

THE TRANSFER AND DISSEMINATION OF AGRICULTURAL TECHNOLOGIES: ISSUES, LESSONS AND OPPORTUNITIES

Brent M. Simpson

Institute of International Agriculture, 319 Agriculture Hall, Michigan State University, East Lansing, MI 48824-1039,

Abstract

The rapid and widespread abandonment of the World Bank's Training and Visit system in the mid-1990s created an operational vacuum within the national extension programs of West Africa. At the same time, non-governmental organizations gained much recognition for their use of participatory and processed-based approaches, which national programs subsequently attempted to emulate. Key issues related to this period of transformation, as well as the current status of technology transfer activities within the sub-region, include: the increased plurality of extension service provision; significant changes in the methodological orientation of extension practice; continued struggles with the weak level of human resources in extension programs; the limited base of relevant technological innovations; and exploration of alternative approaches to extension financing. While use of a loose collection of participatory tools has become widespread, no dominant approaches experiencing widespread adoption have emerged, nor have any particular types of organizations (governmental, non-governmental, or private) distinguished themselves as operationally superior. Factors associated with positive impacts include programmatic size and strength, attention to supportive capacity-building, and lateral networking efforts linked with strong vertical integration into field programs. Future successes in the sub-region will be linked to greater attention being given to strengthening the human dimensions of development practice.

Key Words: extension, agricultural development, technology transfer, technology dissemination, West Africa, capacity-building.

1 General background

Just over a decade ago, a survey conducted within the West Africa sub-region on the basic structure and orientation of extension practice would have found the majority of national extension programs using some variant of the Training and Visit (T&V) system promoted by the World Bank. These systems featured a highly centralized, top-down 'cascade' administrative structure, designed to maximize efficiency in moving new technological recommendations from research out to farmers through bi-weekly meetings with field agents (using demonstrations and contact groups), who in turn were supported by a small cadre of subject matter specialists and regular in-service training.^[2] Ultimately, the high costs of operating these elaborate structures, combined with the lack of new technologies to extend,

led to the eventual abandonment of the model. Although increasingly relegated to the realm of historical footnotes, the T&V experience has continued to exert itself through the attitudinal and operational footprint it left upon individuals and programs indoctrinated in its use.

Today few, if any, of the classic T&V programs still operate within the sub-region. The extent of the fall from grace of the T&V model is remarkable for both its breadth and rapidity, and is based upon the combined effect of (i) the mutual recognition by the Bank and implementing countries of the operational shortcomings (or outright failures) of the T&V approach in West Africa, (ii) the shifting of the Bank and other donors to channelling increasingly large shares of operational funds through so-called non-governmental organizations (NGOs),^{[3][4]} and (iii) based on both the weak performance of the T&V model and the withdrawal of financial support, governments have had to face 'a day of reckoning' over what type and size of programs they can support through their own resources, and in response, national programs have begun to gravitate towards alternative methodologies of extension practice and models financing.

Although few entirely new forms of extension service provision have emerged in recent years, there has been an important shifting and re-partitioning of activities among the existing actors. One of the most important trends across the sub-region has been the transfer of basic service provision, such as rural credit, input supply and produce marketing, out of national extension programs and into the private sector. This process began in the mid-1980s with the introduction of structural adjustment policies, and accelerated through the 1990s. Interestingly, and contrary to the trend among national programs, a surprising number of donor-supported NGOs, large and small, are promoting their own credit schemes and arranging for input delivery. Seed multiplication and dissemination is perhaps the single major agricultural service area that has remained primarily under public sector control, due largely to the nature of the product and the weak potential for private sector enterprise to profitably provide the service. In terms of their overall content, it is fair to characterize public sector extension programs, as well as most NGOs, as providing public goods (largely in the form of technical advice and recommendations) to farmers across the majority of, but not all, environmental and socio-economic conditions found within each country's borders. In contrast, private sector service providers, and quasi-governmental parastatal organizations, tend to be oriented towards the provision of private goods and services within much more limited geographic and economic domains.

