The Role of Educational Institutions in Transforming Agricultural Knowledge Systems for Development

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Abstract

It is widely perceived that conventional agricultural education is now not meeting the emerging needs of agricultural development. This is more so in the economically developing world which now more than ever needs new agricultural knowledge to meet new challenges such as participating effectively in globally competitive markets and adapting rapidly to climate change, reduced access to natural resources, narrower agricultural biodiversity and new pests and diseases from afar that spread rapidly.

The paper discusses several key trends that are impacting educational institutions in their transforming agricultural knowledge systems. These include re-envisioning the role of these Institutions to make their roles broader beyond increasing agricultural production and productivity, introducing new trans-disciplines in their academic agendas, consolidating them for greater efficiencies and academic excellence prior to investing in them, changing leadership, curricula, widening the catchment by offering education in new academic area and providing off-campus, distance, and open learning using new Information and Communication Technologies and considering them as hubs for agriculture and agribusiness innovation.

The paper also considers that the Indian agricultural education system and along with it the agricultural knowledge system is now at a crossroads. After discussing this conclusion, the paper suggests the need for urgent transformation institutionally and how it can be done. This is by revisiting the vision of the system and its Institutions, considering the need for consolidation, increasing investment, new capacity generation and quality assurance. It suggests widening the Institutions' scope to offer formal, on campus and off campus distance, open and informal learning and
innovation to agricultural communities so that India can bring about a more knowledge based agriculture in as short a period of time effectively and efficiently.

The paper also discusses India’s possible contribution of its considerable experience and capacities to improve knowledge systems globally as also the country’s needs to improve its educational and knowledge system to meet emerging demands and for the future.
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Introduction

It is widely perceived that conventional agricultural education is now not meeting the emerging needs of agricultural development. This is more so in the economically developing world which now more than ever needs new agricultural knowledge to meet new challenges such as participating effectively in globally competitive markets and adapting rapidly to climate change, reduced access to natural resources, narrower agricultural biodiversity and new pests and diseases from afar that spread rapidly.

Most of the time the common belief, as discussed in several forums including the Global Conference on Agricultural Research for Development (GCARD 1 and 2; see http://www.egfar.org/gcard) is that the failures are in the education systems’ abilities to attract students, retain them during the course and produce competent graduates. The reasons attributed to this failure are the lack of adequate investment and curriculums that do not meet the aspirations of the students and the needs of their employers.

The malaise is a lot deeper. This paper discusses the wider role of educational institutions in transforming agricultural knowledge systems for development especially in developing countries of the South, while considering the Indian case in detail, so that they lead and are central to the shift for agriculture and agribusiness to become key economic and social components of their emerging knowledge based societies.
Key Trends for the Role of Educational Institutions in Transforming Agricultural Knowledge Systems for Development

There are six key trends that drive educational institutions to fulfill their role in transforming agricultural knowledge systems for development in the foreseeable future. These are exemplified by the transformations erstwhile agricultural educational Institutions in the North including Wageningen University in Europe and several universities in the United States are undergoing. These Universities initiated radical changes in the previous decade and are now becoming hubs for innovation not only in agriculture but also in broader disciplines related to life sciences and the environment. They are contributing significantly to transforming agricultural knowledge systems to being much broader by including complex food systems and the environment as components of agriculture to meet not only the needs of their own regions but also of the world. In several cases, their new visions and actions have become brand names for their specialization and fame that attract not only quality faculty and students and but also private investment.

Recognition of a wider role beyond contributing to increasing agricultural production and productivity

The first key trend in agriculture related educational Institutions transforming the role of agricultural knowledge systems is their to recognition of a wider role they have in providing new knowledge and skills and contribute to innovation and technology generation beyond conventional agriculture. Wageningen University has considered healthy food and environment together. Agricultural educational institutions in the South also need to reconsider the needs of their societies in the changing context in a similar fashion and include a larger agenda of agricultural knowledge and innovation in development rather than the current approach of development only through agriculture. This would mean these Institutions foray, team up and integrate with other Institutions, both public and private and in several cases outside their parent country, that contribute to development beyond agricultural production and productivity. This would also mean that these Institutions while keeping the focus on the needs of agricultural and agribusiness actors and stakeholders also address the
formal educational and informal learning needs of actors in the entire chain of development. This is similar to shifts that premier educational institutions in other academic disciplines are undergoing as they include new approaches and curriculums to address the needs of science, technology, medicine, business, humanities and art.

