Future Perspectives for Agricultural Education

Review of Support for Agricultural Education in the Bank and by Other Donors

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AKIS Discussion Paper

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Foreword

AKIS is the Agricultural Knowledge and Information Systems Thematic Team, composed of World Bank staff working in or interested in research, extension, and education programs. The overall team objective is to enhance the effectiveness of Bank support to agricultural knowledge and information system development and thus contribute to the Bank’s objectives of alleviating poverty, ensuring food security, and improving sustainable management of natural resources. The AKIS team emphasizes policy, institutional, and management issues associated with agricultural research, extension and education, recognizing that other thematic teams will focus on technical issues. The Team mission is to “promote the development of sustainable and productive agricultural research, extension, and education systems in Bank client countries.”

"AKIS Discussion Papers" are to disseminate views, experience, and ideas, which may assist World Bank Team Leaders, national counterparts from Borrower counties, and other partners with preparation and implementation of projects to strengthen agricultural research, extension, and education programs. They attempt to disseminate lessons from innovative experiences in World Bank projects and elsewhere and make this information readily available for comment and use by project teams.

In 1998 the AKIS Thematic Team noted the limited amount of World Bank financing going into agricultural education projects and the potential negative impact that this could have on sustainability of agricultural research and extension programs and broader rural development. The AKIS Thematic Team commissioned two studies of agricultural education investments: a retrospective look at current and past investments by Anthony Willett and this companion paper looking to the future. This review was finalized in collaboration with Charles Maguire, World Bank Agricultural Education Specialist.

This "AKIS Discussion Paper" summarizes this review of future perspectives for agricultural education and is intended to contribute to exchange of ideas and experience within the Agriculture Knowledge and Information Systems Thematic Team.

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Abbreviations

AET Agricultural education and training
CBO Community-based organization
DNA Deoxy-ribo nucleic acid
ESD Ecologically Sustainable Development
HIV Human immune-deficiency virus
IDU Internal Documents Unit of the World Bank
NGO Non-governmental organization
Future Perspectives for Agricultural Education: Review of Support for Agricultural Education in the Bank and by Other Donors

Richard Bawden
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I. This report in perspective

A review of support for agricultural education in the Bank and by other donors summarized past and present perspectives (Anthony Willett 1998). That review describes Bank and other donor agricultural education and training (AET) projects in some detail and provides a baseline survey and resource material as a foundation for further work. While noting that over the past few decades much had be done in developing AET facilities and in training AET faculty, Willett suggested that AET systems and the agencies supporting them had entered a hiatus over recent years. Few new activities have been initiated in recent years, even though there was a strong impetus for development from the rapidly changing conditions under which the AET system had to operate.

For all the apparent inactivity in concrete developments however, there was potent evidence of a new appreciation within some parts of the AET sector at least, that past approaches to the development of that sector were inadequate for emerging circumstances. Calls for change were being accompanied by suggestions of the need for new policies, new philosophies and theories, new approaches, and indeed new visions (a) for agriculture itself, within a culturally responsible context of ecologically sustainable development (ESD), (b) for higher education as a whole sector, in an era of burgeoning demand for student places on the one hand and fiscal constraints on the other, and (c) at a time that is being characterized overall by forces for the globalization of trade, communications, and risk.

The changed conditions and the need for innovative responses, triggered the suggestion by Willett that the Bank initiate a second generation of development support for AET as informed by new visions and emerging concepts for the system. Specifically it was suggested that these new endeavours should promote: (a) a future vision of agriculture in the broadest terms, including its relationships with natural resource management, rural development, and knowledge and understanding of ESD, its organization in light of changes in economies, governance, and information and communications, and the impact on it of developments in science and technology; and (b) educational research and institutional development in AET.

The focus in the paper from which these present Key Findings are extracted was on future perspectives of what is referred to as the AET system. The arguments presented follow a logic that suggests that as the realization that these matters relating to agricultural education and training are much more complex and dynamic than has been previously acknowledged, the call is for an approach to analysis and development of the sector which accommodates such complexity and uncertain change. The approach suggested is one based on systemic principles, which draw on systems theories and philosophies.

Those, like the Bank, who would currently review their support for agricultural higher education across the globe, must acknowledge that the circumstances are far more complex, and in many ways much more compelling, than they have been to date. This is particularly evident when the situation is viewed from future perspectives.