Although the perfunctory characterization of governmental extension program performance as slow, ineffective and grossly inefficient in comparison to NGOs has become standard, the on-the-ground reality is not so clear-cut. Freed from the operational bondage imposed by the T&V system, and armed with cutting-edge approaches and more responsive management styles, national programs are proving to be equally capable of delivering the same types of benefits as NGOs (at the same, or even lower, costs). In addition, due to their large size, national programs are able to generate impact at a speed and scale that are orders of magnitude beyond that possible for most NGOs. Poor infrastructure and policy constraints continue to limit the impact of market forces and the ability of the private sector in many countries to offer clearly superior alternatives. In general, African farmers face some of the highest transaction costs in integrating themselves in the marketplace, paying 3 to 5 times the world market prices for inputs, while receiving only a fraction of market value for their produce. While the provision of certain goods and services (e.g., veterinary services) is finding a ready home in market-based transactions, others have not (e.g., seed supply), and may never be fully absorbed by private enterprise. In general, the low educational levels of extension field staff and supervisors, and limited sources of new, viable, technological innovations, affect all technology diffusion efforts alike, regardless of the type – public, private, or NGO.

2 Major issues

A number of important issues warrant identification and further comment regarding their immediate and mid-term future impact on technology transfer and dissemination efforts in West Africa.^[8] The first concerns the general increased plurality of extension service provision that has occurred over the past decade. For recipient countries, one of the major fallouts from the waning support among donors for public sector institutions is the structural transformation of how, and by whom, extension services are provided. This is most clearly seen in the emergence of a truly pluralistic organizational landscape, where state extension agencies have had to learn to share the field with an increasingly large number of NGOs. To illustrate the point, in the case of Mali, over 1,800 NGOs were reportedly listed at the national registry office in 2002,^[9] compared to the estimated 800 a decade earlier.^[7] While not all of these organizations carry out direct extension activities, many do. These range from one-person 'briefcase NGO' consultants, to large, principally northern-based, and often times well-funded, organizations that rival and may even exceed the national programs in terms of budget and operational prowess. Despite this trend towards diversification, the fact remains that in most countries within the sub-region, state extension services remain the largest, and single-most important, organization engaged in technology dissemination. The reason Guinea, for example, has been able to successfully launch and sustain a massive effort to rapidly multiply

and disseminate NERICA rice varieties (NEW RICE for Africa), developed by the West Africa Rice Development Association,^[8] is because they have over 2,000 agents in the field. Similar figures can be cited from neighboring Cote d'Ivoire and Ghana. Compared to the one or two hundred field personnel of the very largest NGOs, and the more typical number of 6 to 7^[9] field technicians, the potential and real power of public extension services must not be under-valued.

As would be expected, under conditions of appropriate public policies, adequate infrastructure and sufficient effective consumer demand, the private sector has been successful in providing a wide range of production inputs (including, in some contexts, the emergence of private seed companies), certain discrete technical services (such as veterinary), as well as various production credit opportunities, particularly in situations where farmers have achieved higher levels of market integration through cash crop production. The provision of 'public good'-type services, however, such as technical advice on crop production techniques, natural resource management, small enterprise development and others, has not been an area of growth, although Mali is currently experimenting with a limited program.^[10] Nor has the private sector done particularly well in situations where the farm population is dispersed and generally poor. In response, one observer has wondered where the rich body of experience is found showing that farmers living on 1-2 dollars a day "have bought their way out of poverty."^[11] Others have raised questions over the willingness of the private sector to invest in staff training, who will provide this training, and how effective for-profit enterprises will be linking with governmental research institutions, among other issues.

The examples of voluntary technology dissemination emanating from certain group-based development efforts, and the increased political advocacy of established farmer unions, fed hopes through the 1990s for the potential involvement of producer associations in technology dissemination activities. The record of evidence to-date, however, shows that these hopes have not been, and may never be, fully realized. While most farmer associations organized around viable commodity markets readily assume greater responsibility for input provision and marketing of members' produce (as a means of reducing costs and gaining more revenue for their members), there has been much less involvement in actual technology diffusion activities. Those examples that do exist tend to reflect conditions where there is a high-value, specialized cash crop and few or no other alternative sources of technical information.

A second, closely related and equally important issue is that of the significant changes that have taken place in the methodological orientation of extension practice over the past 10-15 years. For governmental extension services, the operational void created by the abandonment of the T&V model has generally been filled by a loosely defined set of 'participatory practices,' generally reflecting the struggle of national extension programs to assimilate the language and practices of more participatory

and multi-actor orientations to technology dissemination that have characterized the work of their smaller NGO cousins.

