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Modernizing Higher Agricultural Education System in India to Meet the Challenges of 21st Century

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Abstract

Indian agriculture has come a long way from the situation "living from ship to mouth" to "food self sufficiency". The agricultural sector is getting more complex due to globalization, impact of climate change, entry of corporate sector in agriculture value-chain, expanding demand for processed food, and need for postharvest technology. India will need rich human capital of highly qualified, motivated, and well trained agricultural scientists to meet these challenges of 21st century. It is the responsibility of the State Agricultural Universities (SAUs) to provide such human resources. In the first green revolution, SAUs played a key role in generating technology and taking it to end users through effective integration of education, research, and extension. During the past 2–3 decades, the journey of higher agricultural education (HAE) got interrupted and SAUs are on fast track of deterioration. The paper indentifies major constraints facing HAE system in India. A few important ones include (i) difficulty in attracting bright/talented students, (ii) funding crunch, (iii) large number of vacancies, (iv) inbreeding of faculty, (v) lack of autonomy to the Vice-chancellors, and (iv) poor state–center and state–SAU relationship. The paper makes specific suggestions to address these constraints; compares functions of Land Grant Universities in USA with SAUs; discusses the role of external donors like USAID and the World Bank in support for HAE and in conclusion makes specific recommendations to modernize HAE.

1. Disclaimer: The views expressed in the paper are those of the author and not of Maryland University. Dr PM Tamboli is Trustee of AAHF, and Adjunct Professor and Director, International Training Program, Department of Environmental Science and Technology, University of Maryland, College Park, MD 20742, USA (email: ptamboli@umd.edu).

   During 2005–10, Tamboli visited more than 15 campuses of State Agricultural Universities, interacted with faculty, students, and farmers. In February 2010 he organized a national workshop on "Revitalizing Higher Agricultural Education in India" with the help of National Academy of Agricultural Research Management (NAARM), Hyderabad, India. The findings and recommendations of that workshop have been published in the form of a paper in Economic and Political Weekly (Challa *et.al.*, 2011).

Need/urgency for modernization of higher agricultural education (HAE)

India has come a long way from the situation "living from ship to mouth" to "food self sufficiency". On a world-wide basis, India today has 17% population, 11% livestock, 4.2% water, and 2.4% area. The country has 142 million ha cultivated and 60 million ha net irrigated area with 138% cropping intensity; 58% of population earn livelihood in agriculture. The agricultural sector contributes 14.5% to gross domestic product (GDP) (Ayyappan, 2012). Recently several papers have been published indicating that the agricultural sector has gone through different phases of growth, embracing a wide variety of institutional interventions and technological and policy regimes. A few recent papers include Ahluwalia (2011), Desai *et al.* (2011), Chand and Parapprathu (2012), and Lele *et al.* (2012). The bottom line is that India will be facing serious challenges to achieve a target growth rate of 4% to reduce poverty at a fast rate. Moreover the agricultural sector is getting more complex due to globalization, impact of climate change, entry of corporate sector in agricultural value-chain, diversification of agriculture towards high value commodities, expanding demand for processed food, and need for postharvest technology. To address these challenges, India will need rich human capital of highly qualified, motivated, and well trained agricultural scientists. It is the responsibility of the State Agricultural Universities (SAUs) to provide such human resources. Are we doing enough in terms of quality and quantity of building rich human capital to meet the needs of higher education in the 21st century?

HAE in pre-independence period

It is somewhat doubtful whether in the ancient times formal education was imparted in agriculture, although it is believed that agriculture was formally taught at Taxila and possibly Nalanda. Through millennia the farm education, gained through empirical research, was imparted by farmers of a village and nearby areas to each succeeding generation. In the early years of the 20th century, the British introduced formal education in agriculture, which was modeled on a European knowledge base because the traditional Indian knowledge base was considered hopelessly outdated and unscientific. Also the education was to be imparted primarily to revenue workers and landlords and not farmers. By 1947 India had 17 colleges of agriculture with annual enrollment of about 1500 students. These included the colleges at Coimbatore, Nagpur, Kanpur, and Pusa.

