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RESEARCH AND EXTENSION PROCESSES AND PRACTICES IN RELATION TO SMALLHOLDER AGRICULTURE IN AFRICA: PRESENT, PAST TO PRESENT

T. Ngomane[1]

> *"Africa remains the only region of the developing world where per capita agricultural production has fallen over the past forty years…Therefore; governments must elevate funding for agricultural research and extension. Furthermore, it is important that farmers' innovations be mainstreamed into the research agenda."*

(Pretoria statement on the Future of African Agriculture, December 1 -3, 2003)

Correspondence author: Dr T. Ngomane, Senior Lecturer, Department of Agricultural Economics, Extension and Rural Development/Associate Director, Postgraduate School of Agriculture and Rural Development, 328 Information Technology Building, University of Pretoria, Pretoria 0002, e-mail: tsakani.ngomane@up.ac.za.

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ABSTRACT

Agriculture constitutes the backbone of most economies in developing countries, especially in Africa. However, benefits in the sector mostly accrue to industry and to the large-scale commercial farmers. The "transfer of technology" (ToT) paradigms introduced during the colonial era, failed to provide research and technology outputs that meet smallholder farmers' needs. In various review reports and regional consultation meetings stakeholders identified extension-research as the weakest link to wealth creation and as the primary contributor to the widening gap between resource-endowed and resource-poor farmers. Resources in this context refer to access to physical production assets, financial and skill-based support, as well as trade

[1] *Senior Lecturer, Department of Agricultural Economics, Extension & Rural Development / Associate Director -- Postgraduate School of Agriculture & Rural Development, 328 Information Technology Building, University of Pretoria, Pretoria 0002, e-mail: tsakani.ngomane@up.ac.za.*

networks for participation in local, regional and global markets. In this regard, smallholder resource-poor farmers, as opposed to large-scale resource-endowed farmers, have limited access to these resources in most parts of the African continent. In addition, successful smallholder farmer innovations, technologies and dissemination approaches are not well publicized.

Using the development perspective, this paper summarizes 1) the problems of technology development and transfer as perceived by the resource-poor farmers 2) the evolution of Transfer of Technology and the implication for extension services in developing countries, 3) the impact of two development approaches on extension, 4) the importance of research and extension linkages in fostering change, and 3) Farmer Field Schools as an alternative extension paradigms. Recommendations to promote pro-poor extension and technology development strategies are discussed.

1. INTRODUCTION

1.1 Setting the scene

At the 2003 World Bank regional consultations assessing the role of agricultural science and technology in improving rural livelihoods, stakeholders agreed that participatory research is the key to successful agricultural development and that there needs to be closer connections between the National Agricultural Research Systems (NARs) institutions, the private sector, and the universities (World Bank, 2003c). The smallholder farmers represented expressed great concern about their inability to access and utilize technologies. These farmers identified problems related to access to include 1) the collapse of formal transfer structures, which has resulted in ad hoc extension services and no feedback mechanism; 2) poorly designed technology transfer campaigns which do not attract a critical mass of adopters; 3) high cost of science and technology applications; 3) low disposable incomes; and 5) inadequate support institutions. They also identified areas of concern in utilizing science and technology, including low literacy levels and "incomprehensible" technical language used in innovation and research products; sub-standard and expensive inputs; inappropriate policies, and gender insensitivity (World Bank, 2003a & b).

In explaining the adoption problem, or lack thereof, farmers stated that the problem does not wholly lie in dysfunctional extension systems or in the poverty of the people in the region. In their view, this problem results from the lack of markets where farmers can sell the produce they

get from using the new technologies. The farmers find problems disposing of their bumper produce. The losses they thus incur discourage further adoption. Hence, many technologies are lying around unexploited. Farmers are also unable to adopt them because of resource constraints (ibid).

Farmers also noted the disparities in technological development within the region. For example, in South Africa and Kenya, productivity is high due to advanced technological development whereas in other countries the majority of farmers still rely on subsistence technologies. They called for innovative mechanisms to transfer new and proven technologies (e.g., the control of the cassava mealy bug) within the region, for new strategies to promote better uptake of successful initiatives and to promote good examples. Farmers' felt that greater efforts should be made to publicize successful case studies in order to overcome skepticism and to ensure that the lessons from past efforts have been learned (World Bank, 2003c).

