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Role of State Agricultural Universities and Directorates of Extension Education in Agricultural Extension in India

K.M. Singh¹, M.S. Meena² and Burton E.Swanson³

ABSTRACT

In India, the first SAU was established in 1960 at Pantnagar in Uttar Pradesh. The SAUs were given autonomous status and direct funding from the state governments. They were autonomous organizations with state-wide responsibility for agricultural research, education and training or extension education. The establishment of the SAUs, based on a pattern similar to that of the land-grant universities in the United States, was a landmark in reorganizing and strengthening the agricultural education system in India. These universities became the branches of research under the ICAR and became the partners of the National Agricultural Research System (NARS). The green revolution, with its impressive social and economic impact, witnessed significant contributions from the SAUs, both in terms of trained, scientific work force and the generation of new technologies. However, most of the agricultural universities in India continue to be dominated by top-down, monolithic structures that follow a limited extension mandate. None of the post-Training-and-Visit (T&V) system extension reforms could revitalize it to meet the demands of a changing agricultural context. The profusion of uncensored information through mass media and cyber sources has long-term consequences of generating public distrust and alienation from agriculture. This is attributed to the lack of a proper mechanism for verifying the accuracy and viability of the information transmitted. As in most of the developing countries, transfer of technology remained largely in the domain of the State Department of Agriculture (DOA), and SAUs are mandated to serve only a limited extension role in technology dissemination activities. The paper tries to critically review the extension activities of the SAUs and their Directorates of extension Education in India.

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HISTORICAL DEVELOPMENT OF THE SAUS AND DOEE IN UNIVERSITIES WITH AGRICULTURAL FACULTIES IN INDIA

In its early phases, the Indian agricultural education system was in the domain of public-funded general universities. Agricultural research and education received major support in the first decade of the 20th century when Lord Curzon was the Viceroy of India. By 1905, only six agricultural colleges had been established in Pune (Maharashtra), Kanpur (Uttar Pradesh), Sabour (Bihar), Nagpur (Maharashtra), Faisalabad (now in Pakistan) and Coimbatore (Tamil Nadu) with annual funding of Rs. 2 million by the government of India. These colleges were adequately equipped with staff and laboratories and mandated with research and teaching initiatives. In 1926, the Royal Commission placed emphasis on the importance of a strong research base for agricultural development in India.

The most significant milestone was the establishment of the Imperial (now Indian) Agricultural Research Institute (IARI) at Pusa (Bihar) in 1905. Due to an earthquake in 1934, the Pusa institute was shifted to New Delhi in 1936. The Royal Commission established the autonomous Imperial (now Indian) Council of Agricultural Research (ICAR) in 1929. It was mandated to promote, guide and coordinate agricultural research with a non-lapsing fund of Rs. 5 million. The establishment of the ICAR empowered agricultural research in India. However, the ICAR had no administrative control on research institutions in the provinces.

At the time of independence in 1947, only 17 agricultural and veterinary colleges were established to focus on training of students in agriculture, whereas the State Departments of Agriculture and Community Development focused on research and extension. There were no close linkages between agricultural colleges and research departments to ensure maximum utilization of proven technologies. Instead of costly agricultural education and limited resources, regional interests pressed for the establishment of a large number of new agricultural colleges during the early post-independence period.

From 1953 to 1960, the number of agriculture/veterinary colleges almost doubled. In spite of inadequate financial support, rapid spread of agricultural colleges affiliated with traditional universities led in the downward slide of standards in education, which became a serious problem. Accordingly, the pace of progress remained slow, and production technology developed at these institutions did not keep pace with the fast changing requirements. Therefore, it was realized that both the system of education as well as the set-up of the agriculture/animal sciences institutions needed to be reorganized to serve as an effective vehicle for agricultural progress and development. This necessitated a review of the existing system of agricultural education.

Recognizing the weakness of the then existing educational system and need for linking programs of agricultural education with production programs, the University Education Commission (1948) headed by Dr. S. Radhakrishnan suggested the establishment of "Rural Universities." This recommendation was strengthened by the proposals made by two Joint Indo-American Teams (1955 and 1960), which endorsed the establishment of State Agricultural Universities (SAUs).