One of the primary reasons why NGOs have captured the imaginations of donor organizations and have been so successful in mobilizing funds is the perceived notion of NGOs' superior effectiveness and efficiency in meeting the needs of target populations through their streamlined, more flexible approaches to programming and use of innovative, responsive, participatory methodologies. The general shift by NGOs to a more process-oriented, demand-driven style of rural development often involves related adult education, local organizational capacity-building and empowerment themes, most of which were lacking in the contemporary governmental programs of the day.^[42]

As one review indicates, however, the optimism of the pro-NGO view is founded more on belief (desire) than empirical evidence.^[43] The factual body of evidence supporting the picture of NGOs' superiority rests largely on anecdotal glimpses and isolated case studies. Yet an equally persuasive body of anecdotal material and case examples can be compiled showing just the opposite – that many NGOs may, in fact, be no more effective, even less efficient, and perhaps no more operationally innovative or participatory than the governmental services they are supposedly superior to. Within this atmosphere of uncertainty, one issue is resoundingly clear: given the sheer number of organizations involved, their diverse ideological orientations, unequal resources, disparate levels of trained human resources etc., the resulting challenge of attempting to coordinate or undertake any sort of broad-based, complementary programmatic activities will, in many countries, become prohibitively complex. Underlying this observation, and in contrast to what is known about past governmental programs, it is clear how very little we know at the national level about NGOs – what they do, where they work, who they target and how they locate new innovations. Given the large portion of financing currently being channeled through NGOs, this basic lack of understanding, and continued 'blind faith' in their support, is troubling to say the least.

A third area of concern, affecting equally governmental services, parastatals, NGOs and, presumably, the yet-to-emerge cadre of private sector extension employees, is the low educational levels of the majority of extension field staff and managers. The rising demands associated with new extension methodologies, and the need to coordinate activities of numerous partner organizations, require field agents and their supervisors to increasingly act as process facilitators, learner-driven adult educators, multi-actor networkers, as well as to assume more prominent roles in up-stream technology development and adaptation efforts.^[44] The skill requirements demanded by these activities lay well beyond the educational preparedness of the vast majority of field agents. The one-off, in-service training 'workshops' on 'new' extension methodologies that became one of the cottage industries of the development enterprise in the 1990s were simply not sufficient to overcome the more basic

lack of a sound educational background. Furthermore, and perhaps most troubling of all, an assessment of available educational programs within the sub-region that are capable of meeting the professional demands of the new extension realities would likely come up with only one or two notable candidates,^[45] a sobering reminder of the massive failure on the part of donors in taking seriously the need for long-term, institution-building investments within the sub-region.^[46] The important exceptions of the tertiary education program for mid-career extension agents at the University of Cape Coast, Ghana,^[47] and the launching of similar programs in Mali and Burkina Faso, deserve to be closely studied by other countries and donors. In general, however, the level of dis-connect between the existing education-research-extension programs, and the inability of most countries to offer adequate training opportunities for their own scientific and extension professionals, underlies the question of how countries in West Africa will rise to the challenge of driving an autonomous economic development agenda.

One of the perennial 'thorns' in the side of nearly every extension program is the limited base of innovation and struggle to find relevant new technologies. One of the persistent complaints levied against national extension programs over the past 25 years has been over their dogged promotion of the same, tired, old technical messages. Where NGOs have shown their superiority has often been through their linkages to, or mobilization of, alternative sources of technical information. Although not a direct relationship, the growing plurality of organizations involved in technology diffusion has tended to result in a growing (though still limited) plurality of technology sources. While on the surface this would seem a positive trend, the divided, often highly antagonistic, nature of GO-NGO relations has meant that these two levels of diversification – innovation source, and vehicle of dissemination – have tended to assume and retain stronger lines of vertical integration rather than evolving into true horizontal networks of exchanges. Governmental extension programs tend to get most, if not all, of their 'technology choices' from governmental research programs, while bi-lateral and multilateral funded-projects, as well as large, northern-based NGOs, tend to utilize and promote their own technical innovations (the common pattern for smaller NGOs is to serve as the implementation vehicles of donor-specified activities, which typically come with their own technical assistance components). Only in those cases where some degree of true inter-organizational collaboration has been established (typically in the context of a specific funding initiative) has there been a real broadening in the pool of innovation sources available to all participating diffusion organizations. The socio-political climate for these types of inter-organizational collaboration varies markedly from country to country, and often from program manager to program manager.

