the depositories of knowledge old and new, must find their rightful place as science surges forward. In the short and medium term, our efforts to improve food security for 3/4 billion people globally will not come from genetically modified crops, fish and animals. They will originate in doing better what we know now, giving market incentives for farmers to use their own innovation systems for improved earnings, and supplement their knowledge systems with modern science innovations. In constructing and maintaining institutions for this capacity building, information technology will have a significant role to play, as we move into new learning processes, including distance training, and the reliance of computer-based teaching. The fascination with technology will nevertheless have to be secondary to institutions filled with living women and men wishing to better their lives. Institutions still matter a great deal, and knowledge must have homes to develop and thrive.

Introduction

For many developing countries, agricultural research has been built on the institutional and knowledge transfer models of the previous colonial rulers. The supply of technical knowledge from the outside, and the local adaptation of this knowledge, enable technology transfer to take place via extension agents to the peasant farmer, expected to be a male between 30 and 40 years of age. It is with some regret that we must admit that many national research organizations still work like this, although the world has changed dramatically over the last 30 to 50 years. And it is also with some regret that we can observe that there have been patterns in the behavior of international agricultural research institutions that have reinforced this dated, historic model. Until recently many research programs had "technology transfer" components, and diagrams were normally drawn with the international research center on top and the poor farmer at the bottom.

Participatory research, client-oriented agendas, interdisciplinary approaches and holistic programs are recent entries in agricultural research models. Although now well embedded in the international research centers, many national agricultural research systems have not explored these new organizational tools.

New challenges

The original model of the farmer has also dramatically changed. Many societies have been accustomed to strongly patriarchal farming communities, with a normal age distribution, strong traditional values and significant social control. The modern peasant farmer of Latin America and many parts of Asia goes to his or her field in the morning with a transistor radio on the shoulder, blaring out the latest pop music from commercial radio stations. Most villages have a TV, fascinating its inhabitants with soap operas set in the urbanized contexts of USA, Europe, Mexico or Brazil. And many farmers are young, and in many countries, particularly in Africa, they are teenage girls trying to keep families together under the stresses of the HIV/AIDS pandemic. Or they are old, because the middle age group has gone — victims of the pandemic or migrated to the city. What we have witnessed in Sierra Leone and Liberia, in East Timor and parts of Indonesia and the Philippines, is also that the lack of prospects of adequate rural livelihoods entices young men to become soldiers of fortune instead of soldiering on the farm. Traditional values, and the traditional knowledge systems, are being challenged and they now change rapidly. The generation of scientific knowledge through our agricultural research systems must now cater for a different breed of farmer.

How do we organize new agricultural research and extension to reach those that are about to leave the land (as they have done on a massive scale in Latin America and increasingly in Asia and Africa)? How to we make it likely that we can generate the kinds of income and settings that make it attractive to remain on the land? It can be argued that the main incentive to stay on the land must come from increased income, not from increased production. Indeed, increased production (the target of so much agricultural research) repeatedly leads to decreases in prices and little economic improvement. The main lesson that we learned from the Green Revolution in Asia was that technological innovations (the new rice and wheat varieties) were important for economic progress, but not enough. A host of other elements (credits, land ownership, schooling (especially for girls and women), rural roads, availability of markets for selling produce to fair prices, and to obtain agricultural inputs timely and to fair prices) are also necessary. Rural wealth, or rather poverty reduction, cannot rely on technical innovation alone.

Tools at our disposal

Against this setting of a complex, developing rural landscape, in flux demographically, socially and economically, there is in my view no single mechanism that can assist in achieving progress in livelihood. It is also clear that agricultural research is but one of many tools. There are, however, indications that **information technology** (IT) can be applied to set agricultural research agendas that are more directly relevant to the needs of small farmers in developing countries. There are also indications that there are new IT tools that allow research findings to reach farmers much more efficiently than through classical extension methods. And there are now many experiments to show that information and communication technologies (ICT) may offer the possibility to let knowledge travel up and down that last elusive mile to the farm gate of the most distant farmer.