HAE in post-independence period leading to national food security

How did the modified Land Grant system universities come into being?

After Independence, the Indian University Education Commission was appointed and was headed by Dr S Radhakrishnan. In its report submitted in 1949, the commission urged that the country needed a continuous flow of scientific workers as well as leaders in all fields including agriculture. It was in 1954 that the first Indo-American joint team was appointed; in 1955 the first authorization was provided for five universities

contracts with United States Agency for International Development (USAID) to strengthen agricultural universities in India. The second Indo-American joint team appointed in 1959 made supplementary recommendations, which were a prelude to setting up agricultural universities on a modified basis of Land Grant pattern universities in the US. Dean Hanna of the University of Illinois prepared a blueprint of an agricultural university and circulated to all the state governments. On the basis of this and recommendations of Dr Ralph Cummings committee, the first agricultural university was established in 1960 at Pantnagar. Few more such universities were established and a Model act was passed.

What brought about first green revolution?

Political will and commitment under the leadership of the Minister C Subramaniam, innovative research by scientists from India and the CGIAR (Consultative Group on International Agricultural Research), and agricultural universities (with highly qualified and motivated faculty) played a key role, through effective integration of research and extension. Dr N Borlaug called it "Human Capacity Revolution". And India achieved self-sufficiency in food. Unfortunately, the status of SAUs has deteriorated in the past two decades. As pointed out by Mellor (2011) the journey of higher agricultural education got interrupted.

The current status of agricultural research

To increase productivity of per unit of land, there is need to develop a location specific technology package by a multidisciplinary team. This package of best practices should be economically viable and environmentally sound. Due to various constraints within Indian Council of Agricultural Research (ICAR), research has lagged behind and there is technology fatigue after first Green Revolution.

While addressing the 79th Annual General Meeting of the ICAR in 2008, the Union Agriculture Minister, Mr. Sharad Pawar said, *"That the pace of innovation in agriculture universities and research institutes of India is not satisfactory; therefore, remedial steps must be taken by the council. It must also put in place skilled and competent resources. There is need to revise course curriculum of agricultural education to make it more relevant."* In 2005, the Minister of Agriculture (Mr. Sharad Pawar) appointed ICAR Reorganization Committee (headed by Dr RA Mashelkar) to suggest the reorganization and procedural changes in the ICAR. Amongst many recommendations made by this Committee in its report, "Accelerating ICAR's journey towards excellence", was that India's Prime Minister should head ICAR. The same year another Committee, "Task Group (headed by Dr MS Swaminathan) on revamping and refocusing of national agricultural research" was constituted by India's Planning Commission. The Report admitted that bureaucracy was a problem,

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and added that political and administrative tinkering with staff selection process led to recruitment of subordinate scientists. The Group recommended setting up a National Board for Strategic Research in Agriculture that would act as an umbrella organization and coordinate several government agencies that fund research in overlapping areas of plant and animal sciences.

However, these recommendations have not been fully implemented. The ICAR needs major restructuring to be able to meet the needs of the 21st century. The ICAR is operating currently as a "complete" bureaucracy. Various reports and published papers (World Bank, 1983) have pointed out that in India, the research relevant to farmers' needs is not usually done, and more importantly the contact between research team and farmers is almost nonexistent due to fragmented responsibilities of extension between state governments and universities.

In January 2011 the ICAR prepared a paper "Vision 2030" to improve the performance of the Council (ICAR, 2011). However, human resources to realize the vision are not adequate; hence there is a need for modernizing HAE.

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The status of agricultural extension

In a recent study conducted by FAO (Food and Agriculture Organization of the United Nations) "The State of Agricultural Extension and Research Reforms in India – Strategic Priorities and Policy Options", SC Babu and co-workers did a detailed analysis using a case study of extension/research system in India and have given specific recommendations to improve performance of research and extension. One of the important recommendations is to develop a strategy for human resource capacity and management at all levels, especially at higher education level.