The United States Agency for International Development (USAID) and American land-grant universities helped with the development of SAUs in India. In some developing countries, especially in Asia, agricultural research and education is organized under an autonomous agricultural university based on the pattern of the land-grant universities in the United States of America. The SAUs of India, Pakistan and the Philippines are based on this model as well.

In India, the first SAU was established in 1960 at Pantnagar in Uttar Pradesh. The SAUs were given autonomous status and direct funding from the state governments. They were autonomous organizations with state-wide responsibility for agricultural research, education and training or extension education. The establishment of the SAUs, based on a pattern similar to that of the land-grant universities in the United States, was a landmark in reorganizing and strengthening the agricultural education system in India. These universities became the branches of research under the ICAR and became the partners of the National Agricultural Research System (NARS). The green revolution, with its impressive social and economic impact, witnessed significant contributions from the SAUs, both in terms of trained, scientific work force and the generation of new technologies.

The SAUs are headed by a Vice-Chancellor, governed by a board and advised by an advisory committee. The governing boards of the SAUs have representatives from government, farmers and agri-business. Being autonomous organizations, they are able to effectively integrate research and education and carry out their mandate. The SAUs receive core funds for research and education from the state governments and substantial grants from the national agricultural research council or national institutes. The second National Education Commission (1964-66), at that time headed by the University Grant Commission Chairman, Dr. D. S. Kothari, recommended the establishment of at least one agricultural university in each Indian state. These universities imparted education on all aspects of agriculture on the same residential campus and integrated teaching with research and extension.

Subsequently, implementation of the recommendations of the Education Commission (1964-1966) and Review Committee of Agricultural Universities (1977-1978)

streamlined their functioning, and all matters related to agricultural research in the states were transferred to the universities. According to Review Committee of Agricultural Universities (1978), an essential feature of the agricultural university system is the acceptance of the philosophy of service to agriculture and to rural communities with the following mandates:

- State-wide responsibility for teaching, research and extension education.
- Integration of teaching, research and extension at all levels of the university administration.
- Multi-disciplinary teamwork in the development programs of education, research and extension.
- Acceptance by all concerned in the university of a philosophy of service to agriculture and the rural community and emphasis on programs that are directly and immediately related to solving social and economic problems of the countryside.
- Quick communication of new knowledge to students in classrooms, to extension personnel and to farmers.
- Programs giving specialized training to the rural youth and adult men and women who are not candidates for degrees, through departments involved in responsibility for the subject matter being taught.

To accomplish these commitments, there is a need for adequate and efficient extension to be set up for the speedy and effective communication of new knowledge and technology to extension agents and to farmers. As agriculture plays a very important role in the Indian economy, setting up an adequate number of agricultural universities was considered very important. However, the responsibility for extension rests with the Department of Agriculture and Cooperation (DAC) and the Department of Animal Husbandry, Dairying and Fisheries (DADF), which are under the Central Ministry of Agriculture.

CURRENT STATUS

The SAUs are the major partners in growth and development of agricultural research and education under the NARS. All important states have at least one SAU, and most of the SAUs are multi-campus universities. Some states have established new SAUs by elevating an old campus to the university level. Although efforts were made to establish the ICAR, institutions in the major production state for the mandated commodity, there appears to be some influence of political-economic factors. For instance, a large number of institutions were established in the northern and southern states—the states having larger representation in the Union Ministry of Agriculture. Meanwhile, western and north-eastern states were given low priority.

A large number of non-agricultural universities, government organizations and public sector undertakings are also involved directly or indirectly in agricultural research. Some universities, like Banaras Hindu University, have independent faculty for agricultural research and education, while government departments or scientific organizations—like the Department of Science and Technology (DST), Department of Biotechnology (DBT), Council of Scientific and Industrial Research (CSIR), Department of Research and Development Organization (DRDO), etc.—conduct or support agricultural research directly or indirectly. To some extent, the public sector industrial units are also involved in agricultural research, mainly on inputs. The private sector undertakes research for the development of embodied technologies, i.e., chemical, mechanical and biological (only hybrids). However, private sector research, so far, is adaptive in nature and is expected to intensify in the years to come with the adoption of favorable industrial and regulatory policies. Several private foundations, both national and international, also conduct and/or invest in agricultural research in the country.