In addition to the struggle to find current, new information, one of the sad truths of agricultural research and technology development is that, outside of the established gene banks, there are often no national, let alone

sub-regional or regional, repositories of accumulated wisdom where farmers, extension services, NGOs or others can access a comprehensive range of technological options. Plagued by staff turnover and major policy shifts, individual research organizations tend to operate within their own limited sphere of current activities, which represent neither the breadth nor historical depth of developments within their own organizations and countries, let alone the larger regional and global environment. Over the past several decades, African universities have generally been side-line spectators to the research process, and are only recently beginning to receive the attention they deserve in increasing their involvement in research activities.^[18] Set against the backdrop of the long time delays in technology development (few breeding programs, for example, have had anything significant to offer in less than a decade), and the truly difficult nature of problems facing research organizations, any potential loss in opportunities due to the inhibited movement of existing technologies, or the development of new, should be a major area of concern. The bottom line is that without access to the full range of existing, and the addition of new and responsive, technical alternatives, any diffusion program – public, private or non-profit – will have little to offer their audiences.

Alternative approaches to extension financing, intermingled with the related topics of operational structure, need for increased market orientation, investment in human resource development etc., have been a lightning rod of debate in recent years among donors and development scholars focusing on extension issues and, more importantly, governmental extension programs.^[19] To illustrate the point, the four neighboring countries of Côte d'Ivoire, Ghana, Guinea and Mali have all abandoned their previous T&V-based approaches to extension programming, and are all now pursuing self-described participatory approaches to extension through various mechanisms: Côte d'Ivoire (before the outbreak of violence) through a system of contractual arrangements between line-Ministries and the national extension service for the delivery of specific extension programs; Ghana through its program of national decentralization, which allows for additional district level buy-in to extension programming options (currently focused on expanding the Farmer Field School program); Mali through the increased privatization of services, including experimentation with a limited user-pay program, offered through the traditional regional and commodity-oriented quasi-governmental organizations; and Guinea through the continuation of a fairly traditional, centrally-financed and managed mainline national extension service. Although currently most of these programs receive significant levels of direct and in-direct donor support, financing is intended to devolve entirely to state resources in the future.

The need to fit alternative models of extension financing to unique national policy orientations, levels of market integration of specific target groups and production systems, and other significant historical, institutional and current contextualizing factors, suggest that no one

model will emerge for widespread adaptation (in fact, the extensive history of failed efforts to blindly promote blanket solutions, irrespective of context, would argue strongly against such a notion). The current experiments being carried within the sub-region, as well as those from elsewhere on the continent and beyond, will need to be closely monitored for the lessons they provide in terms of identifying which country-level conditions provide the best guidance in matching various financing mechanisms.

3 Major approaches and lessons learned

Due to their underlying differences (dissemination within, as opposed to transfer across geographic and organizational contexts), it is easiest to address issues related to dissemination and technology transfer separately, although in operational terms most organizations are involved in both types of activities.

3.1 Dissemination

The widespread diffusion of the language and practice of participatory development has been one of the major changes to extension practice occurring worldwide over the past 20 years. Within the sub-region, most of this growth in popularity has occurred in the form of a diffuse body of non-unified 'participatory' techniques and discrete methodologies, although at least one major operational approach, Farmer Field Schools, is gaining significant exposure. Data from a nine-country survey of 216 NGOs^[20] involved in agricultural and NRM technology diffusion in West Africa indicates that some of the most important examples of participatory methodologies include:

- ⇒ -Rapid Rural Appraisal/Participatory Rural Appraisal (RRA/PRA). Introduced through short-term, in-service training or standalone workshops starting in the late 1980s, these approaches have become the 'bread-and-butter' tools of most NGO field activities, and it can be safely said that at least an awareness of their general form is now well established within the major dissemination organizations across the sub-region.^[21] The widespread awareness of RRA/PRA practices, however, does not mean that the level of quality, or even observance of the basic principles, is always high;
- ⇒ -Participatory Varietal Selection (PVS). An approach initially targeted at assisting breeders in understanding farmer preference, PVS has since increasingly been used by extension programs to identify and disseminate locally desired varieties. WARDA spear-headed the promotion of PVS application through a multi-year annual training and small grants program, which trained a small core of rice breeders and social scientist researchers in every NARS across the sub-region. Use of the approach has since spread to use with other crops and, through joint field activities, exposure through 'field days'-type demonstrations and various publications, to extension programs;