**The blurring of conventional disciplines and emergence of new academic areas**

The second trend is that of blurring of conventional disciplines as new trans-disciplines such as biotechnology, nanotechnology, Information and communications (ICTs), space technologies and materials sciences emerge and become central to developing new technologies and innovations including in agriculture, agribusiness, food chains and the environment. This brings even greater blurring of Universities as being science, technology, medicine, business, agriculture etc. The key issue not the category the Institutions are classified as but how they deliver the needs of development through academic excellence as measured through innovations they contribute to the society.

**Investments being defined by Stakeholders**

The third trend is about the investment and how the society considers to make them in these Institutions and, because of this, how it is involved in making decisions about the Institutions.

The type of infrastructure and faculty needed and the cost of its maintenance in the new context forces that these Institutions be large and, therefore, need to cater to larger communities. There cannot be a multitude of institutions, as the society cannot afford and sustain them cost wise and in pursuing academic excellence over a range of disciplines and academic areas. Thus, smaller Institutions are forced to consolidate and merge with other Institutions, both public and private, to increase size, infrastructure, faculty, other capacities and more important, share investments and costs. For example, Biotechnology research in human health and medicine at a primary level does not differ much from that in agriculture and other areas of application and there is greater synergy attained when its is viewed as such rather than as being biotechnology for human medicine or for agriculture. It is only at an applied
level that the difference emerges. Considering the huge investments needed for state of the art infrastructure and intellectual and technical capacities needed to pursue excellence in each of the trans-disciplines it becomes apparent that having large consolidated, multi and trans-disciplinary Institutions than a multitude of small Institutions is a more logical and rational way forward. These consolidated larger Institutions, as is happening in China and has happened in the North, need also to include the private sector which incubate technologies and innovations spun off from the Institutions without burdening the Institutions with the cost and effort of technology dissemination and the communities who further innovate in using these technologies and innovations for their development and benefit. These Institutions are hubs for innovation and therefore, new inclusions of actors and stakeholders in all aspects of managing these Institutions becomes imperative for societies to invest in them. This trend makes Institutions change their governance.

Supporting Educational Needs of Large Catchments of Students and Learners

The fourth key trend, and critical for the South to consider, is in the ability of agricultural educational Institutions to support a much larger catchment of students and learners many a times beyond their immediate communities and even countries. In the South, due to reasons of inadequate investments and lack of faculty, Institutions tend to remain small in size, faculty, number of students and knowledge areas and disciplines they cover. They do not enlarge to provide knowledge and skills at a wider scale, informally and through off campus means. There have been suggestions that they venture into distance, open and off-campus modes but their small sizes, lack of capacity and expertise as also academic coverage limit their venturing to widen their catchment. This puts rapid growth of entire knowledge systems for development, critical for developing countries at this juncture, at a disadvantage. For example, farmers and small agribusiness and agriculture related entrepreneurs such as in processing, packaging and logistics are denied access to new knowledge and skills so necessary to shift into more knowledge intensive enterprises when these Institutions cannot offer distance, open and off-campus learning opportunities. But, this trend also brings competitiveness and Institutions need to adapt to it bringing new challenges to their leadership and management.
The use of ICTs for On and Off Campus Education and Learning

The fifth key trend is to leverage advances in Information and Communications Technologies (ICTs) use in education and learning especially for lowering overall costs and improving quality of the learning experience both on and off campus. The now ubiquitous availability of new ICTs such as smart cell phones and Internet connected tablet computers even in rural areas is a major paradigm shift. Yet, many of these Institutions especially in the South have found it difficult to leverage ICTs in their educational activities. These Institutions are finding it difficult to invest in the necessary infrastructure, software, hardware, skills, connectivity and content and use ICTs to cater to learners who are not or cannot attend on campus and access potential learning opportunities. This failure to use ICTs, primarily because of lack of policy support and investment from the State, preempts the wider role of education institutions in enabling rapid development of knowledge based agriculture and related activities especially by the youth and women engaged in agricultural vocations. The State now has an additional cross-sectorial role across its agriculture and rural development and telecommunications sectors and for which it may not have the necessary experience and wherewithal to execute.

Political commitment for new roles and academic excellence

Finally, an important consideration in the context of the above trends is political and social commitment by communities, societies and countries that are in the catchment of these Institutions to provide the necessary investment, support, leadership and policies in the transformation of these Institutions to take up new roles in transforming agricultural knowledge systems that benefit their own development and pursue academic excellence. These, especially political commitment, are many a times in short supply for educational Institutions of the South.
The main challenges India faces in Transforming Agricultural Knowledge Systems for Development are indicated below.