The ICAR as an apex body coordinates research and promotes inter-institutional research linkages. Since the ICAR supports SAUs through regular grants, it has direct participation in the management of the SAUs. In addition, regional committees were formed in 1975 to assess the status of research, extension and education in the ICAR institutes and the SAUs in the eight regions of the country. These committees also make recommendations to undertake research on immediate problems of a region. Officials from the ICAR, ICAR institutes, SAUs, State Line Department, Non-Governmental Organizations (NGOs), members of parliament and farmers' representatives are members of these committees. Another informal but effective link between various research institutions is the cross-nomination of members in various committees and scientific panels. These committees and scientific panels have a major say in the planning and management of research. Efforts are made to ensure effective use of research resources and to avoid duplication of research efforts. Research collaboration with the Consultative Group on International Agricultural Research (CGIAR) System, NARS and research foundations overseas, etc. is operationalized by the ICAR through the Department of Agricultural Research and Education (DARE). However, SAUs can also directly collaborate with these international organizations. Linkages with the national and private research organizations are direct. Public research institutions extend support by activities such as supplying germplasm and training facilities to the private sector. Over a period of time, agricultural universities in India have grown and to-date the list of SAUs, central universities, deemed-to-be universities and central universities with agricultural faculty is as follows:

STATE AGRICULTURAL/CENTRAL UNIVERSITIES

- Acharya N G Ranga Agricultural University, Rajendranagar, Hyderabad, Andhra Pradesh
- Anand Agricultural University, Anand, Gujarat
- Assam Agricultural University, Jorhat, Assam
- Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia West Bengal
- Bihar Agricultural University, Sabour, Bihar
- Birsa Agricultural University, Kanke, Ranchi, Jharkhand
- Central Agricultural University, Imphal, Manipur
- Chandra Shekar Azad Univ. of Agriculture and Technology, Kanpur, Uttar Pradesh
- Chaudhary Charan Singh Haryana Agricultural University, Hissar, Haryana
- Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur, Kangra, Himachal Pradesh
- Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra
- Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishi Nagar, Akola, Maharashtra
- Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Solan, Nauni, Himachal Pradesh
- Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar, Uttarakhand
- Guru Angad Dev University of Veterinary and Animal Sciences, Ludhiana, Punjab
- Indira Gandhi Krishi Vishwavidyalaya, Krishak Nagar, Raipur, Chhattisgarh
- Jawaharlal Nehru Krishi Vishwavidyalaya, Krishi Nagar, Jabalpur, Madhya Pradesh
- Junagadh Agriculture University, Moti Baug, Agril. Campus, Junagadh, Gujarat
- Karnataka Veterinary Animal and Fisheries Science University, Bidar, Karnataka
- Kerala Agricultural University, P.O Vellanikkara, Thrissur, Kerala
- Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan
- Maharashtra Animal Science and Fishery University, Nagpur, Maharashtra
- Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra
- Marathwada Agricultural University, Parbhani, Maharashtra
- Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad, Uttar Pradesh
- Navsari Agricultural University, Vijalpore, Navsari, Gujarat
- Orissa University of Agriculture and Technology, Siripur, Bhubaneswar, Orissa
- Punjab Agricultural University, Ludhiana, Punjab
- Rajasthan Agricultural University, Bikaner, Rajasthan
- Rajendra Agricultural University, Pusa, Samastipur, Bihar

- Sardar Vallabh Bhai Patel University of Agriculture and Technology, Modipuram, Meerut, Uttar Pradesh
- Sardarkrushinagar-Dantiwada Agricultural University, Sardarkrushinagar, Dantiwada, Banaskantha, Gujarat
- Sher-E-Kashmir University of Agricultural Sciences and Technology, Railway Road, Jammu
- Sher-E-Kashmir University of Agricultural Sciences and Technology, Shalimar, Srinagar
- Sri Venkateswara Veterinary University, Tirupati, Chittoor, Andhra Pradesh
- Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu
- Tamil Nadu Veterinary and Animal Sciences University, Madhavaram Milk Colony, Chennai, Tamil Nadu
- University of Agricultural Sciences, Dharwad, Karnataka
- University of Agricultural Sciences, Bangalore, Karnataka
- UP Pandit Deen Dayal Upadhaya Pashu Chikitsa Vigyan Vishwa Vidhyalaya Evam Go Anusandhan Sansthan, Mathura, Uttar Pradesh
- Uttar Banga Krishi Vishwavidyalaya, Cooch Behar, West Bengal
- West Bengal University of Animal and Fishery Sciences, Kolkata, West Bengal
- University of Horticultural Sciences, Venkataramnagudem, West Godavari, Andhra Pradesh
- Rajmata VRS Agricultural University, Gwalior, Madhya Pradesh
- University of Horticultural Sciences, Navanagar, Bagalkot, Karnataka
- University of Agricultural Sciences, Raichur, Karnataka