- ⇒ -Community-Based Seed Systems (CBSS). As a refinement of NGO and FAO decentralized seed multiplication programs of the late 1980s and early 1990s, the CBSS model involves individual farmers and farmer groups in the commercial multiplication and sale of new crop varieties, cutting up to 5 years off the time it takes new varieties to reach farmers. National-level programs have been established in Guinea and pre-war Côte d'Ivoire, with other countries considering implementation plans. A wide number of NGOs are using the same or similar approaches in most countries in the sub-region;
- ⇒ -Community-Based Natural Resource Management (CBNRM). Introduced through a broad range of efforts (e.g. FAO, NGOs and bi-lateral assistance), early CBNRM practice was most closely associated with forest management issues, based on a number of well-researched case studies and a period of popularity in establishing community woodlots in the early 1990s. Since then, the CBNRM approach has been successfully used within the sub-region in addressing a broader range of issues including: soil fertility, grazing lands, water resources, fisheries and wildlife;
- ⇒ -Rural Radio. Although not identified in the survey, the rapid growth in the number and diversity of information technologies in recent years (including radio broadcasting, satellite and land-line internet connectivity) has stimulated interest in using various mediums to accelerate the dissemination of information on new technologies to rural areas. Efforts have been spearheaded by ISNAR, FAO and CIDA, with active programs in several countries within the sub-region, notably Burkina Faso, Ghana and Mali.^[22]

In contrast to these tools and individual techniques used by different governmental and NGO extension programs, the introduction and spread of the Farmer Field School approach within the sub-region is unique, in that it constitutes a broader, more comprehensive strategy to extension practice itself. Introduced to West Africa from S.E. Asia in the mid-1990s, through assistance of the FAO Global IPM Facility, significant FFS programs have begun to develop in at least four countries (Ghana, Mali, Burkina Faso and Senegal), covering a range of production systems, from irrigated rice to rainfed cereals, cotton, plantains and vegetables. Involving the use of the principles and practice of adult education, farmer-led experimentation, farmer-to-farmer communication and local organizational development, the FFS model has embraced many of the core features of participatory development and local empowerment. Although not without problems, the potentials offered by the FFS approach appear substantial, and are only now being explored.^[23]

The cumulative lessons learned from these experiences are several. First, and perhaps most surprising, is the observation that given the opportunity and support, governmental extension agencies are every bit as capa-

ble of being leaders in the development, refinement and implementation of innovative new approaches to technology dissemination as NGOs (e.g., PVS, CBSS, FFS). Secondly, due to their size and established presence at the field-level, the involvement of national structures and larger NGOs have been critical in scaling-up the implementation of new practices. It is important to note, however, that the success of broad-based implementation is closely tied to the successful testing of new approaches in pilot projects and adaptation to local conditions. Where this rule is not observed, the risk of larger scale failures increases exponentially. While programmatic size is important for significant impacts, so is the intelligent phasing of implementation. Third, each of the methodologies highlighted (save RRA/PRA, which, as noted, often suffers from quality concerns in field-level application) are supported by significant capacity-building programs – for example, FFS field training takes place over an entire cropping cycle, and the introduction of PVS methodologies was accomplished through a multi-year training and support program. In the case of Ghana's successful FFS program, there are also important ties to a parallel program of providing extension agents with tertiary university education^[24] that deserve greater attention on the part of donors.

3.2 Technology transfer (TT)

As defined previously, TT is used here to describe the movement of knowledge or technologies across contexts – inter-regional, intra-regional or organizational. Despite the deserved criticism that ill-conceived TT efforts have received in the past, it is important to note that, other than instances where technologies have been developed within a single context, all other innovations that have been broadly adopted by farmers within the sub-region involve some form of TT. Used intelligently, TT represents the greatest mechanism to stimulate and sustain rapid agricultural development within the region. This includes the transfer of farmers' indigenous knowledge and perceptions into the region's institutions of research and dissemination, which over the past 15-20 years has proven to be one of the most important sources of technical innovations, particularly in the area of natural resource management.^[25] Two of the most important TT linkages between formal agricultural research and diffusion efforts are:

-CGIAR Centers. WARDA and IITA, which are based in the sub-region, and ICRAF, which also has a presence in the sub-region, have technology transfer specialists on staff, and operate a number of dedicated TT projects (the other CG centers working in the region, ICRISAT and ILRI, apparently do not have TT staff). The importance of having staff dedicated to completing the additional steps of transforming research results into usable technologies and making these available to dissemination agencies cannot be over emphasized. In addition, both WARDA and IITA facilitate regional and sub-regional networks that serve to assist and partner with national and NGO technology dissemination programs (e.g., ROCARIZ, and WECAMAN). These networks have been highly successful in supporting the transfer of genetic material by keep-

ing different member groups actively involved in regionally coordinated activities.^[26] In response to the unique opportunity of the once-in-a-generation technical breakthrough, such as presented by the NERICA rice varieties, WARDA, supported by multiple donors, has launched a special standalone effort, the Africa Rice Initiative, to help rapidly move these varieties throughout the region;