This paper specifically notes that, for the future, it will not simply be a matter of more of the same from the past, but a genuine transformation into that which now needs to be done for a very different future. Where previously the emphasis of the AET system was essentially on the provision of skilled manpower for techno-scientific production agriculture to assure food security, the emerging focus is on the development
and promulgation of a whole new paradigm: a call for a systemic approach which emphasized a responsible and productive agriculture for more ecologically sustainable, socially equitable, and ethically defensible development process which embraced both the well-being of rural communities, and the biophysical and sociocultural environments in which they had to work and live.

The fundamental difficulty here is that to this point, this new focus has been little more than a rhetorical vision or philosophical ethos. It does not yet have the sound theoretical and intellectual foundation of a paradigm for development.

*One of the basic contributions that donors will be asked to make in committing to a second generation of AET development therefore, is to support work on the transformation of such an ethos into a genuinely rigorous paradigm for development with sound intellectual foundations.*

Without such foundations the many who espouse ecologically sustainable development (ESD) as a context for improved agricultural practices will be matched by those who know how that translates into practice. There will be even fewer who will be aware of the implications for agricultural education and training systems in terms of governance, leadership, and policy, as well as curricula, management, and organization. These developments in theory and practice, it was posited, are as urgent as they are vital.

Reflecting the need for change, the original brief for the present review of future perspectives of AET, was to “suggest a future scenario for agricultural education and training indicating the types of curriculum, the sources of education and training supply, and the characteristics of the agricultural education system of tomorrow”. In the full report of this second phase of the review, it was noted that a number of future scenario statements had already been generated by a number of writers, over the years. While many of these reflected responses to the sort of changes outlined above, they were of limited practical value as frameworks for further AET development assistance precisely because of the manner in which they were generated and the idealistic context which virtually all assumed in resenting a preferred future rather than reflecting the more useful perspective of a range of plausible futures!

The basic task is to create a process through which those involved directly in the governance, management, and daily affairs of specific AET systems themselves learn how to create, explore, and learn from different scenarios of a range of plausible futures, which they themselves envision and which embrace far more than the preferred status.

The vision and the logic is that ‘local leadership’ is essential if AET systems worldwide are to: (a) learn how to envision plausible futures for themselves, (b) learn the influence of particular conceptual frameworks and paradigms on this process; and (c) learn how to use what has been learned from these two dimensions as a context for their own strategic developments. The nature and dynamics of AET systems will need to be adaptable in order to deal with the ever-changing nature and dynamics of their environments. While the future state of these environmental conditions are unknown in the present, they are not, conceptually at least, unknowable. Those AET systems which persist will be those that have not only thought about how they will respond to a wide range of potential environmental influences, but will have designed self-organizing strategies that enable them themselves to have positive reciprocal influences on the environment.

*In essence, agriculture itself will be changed as much through appropriate education of those who lead it as it will be in reaction to the changed environments in which it will have to operate. The quality of such education is thus imperative.*

Weak leadership and inappropriate conceptual maps of the development process continue to characterize the situation, and AET systems are thus not only in crisis themselves, but are contributing to a very critical situation in the broader domains of agriculture and rural affairs more generally. When viewed ‘back from the future’, this situation appears even more critical: The foundations for sustainable development efforts, both practical and intellectual, are not sound. There is a very great difference between the rhetoric of ecologically
sustainable development and the state of development of those theories and practices which would see this rhetoric transformed into meaningful actions.

II. The essential issue: Intellectual Poverty

Billions of dollars have been invested globally in agricultural research, extension and education over the past ten years or so. Yet for all that, chronic rural poverty and its attendant human deprivations remain endemic in very large areas of the world, while the extent to which rural environments are being degraded, continues to increase. And all the while, of course, the human population is growing inexorably to probably exceed 7 billion by thirty years hence. A number of key factors were identified as contributing to the critical situation with respect to rural well-being in its broadest sense:

♦ The lack of will by governments
♦ Fiscal constraints
♦ Inadequately developed institutions
♦ Distortions of influence by vested interest groups and individuals.
♦ Weak intellectual leadership.
♦ Impoverished paradigms, intellectual maps, and strategic intents for development initiatives.

Inevitably each of these factors is closely interconnected with the others, and in a systemic analysis of any particular situation within the sector, these inter-connections would need to be accommodated and explored. This is an important focus, as too often in the past, the analysis of situations within the agricultural education and training sector have been anything but systemic. Indeed this is also so of the broader development context. For all its importance in the assurance of food security, as a source of foreign exchange through export, and for the generation of wealth within rural communities, agriculture itself has seemingly lost its appeal as a national priority in so many different countries across the globe. The glitter of the “Green Revolution” has dimmed, and there is little on the horizon to inspire hope in a second such revolution - the “Gene Revolution” notwithstanding.