1.2 The problem

That agriculture is the key sector for achieving the dream of economic advancement and poverty alleviation in Africa, there is no controversy. The sector provides 60% of all employment in the African continent and constitutes the backbone of most economies (Eicher, 2003). However, recent studies of world poverty single out the same continent as the region of the world in which the numbers of people malnourished and living in poverty have risen most rapidly in recent decades (World Bank Report, 2000). Gabre-Madhin and Haggblade (2003) contends that despite a historical record of scattered successes in various parts of the region, the image of Africa as "*the hopeless continent*" continues to prevail. Specifically, technology transfer or dissemination has been identified as the weakest link in most National Agricultural Research Systems. These weaknesses in technology transfer goes beyond the traditional innovative research generation and distillation through extension to include institutional issues related to farmer client linkages. In fact, the reviews of both the World Bank and USAID experience in research have all identified research-extension-farmer linkages as a limitation on realizing the benefits of research (World Bank, 2003a, b, c; and USAID, 2003). Although agricultural technologies have and continue to derive great benefits for the private sector, *public sector*

research and technology transfer institutions have in the past failed to provide the research outputs and technologies that meet user or client needs. Thus research-extension-farmer linkages remain a critical area of concern to the smallholder clientele in many developing countries. In theory, the dividing line between research technology and extension blurs in the stages of adaptive research, verification and distillation to the clients. As agriculture becomes more knowledge-intensive, these linkages will be even more critical, demanding targeted and user-driven "value for money" research and technology development, which is inclusive of multiple actors.

1.3 Cause for hope

As we explore the latest thinking on the process of facilitating innovation and change in the sector, we need to keep in mind that technology transfer is, nowadays, realized through other mechanisms. Of equal importance, is the need to sharpen the public's image of successful African experiences in technology development and dissemination, especially as they concern regional and country initiatives. Processes aimed at unmasking the hidden successes of African agriculture are now beginning to take shape. The World Bank initiative (supported by four UN agencies) to conduct an international assessment on the impact of agricultural science and technology on rural livelihoods and the political pledge of the New Partnership for Africa's Development (NEPAD) to mobilize increased support for African agriculture, are two examples. Insightful reports on successes in African agriculture are now surfacing (see InWent, IFPRI, NEPAD, CTA conference, 2003). This paper draws heavily from these lessons.

2. THE COLONIAL CONTEXT: THE LOGIC BEHIND THE INSTITUTIONAL FRAMEWORKS

2.1 The 1950s

For many decades now, Africa has been relentless in her pursuit for economic liberation. In the 1950s, the role of industry and agriculture in development and the type of agricultural structures were two hotly debated issues and efforts to find the appropriate agricultural strategy to merge the two dominated African politics. To this effect, colonial development models were developed and implemented at the expense

of significant economic and human capital gains for the region - exporting the economic surplus and staffing agricultural research with expatriates (Beintema, Pardey, & Roseboom, 1998). However, others note some benefits that accrued from the colonial era. The French and British colonialists set up institutional development innovations along regional lines, thereby contributing to the development of what de Wilde refers to as,"mini-green revolutions" in francophone Africa (Eicher, 2003). Eicher (2003) notes that "Colonialists generated some important and often overlooked institutional innovations in organizing rural space and dealing with the immensity of Africa, especially when one realizes that sub-Saharan African is seven times larger than India" (Eicher, 2003:3). He goes on to say "Colonial planners bet on regionalism as the organizational model for agriculture research to meet the needs of the large number of small colonies". Thus it was that regional research stations came into being as primary sites for new *technology generation and transfer* to satellite colonies, to be adapted to local conditions by small teams of researchers.

Following the regional research stations was the establishment of global commodity networks and regional research centers to encourage research spillovers. Similarly, schools of agriculture were also set up along regional lines. Regionalization in agricultural research was established to address the problem of poor connectivity between research and extension. This issue, which we are continuing to address today, has been with the sector for many decades.

2.2 The 1960s and 1970s

The 1960s witnessed a shift in development thinking as more African States gained independence. Neither the developed nor the newly independent countries in Africa viewed agriculture as an important contributor to economic growth. The prevailing belief was to nationalize the colonial regional research stations and training institutions and to prepare state-led industrialization plans to transform agrarian dominated societies into "modern" industrial nations. Many new nations had at that time 80-90% of their population in agriculture. The bottom-up approaches to rural development became the norm - from community development to sustainable livelihood to community-driven development projects. Resources such as foreign aid were channeled toward economic growth rather than poverty alleviation.