**The Capacity Cliff**

India faces what may be termed, to paraphrase a now famous term, a “Capacity Cliff” for developing its agriculture scientifically. There is a mounting shortfall in filling current and future demands of trained manpower in agriculture. The existing education system is producing around 24,000 graduates per year with crop sciences contributing 2/3rds of it. The projection indicated is that by 2020 the requirement would be about 54,000 resulting in a demand-supply gap of 30,000. The shortfall is high across board but higher in rapidly growing sectors like horticulture, dairy and fisheries (Rama Rao et al.; 2011, Menon et al., 2012). Even the graduates the present Universities now produces seek alternative employment such as in banking, insurance and other areas rather than in those related directly at the field level to agriculture. There is also attrition out of agricultural professional employment especially in case of women when posted in rural areas for field duties. The reasons for this are varied ranging from poor service conditions, career prospects to social and family pressures.

The Indian public sector agricultural research system even with a very large agricultural education system has faced a reduction of 17 per cent in its human capacities in the past decade (Pal et al., 2012). And the reduction is not only in numbers and disciplines. It is also perceived, as discussed in a recent ICAR retreat, that the quality in terms of field experience has also suffered. In a subject like agriculture where it takes almost decade or more to build competence, this in the medium and long term indicates a future catastrophe in the making for agricultural institutions, especially Universities, This is especially so as shortfalls in post graduation severely affects agricultural research, education and extension systems. This is now so critical that many Universities and Research Institutions in the country do not have adequate trained and experienced manpower in areas such as plant breeding, plant pathology and veterinary sciences.
Inadequate and falling investments

India reduced investments in its agricultural education systems in the 1980’s and early part of 1990s. Along with reduced funding accompanied with poor leadership and injudicious political interference in all aspects of administrative and academic fabrics, these Institutions lost most of their academic excellence. The situation that now India faces in developing its trained agricultural manpower and skills is a stark choice between whether to pursue growth in number of Institutions or consolidate them and provide them the necessary wherewithal to pursue academic excellence and quality especially in emerging areas of academic pursuit. It is apparent that quantity without quality will not serve the purpose of development but enabling consolidation with appropriate investment and infrastructure in these Institutions can provide both, the necessary growth in student numbers while pursuing academic excellence. A policy and strategy shift is necessary now to bring the once considerable Indian agricultural education system to further contribute through academic excellence and innovation to India’s development in the future.

The need for revamping agricultural knowledge system for development

For India, the key impact expected from its knowledge system is on development, especially agricultural. India has a large, extension system in which, in addition to the state machinery, there are more than a hundred ICAR Institutes, about 65 agricultural Universities and nearly 650 KVKs to transfer technologies and advisory services to farmers. In addition, the State and Central Governments have ICT based advisory services for farmers through radio, television, phone and the Internet/World Wide Web. There are also some private TV channels. The private sector and the Civil Society also provide advisory services to farmers. However, most advice at present is episodic, event driven and generic problem based and very little contributes to innovation and value addition not only by farmers but also for and by the millions of small and medium agribusiness and agriculture related entrepreneurs who are processors, transporters, market intermediaries. These extension systems do not cater to the farmers, producers and market intermediaries for customized solutions with a basket of options needed when agriculture becomes more market driven and the now
growing demands from consumers regarding farm and food products. Apparently there is disconnect between development needs and what the educational institutions provide as extension. Further, today’s extension for a more knowledge driven agriculture requires that a continuous dialogue be maintained between structured scientific and technical organizations and agricultural communities for rapid innovation and its spread to occur. This does not happen with systems that are based on antiquated training and visit (T&V) based approaches that are slow in their responsiveness to transform. This results in low impact rates of new technologies and lack of farmer and producer led innovations as also innovations in value addition chains to be very slow and many a times non existent. Educational institutions now need to consider how they can enable more effective information use through learning in agricultural communities beyond the campus. There is an urgent need for research in new extension policies and strategies as also methods using new information and communications tools and techniques with the full and core involvement of educational institutions in India.

**Transforming Educational Institutions for a central role in Agricultural Knowledge Systems in India**

Transforming Educational Institutions to further build and strengthen the agricultural knowledge systems in India requires the following.