III. The game, its players, and the stakes

In what might now be regarded as the foundational phase of support for agricultural higher education (1960s-1990), the perspective which prevailed both for agriculture itself and for education, research and extension services, was essentially non-systemic. The focus of endeavors was on manpower provision to support techno-scientific production and rational productivity growth. The essential ‘market’ for graduates was seen to be the public service. Little if any concern was expressed for externalities and possible long term negative bio-physical and/or socio-cultural environmental impacts of agriculture. The impacts of the environment on the production process in turn, was simplified to emphasize linear causalities and relatively simple expressions of risk. Within production agriculture, further compartmentalization was evident both in the form of foci on specific commodities rather than on whole farming systems, as well as the separation of agriculture from any broader environmental context. This same non-systemic paradigm significantly influenced the organization of the institutions of agricultural higher education, the separation of the functions of teaching, research, and extension from each other, the fragmentation of curricula, and the isolation of each of the sub-sectors (sub-systems) within the agricultural education sector (system) from each other. There was little sense of an integrated system of agricultural education allowing interconnections between universities, colleges, schools, and non-formal educational providers. Nor were connections between such institutions and other organizations and communities seen as particularly significant. There was a very heavy reliance on funding from the public sector, and few connections established with organizations in the private sector.

The prevalence of a non-systemic perspective in both agriculture itself and the services which support it, has represented a source of very significant impediments to the continuing evolution of both agriculture and agricultural higher education across the globe. In their present forms, neither is particularly sustainable,
and indeed the situation in many countries is such that both are manifestly unsustainable. The challenge lies in the fact that the situations within the AET system, within the environments in which it must exist, and between the system and its environments, are all exceptionally complex. Yet those who must now deal with all of that complexity were not trained to deal with it. For a complex challenge, the appropriate response is systemic analysis - the ability to recognize and study the complexity of both the system itself, and the dynamics which characterize it.

The acceptance of agricultural higher education as a system, presents quite a different framework for considering issues such as purpose, clientele, curricula, pedagogy and organizational structures and their adaptability, to that which has prevailed to this point. The institution is now conceived as an integral part of a much more expansive ‘set’ of interconnected organizations, groups, communities, etc. The present realization, as a prelude for future change, is that AET institutions are but sub-systems within a much more comprehensive and complex holon system for rural development. And that this system in turn, must be integrated within the supra-system which is represented by the environments in which such rural development must occur. This is a very significant shift in focus; not simply because it embraces many more elements and is therefore more complex, but because these elements are so interconnected that together they endow the whole system complex with unique properties, including the concept of dynamic co-development of the AET system with its environments.

From a systemic perspective, the AET system can be envisaged as being composed of four inter-related sub-systems (Figure 1).

Universities

Schools

Non-formal education organizations

Colleges

Figure 1: The AET system and its component subsystems.

The AET system is, in turn, a sub-system of the higher order (agriculturally focussed) system (or bounded network) of rural development (Figure 2) which includes the clientele, organizations and institutions in both the private and public sectors, and both non-government (NGO) and community-based organizations (CBO).
Meanwhile, each of the other sub-systems in this rural development system is also comprised of a complex set of interconnected elements. The clientele sub-system for instance can be seen to comprise seven inter connected sub-sub-systems (Figure 3).

The Public Sector sub-system meanwhile, has sub-sub-systems concerned with policy, infrastructure, research, development, extension, etc., while the Private Sector comprises financial institutions, input companies, marketing companies, manufacturing companies, the media, etc.

The whole Rural Development System meanwhile, with all these component sub-systems, itself operates within an environment of immense complexity which is characterized by a host of factors which can influence, and be influenced by, the rural development system (Figure 4).
This systemic perspective indeed presents a complex challenge to those accustomed to thinking of agricultural education and training in terms of a university focused essentially on serving the needs of export oriented and commercial producers through publicly funded research and extension activities, and all occurring within relatively stable natural and social environments.