Unfortunately, the poverty debate continues to dominate the development rhetoric in Africa today (Radelet, 2003). By the 1970s Africa had become aid-dependent with many of her regional research institutes nationalized. Of course, with foreign aid came foreign economic advisors, extension agents and researchers (ibid). Some copycat projects such as the Ujamaa villages in Tanzania, which has been modeled after the Chinese Commune system, mushroomed. These change models failed for a few reasons. Firstly, nationalizing research institutes helped undermine Africa's comparative advantage in agricultural exports and sped up the transition from trade to aid dependence with smallholder farmers the hardest hit (Eicher, 2003). Secondly, with such an influx of foreign experts, no local ownership of the change process occurred.

2.3 Recent developments

Recent developments in the sector have witnessed the resurgence of regional research institutions and regional networks namely Southern African Centre for Cooperation in Agricultural and Natural Resources Research and Training (SACCAR), Conference of the African and French Leaders of Agricultural Institutes/West and Central African Council of Agricultural Research and Development (CORAF/WECARD) and the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) as a cost effective and efficient mode of technology transfer in small countries (see Gabre-Madhin & Haggblade, 2003). According to the same authors, this new trend has been inspired by some successful and efficient regional coordinated research. For instance, Maredia, Byerlee and Pee (2000) found that, to be responsive to local farmer clients, developing countries with a small area of wheat under cultivation should de-emphasize wheat breeding and concentrate on importing wheat varieties from CIMMYT (an established seed breeding institutions) and test these under local conditions. ASARECA is currently sponsoring several regional research networks covering Central and Eastern Africa (World Bank Report, 2003).

3. THE COLONIAL CONTEXT: IMPLICATIONS FOR EXTENSION

The first dominant era in extension that reflected the impact of colonization in Africa covered the time frame from 1955-1970 and dealt with developing national agriculture extension systems (USAID, 1998). Following World War II, the belief was that existing western technology could substantially increase agricultural production (ibid). According to the same source, teaching farmers how to use modern tools and technologies was the main component of this strategy. One of the models commonly used for transferring technology was the United States land grant university system (Thompson, 2002; USAID, 1998).

From the early 1950s into the 1960s, development institutions in Western countries played a prominent role in helping create extension systems in many developing African countries (Thompson, 2002). Often the extension programs were integrated into community development programs of the specific country (USAID, 1998). At that time, agriculture practices were significantly influenced by donor agent activities, but many of the agriculture improvements introduced was never adopted (Binswangner, 1998 and World Bank, 2003c). This limited adoption was often due to other constraints to change wherein complementary inputs such as fertilizer, credit, storage, marketing, and processing were unavailable (ibid). In addition, many host governments did not have policies that created a favorable economic environment for agriculture, reducing the profitability of farming and decreasing the incentives for technological innovation and agricultural growth (ibid). Many of the extension activities relied on expatriate technicians who were highly trained, well equipped, and in a high ratio to farmers (Thompson, 2002 and USAID, 1998). According to Thompson (2002), this level of technical service was well beyond the financial and human resource capabilities of most governments, and thus, impossible to maintain. Thompson goes on to say that by the late 1960s, few farmers were adopting improved technology and development agencies began to question their strategy of extension-oriented agricultural development. Thus problems accrued: extension in most developing countries continued to be overly centralized; there was limited contact with farmers; there were inadequate linkages between researchers, private industry, universities, and other agriculture participants (USAID, 1998 and World Bank, 2003 a, b & c). Extension relied on

poorly trained and overworked extension agents and there was little technology of practical value to offer (Thompson, 2002).

These problems reflected an oversimplified view of U.S. extension that ignored the land grant system's participatory history and decentralized structure (USAID, 1998). When the U.S. model was partnered with weak research institutions, top-down planning, overly centralized bureaucracies, socio-cultural differences, inadequate inputs, and limited markets, it was no surprise that the "American extension model" failed most of the time in the developing world (ibid).