**Re-envisioning and including new academic areas**

The origins of the modern Indian agricultural Universities system was in the Land Grants Universities of the United States of America that were initially supplanted in the early 1960s and 70s but whose original concepts and principles were diluted and fully vacated by late 1980s. This resulted in their losing financial and consequentially academic freedom. Now, there is an urgent need to re-envision the role of educational institutions post the land grants Universities phase in transforming agricultural knowledge systems for development. The inclusion of more basic and adaptive trans-disciplinary research, inclusion of the private sector and enabling innovation for development and agricultural value addition are key areas to be considered in the re-visioning of these Institutions.
Connecting to Development Needs

Indian agricultural universities continue to teach disciplines and areas that have little connection to the transforming agriculture and rural development in the country. While the country’s agriculture rapidly shifts towards more market participation and value addition, agricultural university curricula and syllabi continue with conventional education focused on staple crops such as wheat and rice with little emphasis on horticulture, livestock production such as dairying and poultry and fisheries or even in environmentally friendly agriculture. Even in specializations such as Veterinary Sciences, the curricula focus on ambulatory care of individual animals rather than on preventive medicine, food animal practice, epidemiology and herd health, biosafety and public health. There are very few colleges that offer courses in agribusiness and entrepreneurship. Very few Institutions are equipped to offer advanced training and scholarship in new trans-disciplines such as biotechnology and bioinformatics, nanotechnology, ICT, space sciences and materials sciences as related to agriculture and the environment. Without these disciplines attracting the youth of today into agriculture science and teaching as a career is difficult if not impossible. The academic agenda and curricula of Indian agricultural institutions need to urgently change.

Consolidation of Institutions

An important issue is the mushrooming of agricultural Universities and colleges in India. This is in reverse of a trend being noticed elsewhere in countries at similar development stage as India such as China and Brazil. While the demand for trained agricultural graduates needed by India cannot be denied the current strategy, in view of reduced investments and falling human capacities of experienced teachers and academic leaders compounded by admission of fewer post graduate and doctorate students, of multiplying Universities rather than consolidating them is inexplicable other than when viewed in the context of political expediency to open new Institutes. However, the impact of this mushrooming is adversely affecting quality of education and learning so necessary for rapid development to a more knowledge based agriculture. India needs an urgent review of its agricultural education policy and
strategy within the need to rationalize and consolidate its entire National Agricultural and Innovation System.

**Financial Investment**

At the moment, Indian agricultural education institutions are financially very weak inhibiting their growth and development and achieving academic excellence. It is estimated that each of these Institutions, the 65 Universities and deemed Universities, will each need between a 100 million -500 million USD in the next 5-7 years depending on their size to transform to a new vision and rebuild their infrastructure and capacity to include new academic areas and reach an acceptable standard of academic standards comparable to Universities in the United States and Europe. These Institutions are wholly supported by the State and Central Governments. The Government and the public sector cannot at the moment make the investments that would be adequate to revamp and transform all the agricultural education Institutions in the country. A new strategy is now needed to improve the academic quality of these Institutions. This strategy will include the need to consolidate and strengthen a few Institutions so that the funds available are used efficiently and effectively to bring better quality agricultural education and knowledge systems. There is an opinion that due to entrenched vested interests, it would even be more cost effective to start a fresh with new Institutions rather than attempt to transform existing Institutions.

**Autonomy and Responsiveness to Stakeholders**

The current Government financing of these Institutions are also seriously influencing their autonomy. These Institutions at the moment have in reality no direct responsibility to their stakeholders other than the Government. Without the necessary autonomy in all aspects of academic management, from envisioning to setting academic agendas and curricula, and lack of responsiveness to stakeholders attaining academic excellence by these Institutions is difficult if not impossible. New ways of financing, even when it is largely from the Government, to ensure autonomy and responsibility to stakeholders in these Institutions are now needed. The Land Grants Model was one approach initially attempted but later abandoned for various reasons, mainly political and for the Government to gain control of the Institutions that were
influencing development in rural areas. Now, funding these Institutions through new approaches such as competitive grants evaluated by representative stakeholder organizations such as farmer cooperatives and Chambers of Commerce and the Civil Society may be one of the ways to ensure responsiveness and academic excellence. The co-optioning of the private sector, which has started to invest more in agricultural research and innovation in the country, to fund capacity development, research, technology generation and innovation can also be an avenue for part of the funding required to transform the agricultural knowledge system. However, it is apparent that Governments in developing countries which have large populations engaged in agriculture such as India cannot absolve themselves from funding agricultural education and learning and for bringing change for academic excellence and transforming agricultural knowledge systems. If they do not do so, a socio-economic and consequentially a political catastrophe awaits them.