DEEMED-TO-BE UNIVERSITIES

- Indian Agricultural Research Institute, Pusa, New Delhi
- Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh
- National Dairy Research Institute, Karnal, Haryana
- Central Institute of Fisheries Education, Mumbai, Maharashtra
- Allahabad Agricultural Institute, Allahabad, Uttar Pradesh

CENTRAL UNIVERSITIES WITH AGRICULTURAL FACULTY

- Banaras Hindu University, Varanasi, Uttar Pradesh
- Aligarh Muslim University, Aligarh, Uttar Pradesh
- Vishwa Bharti, Shantiniketan, West Bengal
- Nagaland University, Medzipherma, Nagaland

THE DIRECTORATE OF EXTENSION EDUCATION

The Directorate of Extension Education (DOEE) is the nodal agency of SAUs for promoting agricultural development in the state through quick transfer of technology by providing training, consultancy and farm information to line departments' professional extension personnel and farmers. It also involves the assessment, refinement and adoption of technology through on-farm testing and front-line demonstrations. The directorate provides guidelines, monitors and evaluates the extension programs of Krishi Vigyan Kendras (KVKs) functioning under SAUs. The directorate also extends its support to the state departments through disseminating farm information by publishing literature on different agricultural disciplines and related subjects. Thus, the three principal, functional areas of the DoEE are training, consultancy and communication. The directorate has a team of multi-disciplinary scientists who work in participatory mode in close coordination with the Department of Agriculture, Animal Husbandry, Horticulture, Forestry, Cooperatives, Panchayat Samities and other agencies engaged in the betterment of rural people.

Mandate of the Directorate of Extension Education

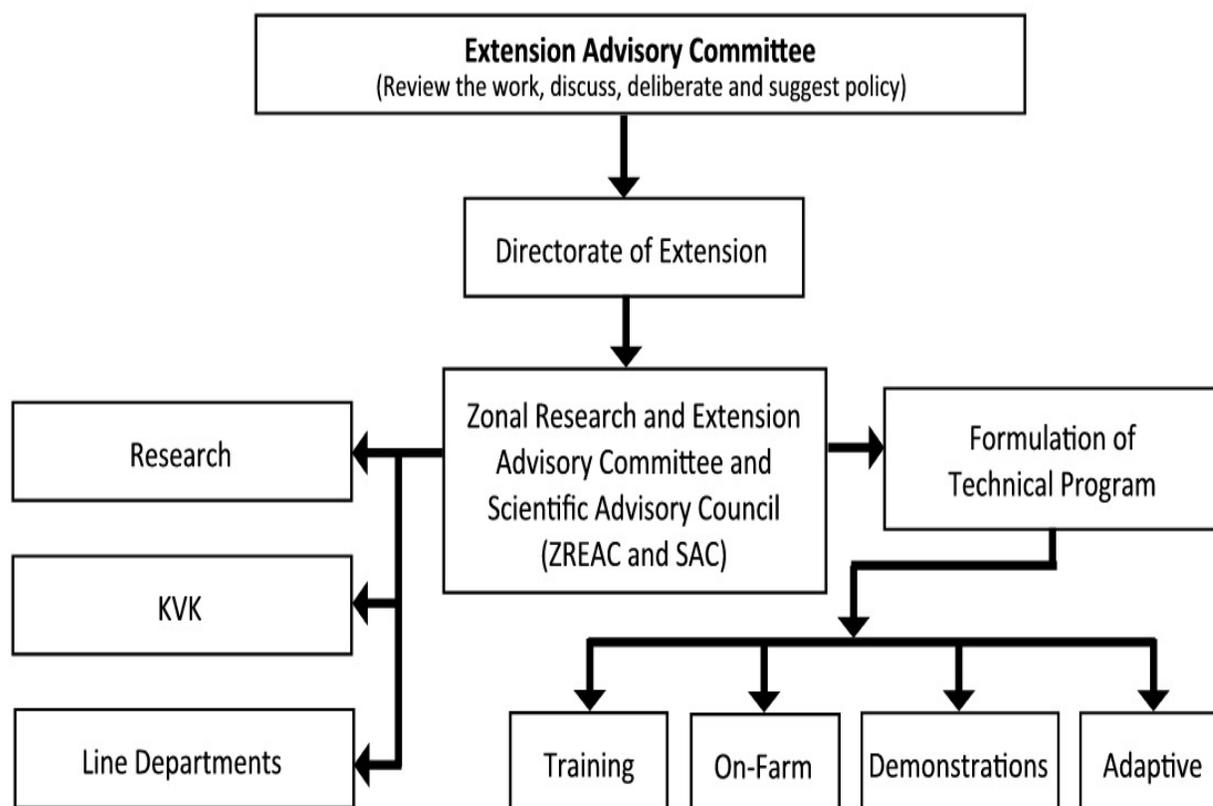
- To formulate and impart in-service training to different categories of officers and functionaries from line departments of state and non- government organizations.
- To conduct short and long-term vocational trainings for farmers, farm women, youth and school dropouts.
- To assess and refine the latest agricultural technology through front-line demonstrations for their wider adoption.
- To provide farm information services through various extension activities, including literature, for the quick dissemination of technology.
- Through the DoEE, the university extension service maintains live and intimate links with the research departments' on one hand and with the field-level functionaries of different state departments, development agencies and farmers on the other hand.