4. COMMON DEVELOPMENT APPROACHES USED

4.1 The basic needs and integrated rural development of the 1970s

Beginning in the 1970s development agencies moved to a more integrated agriculture extension approach. Specific project development approaches were promoted to assist smallholder farmers. The most common one was the Basic Needs and Integrated Rural Development (Lele, 1979). Integrated agriculture projects provided farmers with a coordinated range of inputs and services that included marketing, credit, transportation, fertilizer, seeds, etc. Furthermore, Integrated Rural Development (IRD) projects added health, education, and social welfare services intended to promote a broader process of social and community growth. These approaches were modeled after the success of the Green Revolution in Asia with high optimism for Africa (Rukuni, Blackie & Eicher, 1998). General extension agents and home economists were the appropriate service providers to disseminate requisite information to the farmers (ibid). The projects were based on the simple and often valid premise that multiple and interconnected social and economic barriers to development had to be simultaneously lowered for growth to occur. IRD projects sought to provide a range of complementary services through existing public bureaucracies, newly created quasi-public institutions, or private and voluntary organizations (Lele, 1979). Often an overreaching development authority was created to coordinate the diverse inputs. Implemented on a pilot basis, these projects involved sending a civil servant known as a "multi-purpose village worker" into a village to address a host of needs identified by members of the community. Based on the success of the pilot projects, the United States and the United Nations provided funds for

developing national community development (CD) programs. Although the CD movement faltered in the late 1950s in Asia, the World Bank and USAID replicated IRD projects in Africa from 1976-1988 (World Bank, 1988). These IRD projects were later reported to have had little to offer to a majority (70%) of the resource poor farmers in Malawi (Thompson, 2002 and World Bank, 1988).

The major failing of most IRD projects was their lack of a technologically sound basis for improving rural incomes. Even though services were improved, little sustainable progress could be achieved unless better farming technologies were available for adoption (McClelland, 1996). IRD projects failed to deliver an effective range of services due to a lack of coordination. Examples include extension agents visiting farmers, but with little useful information to offer. Improved seeds were made available but farmers had no fertilizer to grow them, new crops were harvested but farm-to-market roads did not exist. Long-term impacts of IRD projects were often minimal even with well-coordinated projects. According to Lele (1979) and Binswanger (1998), although some rural development projects were successful, they were often too skill-intensive to be replicated. Others found that some of the successful projects were too expensive to be replicated (Holtsberg, 1986 and Cohen, 1987). These projects were loaded with vehicles and experts that could not be replicated on a national or regional scale without a continuous infusion of foreign aid (Eicher, 2003). Most host governments lacked the resources to maintain project services. When a project's funding ended, the new organization and services simply disappeared. Overall, IRD projects failed to improve national extension institutions or provide a sustainable basis for broader technology transfer.

However, some IRD projects did improve agriculture production and incomes in certain regions. Lessons learned from these projects included:

- That the smallholder farmers would alter their agriculture practices when appropriate information and services were provided.

- That the poorest and most isolated farmers can be reached effectively through private and voluntary organizations.

- That the transmission of agriculture knowledge can occur through special geographically focused extension units (Cummings, 1989).

Cummings's findings above provides useful insights in that, whereas IRD failed to foster change at macro institutional levels, the approach made significant in-roads towards improving smallholder production practices at micro levels. The use of multiple actors, such as NGOs and related community based organizations, to provide extension support to isolated farmers still remains an area that needs to be promoted and incorporated in contemporary sector development strategies.

4.2 Moving towards broader agriculture development approaches in the 1980s

During the 1980s, there was a realization among development agencies that extension could no longer be a stand-alone strategy for agricultural improvement, but must be wrapped in a broader agriculture development strategy that included support for policy reform, agriculture research, private sector growth, and rural resource mobilization (USAID, 1998. This new direction was accelerated when the then USAID administrator Peter McPherson, who believed strongly in agriculture as a tool for economic development, outlined on worldwide media a new approach to agriculture extension (Thompson, 2002 and ibid). Included in the new strategy were the following issues:

- Strengthen public extension by linking research and extension, linking the private sector to public extension systems, applying a farming systems approach, direct farmer training, farmer-to-farmer exchanges, and developing human resources.

- Reach rural agriculture producers by using mass communications approaches such as radio broadcasts, advertising, social marketing, and print media.

- Stimulate private sector extension methods (ibid).