-Larger NGOs and Projects. Through their home office technical staff, and hired program officers, the larger NGOs and donor-funded projects essentially constitute separate (independent) technology transfer systems, with the ability to extrapolate experiences and cross-fertilize successes from different project sites and countries. In a number of instances, these organizations and projects have proven to be important contributors in the introduction and movement of new technologies across the sub-region. CARE's work in refining the indigenous practice of using rock lines to control soil erosion and promote greater moisture infiltration in Burkina Faso, and its subsequent spread to neighboring countries, is one of many such examples.

In contrast, the record of the private sector's contributions to significant agricultural developments in the sub-region is rather thin. On the one hand, private companies are without doubt the most important providers of basic input materials (e.g. tillage equipment, fertilizers, pesticides, veterinary supplies and formulated animal supplements). However, many of these inputs have not changed appreciably in decades. In those areas where private companies have attempted to become commercially involved in introducing innovations, the record is uneven. The few private seed companies found in the sub-region have found gaining market share difficult, due largely to the characteristics of the major crops (non-hybridized) and the diffuse, often-poor, potential client populations. Foreign agro-chemical companies are increasingly fighting battles on many fronts as they collide headlong with governmental and NGO efforts to safeguard farmers' health, increase profits and reduce environmental damage. In other cases, targeted assistance that involves partnership between public agencies, private entrepreneurs and other actors has helped commercial businesses to become successful purveyors of new technologies, such as in the case of local equipment manufacturers producing rice thresher-cleaners and selling and repairing imported treadle pumps.

There are several lessons that can be drawn from these examples. First, recent developments by regionally-based CGIAR centers have achieved a certain amount of success in helping to bridge the nether world area between research and extension. Increasing the number of dedicated TT staff positions, effective networking structures, and the initiation of highly-targeted technology promotion initiatives (e.g., Africa Rice Initiative – ARI)^[27] are all promising areas of future investment. Second, the larger NGOs and project-based initiatives constitute additional, and potentially rich, sources of technological innovation and adaptation. However, due

to their independent status, different approaches will need to be employed to gain access to and integrate with their considerable resources. Third, for the foreseeable future, placing greater reliance on the private sector and market forces to drive the process of technology innovation, transfer and dissemination would probably significantly slow, rather than accelerate, agricultural development within the sub-region, and would likely undesirably skew the type of innovations offered, as well as the access to new technologies based on economic and geographic considerations. More than a decade has passed since the first serious announcements about the coming biotech revolution were issued, and still no major improvements have been delivered. While greater private sector involvement can be achieved, special emphasis will likely need to be placed on establishing the appropriate context and helping fledgling businesses to pick up new technologies and expand their technology dissemination roles.

4 General recommendations

Based upon the preceding discussions of major issues, current approaches and lessons learned, several general recommendations can be made for enhancing the identification and movement of technological innovations within the sub-region. These include:

Taking an aggressive stance on filling key knowledge gaps, the results of which would feed into immediate and longer-term investment planning decisions. Gaps of particular concern include: (i) gaining a regional understanding of NGOs and private sector technology providers' activities, capacities, sources of innovation and the best ways of gaining access and mobilizing their resources; (ii) the current status and capacities of the region's agricultural universities to train the next generation of agricultural professionals, particularly in the areas of extension education, commodity research and agricultural business training and support; and (iii) support to establishing national and sub-regional repositories of accumulated research results (the AGORA – Access to Global Online Research in Agriculture – and TEEAL – The Essential Electronic Agricultural Library – offer excellent access to research results published in international journals. Unfortunately, few results from NARS programs are contained in these journals);

Assessing different options for new ways of meeting the critical need for improved access to innovations (e.g., university-managed technology outreach centers, along the lines of the USAID-supported PEARL – Partnership to Enhance Agriculture in Rwanda through Linkages – project, ATTRA-type^[28] information hubs, and increased use of rural radio opportunities); assessing ways of assisting general and targeted efforts to accelerate technology diffusion and transfer (regional 'dare to share' technology fairs; success story study tours and exchange visits; support for ARI-type initiatives to rapidly expand access to technologies with immediate and exceptional promise);

Discussing with IARC and NARS partners ways of improving regional TT and dissemination capacities through strengthening the existing sub-regional commodity networks, sub-regional research coordination bodies (e.g., CORAF/WECARD) and the regionally-based CG centers (e.g., funding additional TT positions, providing additional operational funds to selected TT networks). The major importance of improving regional access to new genetic material warrants specific attention. Issues to consider include ways of unifying and streamlining varietal release systems, the comparative advantages and requirements of alternative dissemination approaches, ways of supporting the development of private sector seed companies, gene bank security, and regional preparedness for post conflict/disaster response measures, among others.