Organizational Structure of the Directorate of Extension Education

The Directorate of Extension Education (DoEE) conducts its extension activities through its headquarters, KVKs, Krishi Gyan Kendras (KGKs), etc. The directorate disseminates the latest technological innovations through farm advisory, training, information and communication services by involving scientists from different departments of the university and research institutions. It aims to serve as a link between research, extension and farmers and provide critical feedback for university research as well as to the main extension system. A well-defined mechanism is followed involving the Directorate of Research, the line departments and extension education units while formulating technical programs for different units of the DOEE.

As per mandate, a Scientific Advisory Committee is constituted at each KVK for assessing, reviewing and guiding their programs and progress. The members of this committee comprise a cross-section of scientific and farming communities—representatives of both government and non-government organizations who are directly or indirectly involved in the process of agricultural training, production and development. The ATIC is a constituent unit of the directorate which serves as a single-window delivery system to help farmers and other stake holders by providing solutions to location-specific problems and making all technological information, along with technology inputs, available. The organizational set up and extension mechanism of the DoEE is presented in Figures 4.1 and 4.2 (on the next page).

Figure 4.1: A Typical Organizational Set-Up of the Directorate of Extension Education at the State Agricultural University Level.

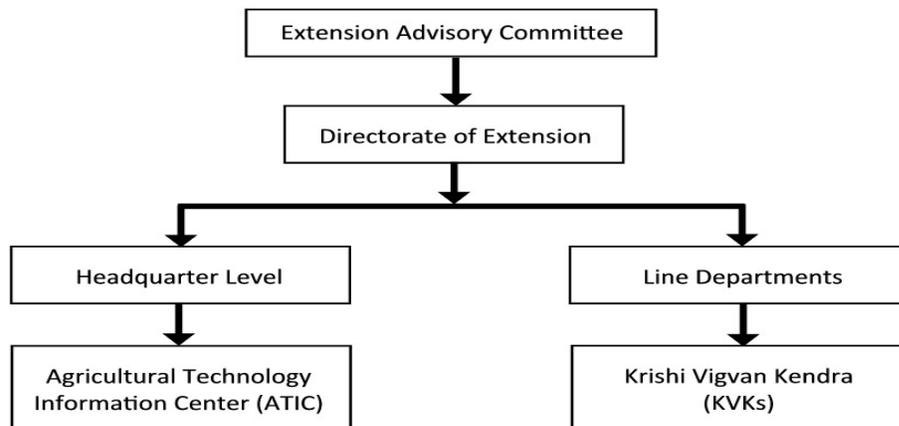


Approaches and Methods used by the Directorate of Extension Education

ELECTRONIC MEDIA-INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

ICT has a major role to play in all facets of Indian agriculture. The extensive use of ICT and its infrastructure would therefore be a critical component of the strategy to revitalize the national extension system. The directorate usually arranges radio talk—discussion by university experts on All India Radio. The scientists from headquarters, KVK and KGK also deliver radio and TV talks regularly for the benefit of the farming community. Integrated use of both the conventional as well as upcoming electronic media like Intra and Internet, information kiosks, cable TV, mobile telephones, vernacular press and other print media is the way forward—by pooling and effective use of ICTs. The radio and Doordarshan (public television broadcaster of India) cover special activities carried out by the university such as kisan mela, agricultural officer workshops, training, field days, kisan goshti, etc.

Figure 4.2: A Typical Extension Activities Mechanism of the Directorate of Extension Education



MASS MEDIA

Among various extension methods, the use of media is useful in creating awareness and stimulating interest, along with large coverage of the audience (Hussain, 1997; Okunade, 2007). New and improved agricultural technologies, developed in Agricultural Research Institutes, universities, the private sector and often by the farmers themselves, have to be disseminated among the masses in order to increase productivity and overcome hunger and poverty. In this context, farmers need adequate exposure to information on technologies that may be available. Research has shown that by-and-large farmers' exposure to information is an important factor influencing their technology adoption behavior. In South Asian countries, including India, it is primarily the public extension services that are mandated to disseminate new agricultural technologies.