The potential contribution of stronger linkages developed from research to extension to farmers, private to public research/extension systems, and using more farmer inclusive approaches and local based communication strategies to agricultural development and extension

systems, remains immense. There are encouraging initiatives in the region to promote private public sector partnerships to support development in remote areas that could use extension as an opportune distillation vessel. These broad based approaches should have as a driving force the objective to advance the participation of the smallholder farming sector in the mainstream market economy via sound research-extension- farmer linkages.

5. IMPORTANCE OF RESEARCH-EXTENSION-FARMER LINKAGES

T.W. Schultz, Nobel Laureate in Economics, once stated that smallholder farmers can "turn sand into gold" if they have access to land, public and private agricultural services, favorable economic incentives, and access to markets (Eicker, 2003). One of the critical "ifs" is the presence of an effective and fiscally sustainable research-extension system. The primary objective of both research and extension should be to increase farm productivity and to enhance farm incomes (Cummings, 1989).

To achieve this objective in ways consistent with national priorities, the extension system must feed research workers information about the constraints farmers have experienced in adopting research recommendations and the research system must have the capacity and readiness to respond with problem-specific recommendations. Ideally, research should also seek to obtain direct feedback from the clients themselves, through field visits undertaken by research scientists in their geographic areas or work, preferably accompanied by extension workers. Farmers, especially smallholder resource-poor farmers, should also have the opportunity to present and to directly pose specific problems to both research and extension personnel in their own localities. Taking into account the physical, human and financial resources that such a consultative process would need, creative thinking would be required to bring on board multi-sector role-players (financing institutions, funding agencies, regional research organizations, public sector institutions, etc) for collaborative partnerships. These multicultural approaches can be implemented on pilot basis in planned phases following specific local development plans. Testing this approach would be but one step towards the

transformation of the traditional research development and extension system.

The traditional extension system has a long and distinguished history of non-formal education focused on enhancing the well being of individuals, families and communities (Warner, Hinricks, Schneyer, & Joyce, 1998). In most developing countries, such as South Africa, the system is not linked to research institutions or academic institutions. In countries such as the USA, where extension is directly linked to the research institutions (Land grant system), the research-extension base is unparalled in its strength. According to Shafer (1995), it is therefore not surprising, that in that country, extension has developed a strong track record in extending university-based knowledge to the agricultural industry, families and communities. In fact, it was from these roots that the common association of extension with such terms as "knowledge extended" or "knowledge applied" and "knowledge transferred" emerged each focusing the role of extension to that of identifying new research agendas and extending research knowledge (Simpson, 2001). Extension thus defined is consistent with what Roling (1995) noted that if someone asks any agricultural researcher how extension works, the likely response would be "extension transfers the findings of agricultural research to 'users'. Although the linkages to research in acknowledged, extension so perceived as "knowledge extended" or "knowledge applied" and "knowledge transferred" is limiting, especially in the context of developing countries where the typologies of needs for smallholder farmers vary.

The needs and nature of the smallholder "users" are not only diverse, but rather more complex and integrated within the broader society and economy. By assuming a linear, homogeneous approach to research/extension, the system downplays the porous boundaries that define the myriad nature of the socio-cultural, economic and political factors that shape our society. Both research and extension service providers must take on new roles as educators, as facilitators, and as builders of community coalitions using as a reference point proven successes of traditional knowledge, local institutional resources and political commitment. The importance of harnessing local knowledge in policy, in program design, and in implementation cannot be overemphasized, for inherent to such an orientation is an increased likelihood of bringing communities and researchers into a closer, more

meaningful and relevant partnership which will result in practical research for social change (Deshler & Merrill, 1995). Thus, use of new strategies in technology development and transfer such as participatory action research not only incorporates the collective knowledge of key role players, it increases the likelihood that research results will be applied by giving the community ownership over the research process and its results (FAO & World Bank, 2000 and Shafer, 1995).

6. ALTERNATIVE EXTENSION PARADIGM: FARMER FIELD SCHOOLS

Several new paradigms have been developed and implemented in developing countries (Simpson, 2001 and Moyo & Hagman, 2000). Most involve use of participatory methods and attempt to put the smallholder farmers first. Due to space limitations only one approach is described below, that is the Farmer Field Schools (FFS) approach in Asia. Of note, is the rationale for the author's decision to use Southeast Asia as an example to showcase the pros and cons of the Farmer Field Schools method. The decision has been largely informed by the documented literature, which attributes the origin of the approach to that region (Pontius, Dilts, & Bartlett, 2000). Hopefully, this attempt to trace the roots of the Farmer Field Schools approach and the lessons learned from its application in other regions of the world will help others minimize the cost of re-inventing the wheel. Reference is made to the application of the Farmer Field Schools approach in African countries.