Information technology is often now strongly linked to Internet technology. In the context of the developing world, the term ICT must be seen as wider and more inclusive. The traditional news media (radio, TV) may be more important than the web to poor farmers for many, many years. Rural radio constitutes a

strong communication tool. It is gratifying that several important research and development groups, in FAO, in Guelph in Canada, Worldvision and also in ISNAR, invest significantly in this far-reaching technology[1]. Internet access, requiring major investments in ICT, is seriously limited in many countries in Africa, although increasingly less so in Latin-America and parts of Asia. Mobile telephones are about to revolutionize contacts in the countryside, ultimately opening up for two-way contacts that were unthinkable only 5 years ago. New computer access services over mobile phones offer additional connectivity that is currently possible in industrialized countries, albeit at a cost. Television spellbinds many, but is less interactive for the rural poor, and very expensive to produce. Emails are creeping in, and will be supplemented by web services. How do we make this technology available to the truly poor, to those who live below US$1 a day, or US$2 a day, and in addition may not have access to many infrastructural services that can otherwise compensate for low cash incomes? There are at least 1.5 billion people in this category, and it is reducing only very slowly. There are imaginative models being tried out: the "Information Villages" of the M.S. Swaminathan Foundation in India constitutes one such effort. Here there is one electronic communication point in a village, operated by a daughter or son in the village, linking in to the national and global agricultural research and extension community. At a higher level, the Canadian-led Acacia project has made inroads in African agricultural research connectivity.

Faced with the direct connectivity of farmers, their associations, and their extension agents, to the agricultural research community, the agricultural researchers will soon become exposed to the same consumer pressure as medical doctors increasingly see. Patients in industrialized countries may arrive at the surgery with piles of printouts of medical diagnoses downloaded from the Internet[2]. In industrialized countries, precision farmers hire their own research and extension consultants and pay them on performance. Poor subsistence farmers are still a long way away from this. But public agricultural research in developing countries has got the same challenge waiting only a few years down the road as villagers tool up, through connectivity and knowledge, to set research agendas and tap directly into the latest advice. The discussion on payment for such services by developing country farmers has still a long way to go, whether payment is levelled at the individual farmer's level or their associations.[3] Is ICT in agricultural research then dependent on poor farmers' purchasing power? The development of ICT techniques in general has shown that there is considerable purchasing power elsewhere in society, so that a large number of "free riders" can be tolerated. The Internet itself is a proof to that. It is a challenge for both international and national agricultural research to allow poor farming communities "free rides" on the ICT highway. We have to turn it into an advantage to have missed most industrial revolutions.

[1] For its 20th anniversary, ISNAR produced a series of short radio spots on agricultural research, with developing country scientists, to be aired on local FM stations in developing countries. Produced and distributed professionally in Spanish, English and French with scientists from Latin America, Asia and Africa, it is estimated (from broadcasting station reports) that many millions of listeners - possibly 100 million - heard one or more of the programs during the second half of 1999. Segments were also used by BBC World Service. ISNAR has never reached a larger audience with information on agricultural research, and at quite moderate costs. If there were 100 million listeners, the costs would have been around 0.03 US cent per listener. ISNAR had very positive listeners' reports from many of the broadcasting stations. This indicates that the old medium of radio is still a strong one, and one where a 5 min interview with a national agricultural science leader can fit in well between the latest rap and salsa records. The audio segments are available on www.cgiar.org/isnar.

[2] Medical doctors are becoming increasingly concerned about their legal liabilities should their "hand-made" diagnosis differ from that of the computer-based medical system.

[3] The international agricultural research centers of the CGIAR produce global public goods. There are currently a wide discussions on intellectual property rights protection within the CGIAR system. IPR (trademarks, copyrights, plant breeder's rights, patents) could open for the collection of royalties. However, no CGIAR center has suggested that farmers should pay directly for CGIAR intellectual property.

In the midst of this connectivity revolution, our newly found appreciation of the value of traditional knowledge must ensure its viability. Our respect for the values of age-long learning and the wisdom of inter-generational experience must not disappear off the computer screen. Universal connectivity, to every farm everywhere, is a very long way off in developing countries, even at the village level. In this phase, it is critical to recall that the institutional structures on which learning relies, and the depositories of knowledge old and new, must find their rightful place as science surges forward. In the short- and medium- term, our efforts to improve food security for 3/4 billion people globally will not come from genetically modified crops, fish and animals. They will originate in doing better what we know now, giving market incentives for farmers to use their own innovation systems for improved earnings, and supplement their knowledge systems with modern science innovations. In constructing and maintaining institutions for this capacity building, information technology will have a significant role to play, as we move into new learning processes, including distance training, and the reliance on computer-based teaching. The fascination with technology will nevertheless have to be secondary to institutions filled with living women and men wishing to better their lives. Institutions still matter a great deal, and knowledge must have homes to develop and thrive.