Quality assurance, monitoring and evaluation and change in Reward and Accountability Systems for Faculty

As an immediate intervention, in addition to financial investments, educational institutions, which include the ICAR Institutes, the State Agricultural Universities and colleges affiliated to general Universities, engaged in teaching agriculture and environment related subjects, urgently need Institutional changes, which includes changes in statutes and governance towards academic independence and excellence and to enlarge the scope of providing education and learning especially through distance, open and off campus formal education and informal learning for agricultural communities along with formal, on campus students. An independent University Grants Commission like structure for agricultural Institutions with powers to assure academic quality through effective monitoring and evaluation at individual Institution and the system collectively is now needed. This may entail changes in Central-State relations as regards agriculture which is a state subject. But, for a country which has almost 65 per cent of its population dependent on agriculture and allied livelihoods and who need to rapidly shift to a more knowledge based economy, the gains from this can be immense.

For Indian educational Institutions to contribute to development the need for change
in accountability and reward systems of public sector agricultural development, extension, research and education systems is also urgent. Continuing education and regular up-gradation of academic skills need to become a norm rather than a formality. Under the University Grants Commission guidelines that also the ICAR and the State Agricultural Universities follow, there is formal provision of teachers to attend training courses for promotion and this has also been applied to scientists but these trainings are too short and span over time. There is little impact of these trainings, largely short term, on improving the quality of teachers and scientists. In fact, while primary and secondary school teachers need to undergo training, there is no such requirement for professors in Universities! Nor is training and skills enhancement compulsory for scientists and research managers. The resultant quality in teaching and providing learning is poor.

Reward and accountability systems for agricultural teachers and scientists in India reward them largely for scientific publications in journals and for books. The reward systems do not recognize contributions such as content for new digital media and contributing to learning outside the campus. This is a major barrier in generating digital content that can be used by web and cell phone based services to share new knowledge in a a more widespread manner and in offering distance, open and off campus learning. Training and skills enhancement, work processes that promote team work so necessary for generating new digital content, infrastructure such as digital repositories of text, images, audio and video clips and interoperable, re-useable information objects have not yet be developed by the ICAR, which should by its position, be its core function to fulfill its mandate. The development of these repositories using international standards and a prominent coordinating role of the ICAR would contribute significantly to strengthening content development for agricultural education and learning and transforming India’s agricultural knowledge system.

**India’s role in Transforming Agricultural Knowledge System Globally and International Agricultural Capacity Development**

India cannot escape its obligation as a responsible member of the global community and not participate in efforts to build agricultural capacities globally. India has one the
largest national agricultural research and innovation system and its experience and skills in building this system and its capacities remain valid for many countries especially in Sub-Saharan Africa and Central Asia to emulate in their current stage of development. India can do this by actively participating in global and regional initiatives such as the Tropical Agricultural Platform led by FAO and GCHERA, collaborate with AGRINATURA and RUFORUM for African agriculture and enter into bilateral arrangement with other reputed Universities in various countries. India can also open its educational facilities to foreign students and encourage foreign and expatriate faculty. India can also offer short and medium term training in specialized areas. It can also contribute to sharing of agricultural content for education globally.

India needs to learn how educational Institutions are transforming and re-envisioning their role and contributions to societies in other countries. It needs expertise to develop new curricula and educational content needed for its future development. It needs managerial expertise in academics. It also needs to know the use of new ICTs in enabling off-campus, distance and open learning. Opening its Institutions to foreign faculty can in many ways contribute to this as was done successfully in the 1960s when India opened its agricultural education and invited foreign teachers and experts to contribute to developing the State Agricultural Universities. India also needs to re-attract its large diaspora with expertise in agriculture and related areas to contribute and share their and Indian experiences in agricultural education and in transforming the role of educational Institutions in transforming agricultural knowledge systems.

**Conclusion**

There are several key trends that are impacting educational institutions in their transforming agricultural knowledge systems. These include re-envisioning the role of these Institutions to make their roles broader beyond increasing agricultural production and productivity, introducing new trans-disciplines in their academic agendas, consolidating them for greater efficiencies and academic excellence prior to investing in them, changing leadership, curricula, widening the catchment by offering education in new academic area and providing off-campus, distance, and open learning using new ICTS and considering them as hubs for agriculture and agribusiness innovation.
The Indian agricultural education system and along with it the agricultural knowledge system is at a crossroads. It needs urgent transformation institutionally, in revisiting their vision, consolidation, investment, capacity generation and quality assurance and widening its scope to offer formal, on campus and off campus distance, open and informal learning and innovation to agricultural communities so that India can bring about a more knowledge based agriculture in as short a period of time effectively and efficiently.

Note:

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References