6.1 The evolution and educational philosophy

Simpson (2001) and others (Pontius *et al* (2000) have highlighted the potential offered by the Farmer Field School approach. This interest is generated by the success of FFS among smallholding farmers in South and Southeast Asia. They describe FFS as a possible future approach that state agencies can use to mainstream extension practice and build concrete participatory practices into their programs. The FFS as described in this paper is drawn from the experiences of Pontius *et al* (2000), Rola, Quizon and Jamias, (2001) and Simpson (2001).

The Integrated Pest Management (IPM) FFS emerged out of a decade of experimentation in implementing participatory farmer training

activities in the Philippines beginning in the late 1970s (Simpson, 2001). Refinements in the Philippine program and a new major effort in Indonesia in the late 1980s led to the birth of the FFS movement (Pontius *et al*, 2000). The educational philosophy of the FFS rests on the foundations of adult non-formal education, and reflects the four elements of the 'experiential learning cycle' proposed by Kolb (1984): concrete experience; observation and reflection; generalization and abstract conceptualization; and then active experimentation. Operationally, the FFS are organized around a season-long series of weekly meetings focusing on biology, agronomic and management issues, where farmers conduct agro-ecosystem analysis, identify problems and then design, carry out and interpret field experiments using IPM vs. non-IPM comparisons. In addition, the FFS also include a significant focus on group and individual capacity building (Uphoff, 1986). The longer-term empowerment goals of FFS seek to enable graduates to continue to expand their knowledge and to help others learn and to organize activities within their communities to institutionalize IPM practices (Rola *et al*, 2001). During the 1990s, an estimated 2 million farmers were trained through the FFS in South and Southeast Asia (Pontius *et al*, 2000).

Simpson (2001) tells us that the IPM FFS approach was first introduced in Ghana, West Africa, through a season-long Training of Trainers (ToT). Since the initial ToT, the Ghana program has continued to expand, both geographically and into new crops (Simpson, 2001). Following the efforts in Ghana, a major FFS effort on irrigated rice was launched in Mali. As with the case of Ghana, there are national plans for an expansion of IPPM FFS activities into vegetable, cowpea and cotton production (ibid). At the same time that programs in Ghana and Mali were taking shape, similar efforts were launched in Kenya and Zimbabwe (ibid). To date the FAO has helped to start, or is currently working with pilot FFS programs in over a dozen countries from Senegal to South Africa. Several of these have moved beyond the pilot stage and are expanding their activities (Pontius *et al*, 2000).

6.2 The apparent strengths of FFS

The FFS approach, though not a panacea for reducing communication gap between research, extension and the clients, has shown that it is capable of being highly responsive to local needs over a wide range of

conditions and with a wide range of crops, and combines an effective blend of participatory and experiential learning activities (Uphoff, 1986; Simpson, 2001 and Pontius *et al*, 2000). The approach has also made significant strides in providing the opportunity for farmers to acquire an understanding of important 'systems' concepts and relationships (Thompson, 2002). FFS 'graduates' have proven to be willing and able to communicate viable, new IPPM technologies to others in their immediate localities and beyond, and in some cases have made significant contributions to local social development (Rola *et al*, 2001). After decades of stagnation, one of the most uplifting findings is that of the capacity of the FFS experience to bring a sense of real vitality into the interactions between extension agents and farmers (Simpson, 2001).

6.3 The systemic weakness of the approach

Nonetheless, systemic challenges to the FFS approach exist. Simpson (2001) identified them as follows:

- The focus and relevancy of the FFS is not necessarily any greater than a more traditional delivery oriented program.

- The lack of core 'systems' concepts and relationships, around which the IPM FFS are structured.

- The low levels of farmers' self-awareness and actualization in terms of their real and possible roles in knowledge generation and that this may be closely linked with the education levels and training of field agents.