The usual mechanism of technology dissemination is from research to extension; and extension, in turn, passes on the messages to the end-users (research-extension-farmers). The process is constrained in several ways: (i) the role of the media is not high on the agenda, and mass media are not usually considered in technology transfer programs, (ii) the dissemination process is constrained where the research-extension linkage is weak, (iii) the technology transfer process, being primarily dependent on the physical presence of the extension worker, is limited in scale and is often slow. The involvement of mass media in technology transfer can seemingly help overcome these constraints. Print media such as newspapers, magazines, leaflets, booklets, posters and handbills are widely used in technology transfer by the DoEE. Agricultural technology supplements are published along with daily or weekly newspapers by most of the SAUs or the DoEE. Agricultural periodicals/magazines or technical bulletins are often used for disseminating agricultural technology information among farmers by most of these institutions.

ORGANIZING FARMERS' FAIRS AND FIELD DAYS

The directorate is engaged in refining and disseminating agricultural knowledge to farming communities through a network of KVKs in various agro-climatic zones. The directorate organizes farmers' fairs and field days for the active participation of farmers and farm women. These activities give farmers and the public the opportunity to witness the latest, proven technologies. Exhibitions on the latest technologies are organized for face-to-face interactions between farmers and scientists. The sale of the latest varieties of plants and vegetable saplings creates a large amount of publicity. On-the-spot technical solutions are demonstrated at visits of experimental sites.

CAPACITY BUILDING OF EXTENSION STAFF AND FARMERS

Human resource development is an important mandatory activity of the university's extension education system. The DOEE is organizing various national-level, state-level and in-house personnel trainings, model training courses, faculty development courses, winter and summer schools, etc. The directorate is also organizing vocational trainings for economic empowerment and livelihood security for farm families. Short-term trainings for farmers, farm women and rural youth on new production technologies are organized regularly at the directorate.

Training Courses: The DOEE organizes national-level training programs, workshops and seminars for promoting the professional competency of the officials and extension personnel working in different line departments of government. Major training areas include oilseeds and pulses, cropping system approach, seed production technology,

post-harvest technology, integrated pest management, arid horticulture, micro-irrigation systems, etc.

State-Level Training Courses: The directorate organizes short-term training courses for subject matter specialists of line departments on subjects like integrated pest management, organic farming, vermi-compost, women in agriculture, aromatic and medicinal plants, etc. In these courses, the officials are exposed to emerging problems and their possible solutions as well as recent technological advances.

Winter/Summer Schools: To update scientists of SAUs on recent advances in science and technology, the ICAR-sponsored winter/summer schools are being organized by the DOEE. Courses on communication technologies and extension methodology; innovative breeding methodology for sustainable, higher production in coarse cereals; and advanced media communications, extension techniques and vocational entrepreneurship for sustainable livelihood by agriculture practitioners are being organized.