India has moved away from the earlier old extension services, Gram Sevaks, and T&V system. A new structure of Krishi Vigyan Kendra (KVK) (Farm Science Center) and Agricultural Technology Management Agency (ATMA) is in place. However, adequate human resources are lacking to make this system function effectively.

Status of higher education (other than agriculture)

Higher education in India in general is facing several crises related to governance, resources, and ethics. The quality of

education in Indian universities in general is not just poor but declining; post-secondary enrollment rate of age 18–23 years is only 18% in India as compared to 41% in USA. Only around 130 out of 600 universities and 2088 out of 30,000 colleges have received accreditation from the National Assessment and Accreditation Council, Bangalore. More universities are being established every year without showing any concern for high quality.

Status of HAE and SAUs

The situation in HAE is even worse. A large number of agricultural universities/colleges exist in India. There are more than forty-five SAUs, one Central Agricultural University, and five deemed (to be) universities. Between them these cover a wide range of subjects. These institutions attract a large number of students (UG 11,000; PG-MS and PhD 7,500). However, the SAUs are facing serious problems. Some of the major constraints are discussed below along with some suggestions on how to address them.

Difficulty in attracting bright/talented students

In general, agricultural education is not a preferred option for students. Based on the merit list of all India entrance competitive exams, brightest students go for medicine, engineering, law, business, etc., only those who do not get admission anywhere, end up in agriculture. Of course there are exceptions. Some effectual action needs to be taken to attract bright students in the field of agriculture.

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Funding crunch

Agriculture being a state subject, the statutory responsibility for agriculture is in the domain of the state governments. The SAUs get their annual budget from the state government. However, the budget grant is sufficient to meet salary component of the university to the tune of 87%, and the operational fund is only to the extent of 10%. Hence the SAUs are starved of funds to maintain buildings, laboratories, and infrastructure. Ideally the ratio should be 60:40. This situation needs to be rectified by providing adequate operating budget to universities by respective state governments.

To address funding crunch, universities should be allowed and encouraged through policy directives to attract private funding into agricultural education; the universities

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should be encouraged to be self-sustained over a period of time; the Vice-chancellors should be consulted at the time of budget formulation with the Planning Commission and the state departments of agriculture should provide adequate operation funds.

Large number of vacancies

Suresh Pal and Derek Byerlee (2003) and Jha and Sant Kumar (2006) have analyzed the HAE system and concluded that the number of faculty decreased significantly during 1990s and has further depleted in recent years. The number of vacancies is very high; some 43% of the approved positions are filled and no significant recruitment has taken place in recent years. A large number of faculty is retiring in 2–3 years time and they are not very active. This has resulted in having heavy work load on the remaining faculty and consequently poor performance in teaching and no time for research or extension. To address staffing shortage it is suggested that SAUs should undertake recruitment against vacant positions on priority basis and state departments of agriculture should also support this action on priority basis. In the meantime the SAUs should be allowed to hire experienced and retired teachers from within the country. A rolling faculty scheme may be launched to enable these teachers to travel to any place and teach a course.

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Inbreeding

There is high "inbreeding" in the staff recruitment. Recent figures show that 51% of the faculty has degrees from the alma mater. Also the staff turnover is low, which reduces opportunity to introduce new blood in the faculty. Currently it is estimated that 46% faculty has been in the position for over 15 years.

Lack of autonomy to the Vice-chancellors

The Vice-chancellors do not enjoy academic freedom; they have autonomy only on paper but not in real sense. They need state government's permission/clearance to appoint and promote faculty; they are not consulted about their budget needs. More importantly, there is considerable political interference in their day to day activities. There is no accountability mechanism to assess relations between the SAUs and the state government.

Poor state–center relationship

The relationship of state–center and state–SAUs is one of the major constraints in HAE system. Since agriculture is a state subject, ICAR plays only a facilitating role by providing development grant. In view of the changing context, the agricultural education and research may be appended to the Concurrent List of the Constitution, leaving agriculture per se with the states. The Government of India may also consider constituting a national regularity authority for agricultural education to ensure equity assurance and accreditation.