The situation is further exacerbated by the recognition that the AET sub-system plays at least five different yet essential roles within the rural development system:

1. The creation and application of knowledge (including that about the process of knowing = paradigms!).
2. The education and training of a skilled labor force.
3. The selection and formation of dominant elites.
4. The conservation and preservation of cultural artifacts and expressions of cultural norms, and
5. The generation and transmission of ideologies and philosophies.
There is little doubt that through history, universities in particular, have played all of these roles - with the relative emphasis often changing over time. As a general trend, it might be observed that the list above represents an unfolding chronology of emphasis (from the bottom to the top). In other words, where historically universities were essentially concerned with the generation and transmission of ideology as their primary function (viz the Church-based tradition in Europe and the liberal arts tradition in the United States), their most recent emphasis, in many cases in the western world at least, is on the research function of the creation and application of knowledge. The temporal change of emphasis has not necessarily meant the exclusion of one purpose or role by another; but rather its supplementation. But this situation varies very considerably, often as a function of societal pressures (environmental influence on the system!).

Across the world it is impossible to generalize about the state of agricultural universities, from this multi-role perspective. Yet it is a crucial perspective and needs to be regarded carefully whenever further plans for the development of agricultural higher education systems are discussed.

Of particular relevance is the generation and transmission of fresh paradigms - which is an aspect which involves all five of the roles. The virtual universalization of the techno-scientific and associated economic rationalist reductionist paradigms has had much to do with its acceptance by the dominant elite in any nation through their education. But so it has also by its promulgation in the form of scientism, as an ideology. The outcomes of techno-scientific reductionist research and the contribution to the adoption of technologies based on them by a techno-scientifically literate population, have further endorsed the utility of the paradigm.

To shift the emphasis from a reductionist, non-systemic paradigm of agricultural development to one which is systemic in its regard for comprehensive rural development will demand a similar engagement of all of these functional roles.

Ecologically sustainable development will never be achieved through manpower training alone - even if authentic curricula had been developed, and competent teachers were available to teach it.

Considerable detail is provided in the main report, on the implications of the shift from past (and often currently prevailing!) worldviews of AET, where the complexity is reduced to simple variables, to the contrasting situation, while the emerging realizations of the inherent complexity of the whole rural development system within the dynamic environments, is also explored in some depth.

These matters are then woven into the logic presented with respect to the need for all of these elements, in the system and of the environment, to be incorporated in systemic exploration of scenarios of the future for AET systems and how these need to be conducted by those directly involved with their governance. Of particular importance here again is the need to challenge the worldviews of those doing the scenario generation and analysis. The main report presents five hypothetical scenarios of different futures, to illustrate the complexity of the circumstances facing those concerned with the governance, leadership, and strategic management of AET systems.

**IV. Five scenarios of the future for AET systems**

Five scenarios are presented, although these are far from the exclusive set of possible outcomes for Agricultural Education and Training Systems in the future. Rather, they were generated and selected to illustrate a range of possible outcomes which could plausibly arise as a result of the different conditions of the environmental challenges and system responses ‘envisioned’ from a limited number of permutations on situations. They were all set a dozen years hence - in the year 2010 - as this provided a timeline prospective equivalent approximately to the retrospective period covered by volume one of this report. They presented hypothetical views of five different futures which had been imagined to occur as a result of the conditions specified in each scenario. They were presented essentially as examples of the type of logic that is used for
the process of scenario generation as well as illustrating some of the key elements that are embraced by the process.

The examples of the scenarios illustrate the nature of the current challenges facing those concerned with the strategic futures of AET institutions, and the possible outcomes if many of the environmental factors are not ameliorated and/or adjusted. The fate of the institutions under each scenario represents a plausible outcome of the type of environmental changes which are perfectly possible.

**Scenario One - The High Tech Challenge**

This first scenario reflected a situation in which both biotechnologies and information technologies had been developed and extended to most parts of the world, including “Nation X” (the hypothetical nation under review). Most employment opportunities for science and technology graduates were in high tech industries, which for the most part, did their own post graduate training of the specialists they needed to conduct their businesses.

Most of these high tech industries were transnationals, and each had developed particular relationships with the government of the host country, to ensure taxation relief and other significant trading benefits. Most of the senior positions of research and management were filled by expatriates who were educated in the West. Agriculture was benefiting very significantly from these high tech inputs and productivity as so high that, given reasonable weather conditions, food security was comfortably met at least on a regional basis. Inter governmental agreements within regions facilitated this situation with short falls in any one nation in any one year being met by transfers from those more fortunate.

Water for irrigation was freely available through solar powered saline converters which were widely available. Electricity supplies were also reliant on cheap and effective photovoltaic technologies.