Faculty Development Training under Technical Backstopping: Scientists of the DOEE are provided trainings with the purpose of updating skills required for work effectiveness and efficiency. In recent years, scientists have been trained in the areas of on-farm testing, post-harvest management, tally accounting, impact studies, etc.

Agri-Clinics and Agri-Business Training: The DOEE is one of the recognized centres for agri-clinics and agri-business trainings in the country. These trainings are sponsored by the Ministry of Agriculture and Cooperation, (Government of India, New Delhi). With these trainings, the DoEE is providing 60-day training those not yet employed in the agriculture sector. The purpose of such training is to teach entrepreneurial and managerial skills to agricultural graduates so as to enable them to establish their own enterprises and provide jobs to others as well. Major areas where participants established their own business are bio-fertilizers and bio-pesticide production, rural storage structures (“godown”), agricultural input marketing, custom hiring, fruit and ornamental plant nurseries, agri-clinics, retail shops, etc.

Training Programs for Farmers and Farm Women: The directorate is organizing inter-state and state-level short-term courses for practicing farmers and farm women on crop production, horticulture, plant protection, animal production, home science and other related disciplines. These training programs are sponsored by line departments of agriculture, horticulture, soil water conservation and NGOs. These trainings not only provide the participants practical exposure but also give an opportunity for participants to raise their incomes by adopting new technologies. These trainings are organized on the principles of "Learning by Doing" and “Seeing is Believing.”

HUMAN RESOURCES IN THE INDIAN RESEARCH AND EXTENSION SYSTEM

The country has one of the largest and most complex agricultural research systems in the world. Public-sector research institutes still form the backbone of the Indian agricultural research system, despite the rapid emergence of other types of research institutions. The majority of the agricultural scientists in India work for government agencies. Most of them are engaged with the triple function of education, research and extension. Since precise and consistent estimates of scientific staff in the ICAR/ SAU system over time are not available, the rough estimations made by Pal et.al., (1997), and Ramaswamy and Selvraj (2007) approximate the number of scientists working in the ICAR/SAU system during the late 1980s to be 4,189 scientists in ICAR and 14,851 scientists in the SAUs, giving a total scientific strength of 19,040. The number of scientists remained steady in the ICAR during the 1990s (4,092 in 1998) and increased marginally to 4609 in 2005-2006 (DARE/ICAR, 2006). However, numbers decreased significantly in the SAUs (17,678 in 1992). It has declined by 24 percent in the last decade (Ramaswamy and Selvraj, 2007) because of non-replacement of retiring faculty and restrictions on recruitment.

Adjusting the number of scientists by share of research expenditure relative to extension and education (for ICAR) and percent time spent on research (for SAUs), the number of full-time scientists in the late 1990s was 2,999 in ICAR and 8,132 in SAUs, giving a total of 11,131 full-time researchers in the country and making it one of the largest agricultural Research and Development (R&D) system in the world. This is a substantial increase from an estimated 5,666 full-time researchers in the ICAR/SAU system in 1975, and 8,389 in 1985 (Pardey and Roseboom, 1989). However, the investment of Rs. 4.20 lakh per scientist in 2001-2002 was a decrease from Rs. 4.32 lakh during 1992-1994. Scientists' intensity per 1000 hectares of gross cropped area was 8.34 during 1992-1994 and declined to 5.90 in 2001-2002. In 2005-2006 the agricultural scientists of the ICAR institutes were supported by a large technical staff (7355), administrative staff (4705) and supporting staff (9067). However, the ICAR as well as the SAUs are downsizing the administrative staff to balance the ratio of scientific staff to supporting staff.

FINANCIAL RESOURCES FOR THE SAU AND THE DOEE

The SAUs are autonomous institutions for meeting the educational and research needs of the states and these are managed by the board of management and academic council. All the states have at least one SAU. The SAUs are largely funded by state governments, but they also get regular grants from the ICAR. In the past, the research and extension system has achieved much success. It is believed that compared to other alternatives, the investment in agricultural research and extension is much more productive in accelerating the pace of development. Considerable empirical evidence indicates high rates of return

from agricultural research and development investments, making agricultural research a cost effective way for governments to accelerate agricultural development (Evenson, et. al. 1999). It has been shown empirically that the investment in agricultural research and extension is the main source of growth in agricultural total-factor productivity in India, and the rates of return are impressive (Evenson and McKinsey, 1991; Rosegrant and Evenson, 1992; Kumar and Rosegrant, 1994).