Weakness in teaching and learning process

The other problems confronting SAUs include (i) traditional method of teaching material and aids with age-old lecture notes, (ii) lack of good textbooks combining theory and case studies in the Indian context, (iii) inability of most of the faculty to inspire and motivate students and promote interactive classes, and (iv) ineffective communication skills of faculty. All the weaknesses in teaching and learning process can be addressed by retraining faculty and introducing modern methods/technology in teaching.

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Lack of Internet connectivity

There is lack of Internet connectivity for national and international journals. All SAUs provide computers, but the connectivity on many campuses is unsatisfactory. The students do not have access to books and international and national journals. This issue needs to be addressed.

Faculty development

There are very limited opportunities for the faculty to attend international and national seminars and workshops. They also do not get opportunities to take sabbatical leave to improve and update their knowledge. It is important that the faculty is encouraged to participate in international and national seminars and workshops to keep them well informed about global development in their field.

Lack of networking and public–private partnerships in education

With the advent of the World Bank funded National Agricultural Technological Project (NATP), partnerships in research in a

consortium modes have been nurtured in the National Agricultural Research System. Most of the SAUs have partnerships with the private sector and NGOs in this effort; on the contrary, in the case of academic programs, most of the universities handle their own curriculum agenda without involving any outside agencies in handling the courses, and no MOUs are signed between the universities in handling different courses. Some efforts have been made by some universities in having exchange programs with universities from abroad but the costs involved and logistics prevent the exchange of students. Such exchange programs do exist in PG programs only with students doing course work abroad and project work in the university; for example, Haryana Agricultural University with the University of Maryland. Exchange of faculty from across the universities is another issue. Within the university some colleges have sharing of faculty expertise for courses at both UG and PG level but sharing of faculty between the universities has been a far cry.

Private sector involvement

Some universities have tie-ups with private sector agencies for placement and conduct campus interviews. Most of the universities have either reactive or inactive Placement Cells which at the most provide information to the students. The private sector has its own professional requirement of skills. They require professional skills, domain skills, management skills, and other soft skills such as communication skills, presentation skills, etc. Most of the graduates possess academic intensive skills but do lack the skill required for jobs in private sector. Imparting such skills to the students has not been emphasized by the Deans Committees in the curriculum and by way of organizing academics in the universities. Inviting industry to discussions on the curriculum has not been encouraged by the university academia and even the efforts made have been very meager.

To address staffing shortage it is suggested that SAUs should undertake recruitment against vacant positions on priority basis and state departments of agriculture should also support this action on priority basis.

There is high "inbreeding" in the staff recruitment. Recent figures show that 51% of the faculty has degrees from the alma mater. Also the staff turnover is low, which reduces opportunity to introduce new blood in the faculty. Currently it is estimated that 46% faculty has been in the position for over 15 years.

The manpower stock estimated for 2010 was 303,980 in agricultural sciences and 75,780 in veterinary sciences (IAMR, 2001). This increase in stock will come from the annual supply of about 13,000 agricultural graduates and 4,000 veterinary graduates. The estimated annual national demand for these graduates is much less than the estimated stock of manpower. With secure jobs in organized

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sector (Government) declining; there is an urgent need for the universities to encourage entrepreneurship in the graduates. Interestingly, the percentage of graduates who are self-employed is much higher in veterinary sciences than in agricultural sciences. The agricultural education system is designed to meet the manpower needs of the government and hence there is hardly any motivation for self-employment. A survey conducted by them indicates that more than 80 per cent of students preferred jobs in the public sector such as government or academic and research though the opportunities are limited or on the decline.

In order to show how a state university can be effective, a comparison between SAUs in India and Land Grant Universities in USA, where the system is working very well is given in Table 1. There is full integration of the three functions of teaching, research, and extension.