Biotechnological advances had been such that major pests had been eliminated from all major crops, crop and livestock yields had virtually doubled through highly selective breeding based on genetic manipulation through recombinant DNA techniques. In this mechanistic world, ethical matters associated with the spread of genetically altered organisms were not considered to be an issue of any serious concern. All problem situations were approached with the attitude that tomorrow’s technologies will solve today’s problems.

Basic educational needs were easily accessible on the internet and degrees could be studied and obtained through enrolment in virtual universities whose curricula were prepared by a handful of major international universities in the West.

A paradigm of materialism and reductionism prevailed and there was no incentive nor indeed institutional mechanism to allow a serious and critical review of that situation.

*In this scenario, agricultural universities had become irrelevant and indeed extinct. Agricultural science was a program of the past, as production specialists were now holders of basic science degrees with highly specialized postgraduate (hi tech) qualifications gained through course programs offered by the industries themselves.*

**Scenario Two - The Lack of Political Will**

In this second scenario, technological developments had been far less impressive than in the first situation. Indeed with the exception of a number of telecommunication technologies, the technological revolution had stalled. There was very considerable demand for food, as food security had not been consistently achieved, particularly given the widely variable weather patterns which now characterized conditions in the rural areas of Nation X. There is need for concentrated research into farming systems which were able to remain productive under the new dynamic situations as there was for appropriately educated scientists, farm managers, extension agents, and rural teachers. Private enterprise was not attracted to the country as a
function essentially of corrupt and ineffective governance. In the absence of government regulations, there was severe exploitation of the natural resource base, and the future looked far from sound, as the biophysical environment continued to be degraded through the inappropriate practices of poorly educated rural people. HIV infections had taken a huge toll of the sexually active generation in the countryside, with the cohort from which future leaders would normally be drawn, having been decimated by the disease.

There was a pervasive malaise throughout the ‘system/environment complex’, partly attributable to the pandemic and partly to the disempowerment felt by so many in the face of corrupt governance. There was accordingly no motivation at all to explore development paradigms, and the situation was such that there was not even an awareness that things could (should?) be done differently.

In this second scenario, the previously sound agricultural education and training system was in crisis through its neglect by a government more concerned with self survival and promotion than the development of its natural and human resources. HIV infections had had a devastating effect on the population, with recruitment of academic and support staff for the agricultural education and training systems, severely depressed through the lack of availability of health applicants. Student enrolments were equally depressed.

Scenario Three - More of the Same
In this third scenario, it was assumed that the world went on pretty much as before. Nation X was not as affected by changes in the weather patterns as many of its neighbours. It had a productive agricultural labour force, and through ever-tightening terms of trade, structural adjustments were being made in rural areas, with farms becoming increasingly more productive. While the agricultural sector was becoming increasingly ‘lean and mean’, there was a considerable price being exacted on both the bio-physical and socio-cultural environments. While better practices by the increasingly educated farmers were reducing the extent of damage being done to the biophysical environment compared to previous times, there were very few resources being allocated to reconstitute damage that had already been done. As the economic conditions in the nation remain depressed, those displaced from rural areas through capital substitution, were finding it exceptionally difficult to obtain employment, even after their migration to metropolitan areas of the country. This was in spite of a growth in micro-enterprises in the rural and peri-urban areas.

The HIV pandemic seemed to have run its course, and the population cohort that was decimated by the infection, had been replaced through judicious immigration policies and strategies.

There was concern for the sustainability of production, with faith in the ability of human beings to work things out for themselves.

In this scenario, the agricultural education and training sector remained sustainable. It had retained its emphasis on techno-scientific production agriculture, and could justify its need for continuing support from government sources through the activities of its staff and graduates within the rubric of structural adjustment. The system was increasingly successful in attracting funds from private enterprise for contract research and consulting services. Some of its scientists had achieved international reputations for the quality of their research. There was little incentive to change much in the way that things were done, particularly with decreasing public interest in environmental matters and community affairs, as individualism became more entrenched as a prevailing ethos.

Scenario Four - The Land Grant Ideal
In this fourth scenario, the ‘full’ land grant ideal found expression in Nation X, building on the earlier foundations which emphasized the centrality of production science.

In the new curriculum in National X, the humanities and social sciences had been added to broaden the education of student agriculturists. The educational system was integrated across the university, college,
school, and non formal sectors, and this in turn was integrated with research and extension services. Connections with both public and private sectors organizations were well developed, and the graduates had competencies which were flexible enough to gain employment across a wide spectrum of domains.