One of the tendencies in academic and home office assessments of technology generation, transfer and diffusion is to overlook, or at best greatly under-value, the human dimensions of agricultural development. A serious review of successes and failure within the development arena would likely show that significant development success were almost universally achieved in spite of deeply flawed project or program designs, inadequate funding and material support, and in the face of major knowledge gaps. Successes are achieved because people made good decisions at the right moments, and persevered in the face of often extreme adversity. Such a conclusion is difficult for most organizations to absorb because it marks a distinct departure from traditional command and control, and process-outcome, development orientations whose major emphasis is on the blueprint and the use of specific tools. Too often we forget that it is people that interpret and implement plans, that must respond to and function within contexts, and utilize, skillfully or not, the many development tools. Yet what portion of resources is spent in attracting, educating, supporting and retaining talented individuals? The future of agricultural development impact will reflect how well organizations address and engage this critical human element.

Bio: Dr. Simpson is an agricultural and rural development specialist with over 20 years experience in West and Central Africa. His research and development interests focus broadly on the dynamics and impacts of change in agricultural and natural resource management systems and the development of supportive local and national institutions. He has served as a Lecturer and Convener of the Rural Policy and Project Planning Program at the Institute for Social Studies, The Hague, Program Leader for Technology Transfer and Systems Development with the West Africa Rice Development Association (WARDA), Bouaké, Côte d'Ivoire, and as a consultant for the CGIAR, FAO, USAID, and others. Currently he is helping develop international programs in natural resource management at Michigan State University.

References and notes

1. Material for this paper is taken from "Technology Transfer and Dissemination: A contribution to the West Africa Regional Program Action Plan for the Initiative to End Hunger in Africa" prepared by the author for the United States Agency for International Development, Africa Bureau, Office of Sustainable Development. The full paper is available through: <http://www.abtassociates.com/Page.cfm?PageID=1000>
2. A complete description of the T&V model can be found in Benor, D. and M. Baxter (1984) *Training and Visit Extension*, The World Bank, Washington, D.C.
3. Although an implicit assumption surrounds what is meant by NGO, in reality there is little agreement; many organizational types are found, and no agreed upon typology has yet been established, e.g., White, R. and C.K. Eicher (1999) "NGO's and the African Farmer: A skeptical perspective," Department of Agricultural Economics Staff Paper 99-01, Michigan State University, East Lansing, 40 pp.; Uphoff, N. (1996) "Why NGOs are not a Third Sector: A sectoral analysis with some thoughts on accountability, sustainability and evaluation," in M. Edwards and D. Hulme (eds), *Beyond the Magic Bullet: NGO performance and accountability in the Post-Cold war world*, Kumarian Press, West Hartford, pp. 23-39.
4. Eicher and White (1999) report that: 34% of USAID's budget went to NGOs in 1994 and was expected to increase significantly; the World Bank's funding of NGOs rose from 6% in 1988 to 53% in 1994; and DFID channeling of resources through NGOs increased 400% between 1984 and 1994 (source: Overseas Development Institute (ODI)(1995) "NGOs and Official Donors." ODI Briefing Paper 4/95, 1-6, ODI, London.
5. Although often used interchangeably, the terms 'technology transfer' and 'dissemination' are used here, respectively, as they apply to the movement of a technology, management practice or methodology across contexts (inter-regional, inter-national, and inter-organizational), and the subsequent diffusion of a new practice among potential end-users. The adoption (or non-adoption) of a new technology is viewed as a related but separate event, resulting from the internal benefit-cost assessment made by individual enterprise managers once a new alternative is made available.
6. Personal communication from the *Comité de Coordination des Actions des ONG au Mali* (CCA-ONG), Bamako, Mali.