Role of external donors

Donor assistance in the agricultural sector in the past 65 years has been substantial. United States has been a major donor starting from PL 480 assistance in establishing six SAUs. The Rockefeller Foundation, Ford Foundation, and Fulbright have invested substantial amounts in training large number of agricultural scientists (Tamboli and Nene, 2011). However during the past two decades, this support significantly diminished partly due to bad economy in USA.

The role and impact of the World Bank's assistance to Indian agriculture has been recently summarized (Sidhu, 2012). Agricultural Human Resource Development (India) project was more directly involved in improving SAUs. This project achieved most of its objectives. In general, foreign assisted projects provided valuable input, but they were not sustainable. Moreover, there has been no follow up after the end of that project. In the presentation of Ayyappan (2012), it is mentioned that the National Agricultural Education Project (US$ 218.4 million) is in the pipeline. It is recommended that lessons learned from the previous projects should be considered in designing and implementing this new project.

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Table 1. Comparison of State Agricultural Universities (SAUs) in India and Land Grant Universities (LGUs) in USA.

SAUs	LGUs
Integration of research, teaching, and extension	
Three functions not integrated	Three functions fully integrated
Faculty finds little time for research; extension work with the state and not university faculty – little formal exchange	Faculty often has split responsibilities; teaching 75, research 25 or other ratios. The Dean supervises all functions
Funding arrangements	
The state provides 100% funding for teaching and research and ICAR provides development fund	For academic program: State provides 50% and tuition contributes 50%; for research 50%, Federal 15%, and grants 35%; for extension 53%, Federal 12%, counties 20%, grants 15%
Universities starved for operational and maintenance funds	Adequate funding for salaries and operation
Program planning: academic, research, and extension	
Academic: Dean with faculty and Academic Council	Academic: Campus, college, and Deans Committees
Research: Director with Research Council	Research: Producers' group, extension workers, State and funding agencies, and then approved Program Planning and Development Committee
Extension: Director with Extension Council, State officials, and farmers' representatives	Extension: Formulated by County Advisory Committee, State Advisory Committee, and National Advisory Committee
Functioning: Not effective due to poor linkages	
Faculty evaluation	
Faculty submits annual performance reports to Dean for review	Annual faculty review and evaluation; CVs updated every 3 to 5 years
Promotion not related to review or evaluation by Students	Dean reviews faculty progress with department head and recommends advancement for salary and position
Promotion on time bound frame	Students' evaluation of the teacher is given weight

Way Forward— recommendations

India's system of agricultural education continues to face serious problems. This is the consequence of lack of political will Numerous proposals to improve the performance of SAUs and other higher institutions have been discussed in the past five years. However, little action has been evident after all the studies, needs assessment, vision statements, and promises of action. and commitment and collective failure of action by the central government, state governments, local officials, and the agricultural universities and other institutions. Improving the quality and relevance of agricultural education requires a fundamental change of approach in governance and control, financial sustainability, accountability, autonomy, transparency, and meritocracy. Immediate and drastic action is required at all three levels.

Some of the specific actions required are:

By Central and State Governments:

a. At the Central level, the Ministry of Agriculture and the ICAR in coordination with State authorities should take leadership role in improving overall governance of the SAUs by ensuring adherence to the provisions of the Model Act.

b. A central regulatory authority should be established, which would accredit universities for maintaining high standards in agriculture teaching, research, and extension, and monitor system delivery and quality.