New concepts in agricultural research

From Information and Communication Technology on the one hand, and our need to preserve traditional knowledge, and to stimulate and develop new knowledge, on the other, we see the rise of new concepts in agricultural research. To supplement more traditionally designed agricultural research, knowledge management systems are beginning to develop. They incorporate innovation models for the structure of agricultural research organizations, to counteract traditional hierarchical and narrow sector-based models. They give liberty and encouragement to innovate to junior people in an organization, and they positively stimulate cooperation between research units spanning wide fields, going beyond narrow assignments. In the public sector, they may go beyond ministries. They seek to cultivate synergy between universities and ministerial research units. They do not limit themselves to the public sector but seek partnerships in the private sector (and here possibly struggling with intellectual property rights issues). They seek to remove disincentives to team work, to re-educate, if necessary send away, the "lone ranger" among research scientists, focus more on actual achievements for farmers and less on the number of internationally refereed publications. And — in some settings — more on intellectual property rights protection to keep the use of things for oneself rather than publishing in journals for all to see and freely adopt.

Much as you in Japan have experimented with new types of management in your manufacturing industries, there is now increasing experimentation in Western Europe, North America and in Latin America — and notably in The World Bank — with knowledge sharing systems in agricultural research. In Latin America we see how they are in the process of giving rise to completely new organizational structures in applied research.

There are four central pillars to the move towards knowledge sharing in support of innovations systems for agricultural research:

* The availability of strong and seamless information and communication technology

* An internal organizational culture that encourages knowledge sharing and discourages one-sided knowledge hoarding

* More open research organizations eager to cooperate across traditional borders

* Significantly closer participation in the research of the users of the research results.

Nowhere are the challenges for research greater than for agriculture and natural resources management in developing countries in the tropics and subtropics. There are more pests and diseases per cm2 of tropical

crops and livestock than in the temperate regions. Crop and livestock insurance is virtually non-existent, subsidies are normally negative (tax, instead of up to 70% subsidies for farmers' income in Japan, Switzerland and Norway). The knowledge chain may be weak or increasingly broken by human disease, disorder or war. The global investment in poor peoples' agriculture is small and has been falling, although we believe it may now have stabilized and possibly be on a slight rise. Even a middle- sized agricultural university and research center in Western Europe, e.g. Wageningen in The Netherlands, has a budget for national agricultural teaching and research in a country of 16 million people and 15,000 km^2 that exceeds the total budget for all CGIAR institutes by a factor of 1.3. For all the talk of 750 million food − insecure, dramatic decline in the quality of the natural environment, extensive uncertainty about climate change and the likely success and effect of the Kyoto Protocol on greenhouse gas emissions, the total investments in poor peoples' agriculture **is totally inadequate**. Whilst all of us in the CGIAR system applaud Japan as one of the major contributors to global public goods in agriculture, the current total global efforts make it highly unlikely that there only will be 420 million food − insecure people in 2015, at which the World Food Summit in 1996 aimed. As if 420 million hungry people is a positive goal in itself, at the current rate we will not have achieved total eradication of global food insecurity until the next century, not in 2015.

Conclusion

The poor farmers cannot be helped by information and communication technologies alone. They must organize themselves, possibly in farmers' associations, press for and participate in a rejuvenation of the national agricultural research systems that can serve them. They must insist on knowledge sharing beyond their ministry or agriculture system, challenge participation from the universities − who must leave their ivory towers − and appeal to private industry to do their share. Only increased incomes for poor farmers will give them purchasing power to become customers of private industry in the longer term. The new possibilities given by Internet-like connectivity, mobile phones and the old-fashioned radio for poor people to influence the research agenda, participate in the execution of the research, and rapidly acquire knowledge of research results, nevertheless offer hope. But little of this will have any effect unless national agricultural research systems in developing countries are willing to modernize their organizational structures, revisit their organizational cultures and bring forward a new generation of science managers who believe in knowledge sharing and innovation. At a time when many believe that The Market will fix it all, most of us who work with global public goods in agriculture believe that The Market could fail many poor farmers. Knowledge must have homes, and in the struggle to ensure that we as agricultural research scientists can deliver, institutions still matter.