Once again the HIV pandemic had been contained, essentially through extensive educational campaigns in which the AET system was significantly involved.

*Within the AET system in this scenario, there were a number of pockets of innovation in which a number of formal intellectual challenges were mounted to the prevailing paradigms. Research was being conducted into sustainable agricultural practices from a perspective which embraced both a concern for the integrity of natural systems and of communities. The curriculum had a core of courses which adapted agro-ecological principles.*

**The Fifth Scenario - The Systemic Dimension**

In this final scenario, the population of Nation X, having suffered the rigors of the HIV pandemic and severe economic depression, had resolved to attempt to change the whole way the country ran, as an expression of cultural renewal. There was fundamental commitment to the exploration and development of new paradigms which were as appreciative and embracing of deep human values of dignity, ethics, and aesthetics, as of concerns for economic viability and technological effectiveness.

There was a new awareness that the paradigm that once prevailed did little to express or celebrate human spirituality. The governance of the nation reflected and supported this search for a new national identity while also endorsing opportunities for the search for personal ‘self-identity’.

*In this final scenario, the AET system assumed an extensive role within the broader domain of community and environment development as facilitator of systemic societal and cultural change to reflect a more systemic relationship between people and the bio-physical and socio-cultural environment of which they genuinely felt they were integral participants.*

**V. Some Implications**

While these five scenarios were ‘imagined into being’ as contexts for situations in a fictional Nation X, they clearly reflect a range of states of both environments and AET systems that are plausible - and indeed recognizable. In fact that there is little here that surprises. The point that was re-emphasized in the main report however, was that it is the process of learning from such scenario generation that is the key to change, not the acceptance or rejection of the outcomes of the process. Experience indicates that participation in facilitated scenario learning events can lead to significant insights about all three dimensions of the development ‘system of systems’ - (a) the nature of the environment in which the stated system will have to operate; (b) the nature of the system and how it can both influence and adapt to the influence of that environment; and (c) the vital significance of the paradigmatic perspective through which (a) and (b) are considered.

Fresh paradigms arise under circumstances which reveal the inadequacies of the prevailing ways of ‘seeing’ and ‘doing’. Scenario generation exercises can provide opportunities for that situation to arise.

**VI. Recommendations to the Bank**

A number of important recommendations to the World Bank were framed following discussions of the above scenarios:
The Bank should become again active in supporting the further development of AET systems in selected regions across the world.

These ‘second generation’ development activities should be conducted in association with other donor agencies wherever possible such that efforts are optimally focussed and synergies obtained.

Support should be provided for systemic reforms within the broader context of rural development in the place of the conventional, somewhat narrow perspective, of techno-scientific production agriculture.

This should be reflected as much in the way AET systems act to integrate themselves into the broader rural development systems of the nation or region, as in the curricula and research agendas of the institutions.

The overall goal should be to help those who govern, manage, and provide critical leadership to AET systems, to learn how to deal strategically with unknown futures under complex environmental conditions and dynamics.

The greatest priority lies in the support of explorations of a more rigorous intellectual map, paradigm, and methodologies appropriate to the ethos of ecologically sustainable development (ESD).

Another high priority is support for the development of intellectual and academic leaders who have the capacities to develop visions and scenarios of future worlds as the basis for strategic development of their own institutions.

The actual nature of the second generation support strategies should be established in close collaboration with various stakeholders within rural development systems in different regions across the globe.

Essentially the fundamental challenge, to the Bank and other donors, recognized in the report, is to facilitate the actions of AET systems across the globe, to help them generate their own networks of relationships with other institutions and organizations both nationally and internationally, in which they learn to embed themselves, and both from which and with which they continually learn how to adjust their activities (including those identified with curricula, with strategic management, with research, and with outreaching and other networking activities themselves) to reflect systemic commitments to more ecologically responsible, socially just, and sustainably productive agriculture.

Anything less than such a systemic transformation, will see AET systems across the globe, become increasingly ineffective in the face of very complex and dynamic challenges. Those who govern the nations in which such systems are located will need intellectual support as they attempt to deal with the concurrent demands of food security, export income, farmer and rural worker health and prosperity, and the integrity of both the biophysical and sociocultural environments in which all of this must be achieved.

This means nothing less than the generation of a new (systemic) paradigm for development.