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c. Review, develop, and adhere to clear responsibilities and relationships for the center, state, governing bodies, and Vice-chancellors.

d. Ensure appointment/nomination of qualified members to the governing boards and as Vice-chancellors.

e. Central Government/ICAR may consider providing block grants to SAUs to improve teaching, research facilities, and for starting new departments.

f. Streamline functioning of ICAR: As recommended by various committees appointed by the Ministry of Agriculture and by the planning commission, there is urgency to take bold steps to strengthen the role and management of ICAR towards higher agricultural education. Just as other central research organizations such as CSIR and Space and Atomic Energy Agencies, the Prime Minister of India should head ICAR.

g. Provide adequate funds. Most of the state universities are starved for funds especially operating funds. Currently the ratio between staff and operational budget is approximately 90:10. The desirable ratio is around 60:40. The state should ensure output based sustainable and uninterrupted financial support and allow universities to diversify and generate their own income sources and attract private funding; the universities should be encouraged to be self-sufficient over a period of time.

h. Grant autonomy and authority to SAUs to make crucial management, academic, student admission and staff appointment, and promotion decisions; establish clear criteria for interventions and avoid political interference .Currently Vice-chancellors are treated like subordinates to senior bureaucrats and politicians. Since the decision-making powers of Vice-chancellors are curtailed, students, faculty, and workers turn hostile to them. To achieve excellence, universities should enjoy full administrative and academic autonomy with no interference from outside. This would attract distinguished persons of integrity to the position of Vice-chancellors and would ensure smooth functioning for advancing university teaching, research and extension services. Selection of each Vice-chancellor should be by a committee of eminent scientists who are also known for their impeccable integrity. The recommendation of the selection committee should go directly to the Chancellor for action. The Vice-chancellor should be involved in planning commission's exercise, so they have opportunity to ensure regular flow of adequate funds for the activities planned.

i. At the central level, initiate a learning forum to bring together concerned state and institutional leaders to discuss the changing skills needs, challenges facing SAUs, strategies for effective governance, deliverables and its quality through sharing of knowledge, experience, good practices, and study visits.

j. Appoint an International Review Committee in order to put Indian higher education at par with the world class universities, it is recommended that an International Review Committee be constituted comprising educators, researchers, and social scientists drawn from India and outside experts. The terms of reference of such committee should be to recommend specific and detailed action plan to modernize higher agricultural education in India. There should be prior assurance from the Central and State governments and also ICAR that the recommendations of this committee will be implemented.

At the Institutional level:

a. Boards of Governors should ensure good governance by prudent approaches and accept their collective and individual responsibilities. They should ensure and respect institution's autonomy and accountability.

b. Establish an institution-level committee including external experts to monitor and evaluate performance of teaching, research, and extension activities. The institute should also monitor student learning skills and employment outcomes of its recent graduates. Strengthen links with industry and farm community.

c. Periodically review and provide flexible (need based) education and practical skills.

d. Monitor outputs and improve efficiency and cost effectiveness of financial and other resources.

e. Provide adequate faculty staff: The number of vacancies is very high; some 43% of the approved positions are filled and no significant recruitment has taken place in recent years. Large numbers of faculty members are retiring in 2–3 years period. It is recommended that SAUs should undertake recruitment against vacant positions on a priority basis; SAUs should be allowed to hire experienced and retired faculty from within the country. There is urgent need to have short- and long-term master plan for human resource development for SAUs.

f. Encourage faculty development program: The faculty should be given plenty of opportunities to attend national and international seminars and workshops; and to take sabbatical leave to improve and update their knowledge and be well-informed about the global

development in their respective fields. The number of research papers published in peer reviewed journals should be a criterion for promotion, and not just the seniority.

g. Upgrading of teaching and research methods: Teaching using blackboard and lecture notes should be discouraged; instead extensive use of latest computer-based and audio-visual methods should be employed and interactive teaching-learning process should be encouraged. Teaching students to think innovatively with originality should be promoted. Computer connectivity is very limited on many campuses. The students and faculty do not have Internet access to national and international journals. This needs to be rectified.

h. The Vice-chancellors should also devolve the decision-making powers to academic, research, and other University level councils.

i. The universities should develop immediate and mid-term road maps and action plans for reforms and modernization and seek necessary approvals and support for implementation. The SAUs should also address resistance to change and achieve broad support from internal (within institution) and external sources.

Concluding remarks

India is not short of funds or talent. With aggressive but sensible political will and commitment, India can achieve excellence in higher agricultural education comparable to any world class universities. India had done it in the past and can do it again.

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