7. Bingen, R.J., B.M. Simpson and A. Berthé (1993) "Analysis of Service Delivery Systems to Farmers and Village Associations in the Zone of the *Office de la Haute Vallée du Niger*, Mali," Department of Resource Development Occasional Report, Michigan State University, East Lansing.
8. WARDA (2001) "NERICA: Rice for life," West Africa Rice Development Association, Bouaké, 8 pp.
9. A recent survey of 216 major NGOs working in agricultural and natural resources management in the nine CILSS-member countries found on average 12, with a median of 6, staff members working on technical issues (Kulibaba, N., Simpson, B. and D. Beaver (2002) "Inventory of Associations and Non-Governmental Organizations Involved in Agricultural Technology Transfer and Natural Resources Management in the Sahel/West Africa," a survey conducted for the USAID West Africa Regional Program, Abt Associates Inc., Bethesda, and Michigan State University, East Lansing).
10. Bingen, R.J. and E. Dembèlé (n.d.) "The Business of Extension Reform: Cotton in Mali," unpublished paper, 6 pp.
11. Eicher, C.K. (2001) "Africa's Unfinished Business: Building sustainable agricultural research systems," Department of Agricultural Economics Staff Paper 2001-10, Michigan State University, East Lansing, 44 pp.
12. A review of development history, however, will show that many of these themes have played central roles in earlier strategies of development interventions.
13. White and Eicher (1999).
14. Neuchâtel Group (1999) "Common Framework on Agricultural Extension," 20 pp.
15. Association for the Development of Education in Africa (ADEA)(2000) "What Works and What's New in Education: Africa Speaks!" Proceedings of the ADEA Biennial Meeting, Johannesburg, South Africa, 5-9, December 1999, 111 pp.; Zinnah, M.M., R.E. Steele and D.M. Mattocks (1998) "From Margin to Mainstream: Revitalization of agricultural extension curricula in universities and colleges in sub-Saharan Africa," in *Training for Agriculture and Rural Development 1997-98*, Food and Agriculture Organization of the United Nations, Rome, pp.16-28.
16. Board for International Food and Agricultural Development (BIFAD)(2003) "Renewing USAID Investment in Global Long-Term Training and Capacity-Building in Agriculture and Rural Development," BIFAD, Washington, D.C., 36 pp.
17. Zinnah, M.M. and D. Naibakelao (1999) "Bringing African Universities into Development: The SAFE program at the University of Cape Coast," in *Partnership for Rural Development in sub-Saharan Africa*, CASIN/SAA/Global 2000, pp.65-75.
18. Michelsen, H., L. Zuidema, C. Hoste and D. Shaprio (2003) "Improving Agricultural Research at Universities in Sub-Saharan Africa: A study guide," ISNAR Research Management Guidelines No.6, International Service for National Agricultural Research, The Hague, 116 pp.
19. Chapman, R. and R. Tripp (2003) "Changing Incentives for Agricultural Extension—A Review of Privatized Extension in Practice," ODI Agricultural Research and Extension Network Paper No. 132, Overseas Development Institute, London, 13 pp.; Rivera, W.M., W. Zijp and G. Alex (2000) "Contracting for Extension: Review of emerging practices," AKIS Good Practice Note, Agricultural Knowledge Information Systems (AKIS) Thematic Group, The World Bank, Washington, D.C., 22 pp.
20. Kulibaba, et al. (2002).
21. In general there appears to be a lower level of awareness and use of sustainable livelihood approaches in West versus East Africa.
22. Hambly, H. and A. Kassam (2002) "Listening to Stakeholders: Agricultural research and rural radio linkages," ISNAR Briefing Paper No.48, ISNAR, The Hague, 6 pp.
23. Simpson, B.M. and M. Owens (2002) "Farmer Field Schools and the Future of Agricultural Extension in Africa," *Journal of International Agricultural and Extension Education* Vol.9,2, 29-36.
24. Zinnah and Naibakelao (1999).
25. e.g., Simpson, B.M. (1999) *The Roots of Change: Human behaviour and agricultural evolution in Mali*, IT Studies in Indigenous Knowledge and Development, Intermediate Technology Publications, London.
26. Clarke, S., B. Simpson and A. Beye (2004) "Evaluation of the USAID-Funded Collaborative Agricultural Research Networks in West and Central Africa," a review conducted for the USAID West Africa Regional Program, Associates in Rural Development Inc., Burlington, 126 pgs.
27. The Africa Rice Initiative is a WARDA-led initiative for the rapid and broad-based diffusion of NERICA varieties throughout Africa, with funding from the Rockefeller Foundation, African Development Bank, the Government of Japan and UNDP (<http://www.warda.cgiar.org/ARI/index.htm>).