In addition to these possible weaknesses, the in-grained attitudes and patterns of behavior acquired under the Training & Visit (T & V) approach has been observed with the FFS, and without continued support to the contrary, may begin to eat away at the initial gains in improved interpersonal farmer-extension relations (Quizon, *et al*, 2000). There is also a chance that the FFS may develop an 'elite' bias, favoring those who are literate. The majority of smallholder farmers in developing countries are illiterate (World Bank, 2000). Already the content of the FFS is based almost entirely on perceptions and knowledge of 'western' science (Braun, Graham, & Fernandez, 2000). Those who have the most experience with these views and who have

the skills to utilize the printed media in which this knowledge is stored have a distinct advantage. Perhaps the area with the greatest need, and potential, for improvement is that of local institutionalization (Uphoff, 1986 and Simpson, 2001). Addressing the process of institutionalization, as the enduring change in the shared patterns of belief, expectations and relationships, is the key to many of the other issues already mentioned.

7. EXTENSION AND TECHNOLOGY FOR THE POOREST

Different approaches should be used to better access and address the special extension needs of smallholder farmers. The latest thinking on the process of facilitating change in smallholder farming practice includes, among others, the pro-poor extension concept (Christoplos, 2003, Neuchatel Group, 1999 and World Bank, 2003c). A question that must ultimately be addressed in assessing if and how extension can become more pro-poor is whether or not it can reach the poorest of the poor. Even if innovative technologies emerge from the research community, in practice these innovations may fail to reach the extremely poor and destitute due to lack of, research capable of generating appropriate technologies; logistical capacity to reach the isolated poor; staff and/or institutional structures in poor areas; poorly functioning marketing structures that obstruct input supply and market access; knowledge and capacity within the extension organization for judging markets for non-traditional crops for which the poor may have a comparative advantage; and the underlying assumptions that targeting the poor is the role of NGOs and donor-financed projects rather than line ministry structures (FAO & World Bank, 2000).

Reaching the poorest of the poor is not merely a matter of tweaking existing structures. For this target group, extension may be best developed within structures outside of regular structures such as ministries of agriculture, and with resources from social programs, rehabilitation projects and civil society. If such 'out-of-the-box' approaches are to be related to extension policies, it is furthermore important to ask whether (a) there is a normative commitment among key stakeholders to reaching the very poorest and (b) whether there are viable options for reaching the very poorest where they live and within their existing livelihood contexts. The view of Christoplos (2003) that public extension should primarily act as enablers, supporting an array of agents from the private sector and civil society and not merely act

directly as a service agent is supported. This enabling role includes a variety of possibilities. One possibility involves building organizations and institutions that increase smallholder producers' power to negotiate and demand services. Another would entail shifting the control of the production process to smallholder producers by strengthening their capacity to identify research priorities, improving access to national and regional research centers, and increasing their capacity to interpret and apply research outcomes. Basically, this means giving more power to the smallholders themselves as partners in the business of poverty alleviation and wealth creation. Success stories are increasingly reported in smallholder agriculture of farmers and researchers working in harmony to conserve and improve fallows, bumper maize and cassava harvests in Southern Africa (see In Went, IFPRI, NEPAD, CTA conference, 2003). These successes and many others in the region are but a step towards narrowing that gap between large-scale commercial and smallholder farmers.

8. CONCLUSION

Based on the above scenario, it is not enough to point fingers at the way that extension approaches imported from developed regions failed to foster technological change and adoption on smallholders in developing regions, especially in Africa (Rukuni *et al*, 1998). There must be a broader reorientation of the overall problem identification, technology development, dissemination and adoption processes. Such a reorientation must be crafted from within the continent (Africa) and informed by local traditions and time-honored best practices. Successes and failures from such initiatives must be documented and communicated within the continent as lessons learned. In sum, processes underpinning the new technology development and adoption discourse, should support pro-poor extension approaches in rural communities by recognizing the new and broader extension service context, by fostering greater coherence among extension, research, agricultural and rural development institutions, and by placing extension and research policy within a realistic context of the changing social, political and economic rural development arena.

Institutions need to collaborate more and prevent fragmentation of efforts through greater regional and international cooperation in science and technology. Few mechanisms to exchange and share knowledge in

the continent already exist. Efforts should focus on how best to provide the end user with the appropriate knowledge, including technological, financial, and marketing information in order to help alleviate poverty. Different media and types of knowledge are required in order to reach all categories of farmers and related participants in the agricultural chain. Doing so would enhance the value of networking and strengthen the farmer-extension-research partnership. Research and Extension institutions should become learning organizations that encourage "constructive subversion," meaning that new ideas from the young scientists should be encouraged, not crushed.

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