The Union Government of India supports the ICAR, the apex body of agricultural research, extension and education in the country. In addition to financing the ICAR institutes and research centers, a part of the fund is allotted to the SAUs in the form of research programs and annual grants (ICAR Budget Book, 2005-2006). The SAUs are supported by the respective state governments. Some state government funds are also used to support research in public organizations like Agro-economic Research Centers and commodity research stations outside the ICAR and SAU system. Mohapatra and Sahoo (2008) studied the trend in public funding (center and state governments) of agricultural research and education. A perusal of the study reveals an increasing trend in the investment. Investment in public research and education reached Rs. 500.30 crore by 1980-1981 from Rs.160.10 crore in 1960-1961. After 1980-1981 this funding went sky-high and reached Rs.2196.98 crore in 2004-2005, a more than tenfold increase in the last four decades, albeit at only 0.30 percent of agricultural Gross Domestic Product (GDP) (Ag.GDP) in recent years.

It is clear from the figure that there is a consistent increase in the funding of agricultural research and education in India. A break-down of the total investment by center and state governments (Table.4.1) shows that investments made by both the governments showed an increasing trend except for 1970-1971 where the center's share in the total investment remained as low as 3.3%. Funding from the state accelerated during the 1960s and 1970s because of the establishment of a large number of SAUs during that period. Central government investment increased consistently thereafter, and during 2004-2005 it surpassed the state government investment. The central government's effort to strengthen and empower the decentralized research and education system is one of the prime reasons for its increased investment in research and education in the country.

Education

The changes in agricultural research investment by center and state governments are substantiated by the compound growth rates in each period in Table 4.3. It shows that public expenditure on research and education in India grew at 5.54% from 1960-70, 54.02 % from 1971-1980, 5.38% from 1981-1990 and 7.18% from 1991-2004. The phases of change in the real investment correspond to organizational changes in the research and education system. State research and education funding stagnated or declined marginally

in almost all the states during the last two decades. From 1971-1980 it grew rapidly because of the establishment of several SAUs during this period in many states.

Table 4.1: Intensity of Agricultural Research Investment in India at Constant (1993-1994) Prices.

States	Funding / ha (Rs.)			Funding / Agri. Worker (Rs.)			Funding as percent of Ag. GDP		
	1981-1983	1991-1993	2001-2003	1981-1983	1991-1993	2001-2003	1981-1983	1991-1993	2001-2003
A P	19.09	37.99	59.93	13.29	19.39	27.76	0.14	0.23	0.27
Assam	88.08	79.06	98.20	NA	39.29	54.28	0.28	0.39	0.44
Bihar	15.04	30.82	73.95	7.12	10.00	16.40	0.12	0.21	0.28
Gujarat	19.56	39.58	58.91	28.49	36.88	51.44	0.17	0.34	0.38
Haryana	45.53	74.95	125.40	73.48	84.64	103.59	0.34	0.32	0.486
Karnataka	14.96	23.08	57.86	17.43	25.72	43.72	0.16	0.24	0.34
Kerala	70.15	18.2	171.19	54.39	89.49	159.85	0.29	0.44	0.55
M P	3.48	92.89	21.76	4.29	9.77	15.12	0.06	0.16	0.23
Maharashtra	27.94	44.83	74.13	33.86	37.22	57.47	0.38	0.41	0.55
Orissa	10.08	19.35	20.84	9.48	13.66	13.01	0.09	0.18	0.17
Punjab	53.52	88.76	122.62	78.56	105.42	146.44	0.27	0.29	0.33
Rajasthan	6.30	13.71	21.91	13.28	17.58	20.97	0.13	0.20	0.24
T N	23.27	70.09	125.06	11.52	27.53	43.80	0.17	0.33	0.47
U P	18.95	26.54	32.42	13.57	13.84	15.19	0.14	0.16	0.14
W B	32.72	33.98	58.87	21.32	15.66	24.72	0.21	0.12	0.14
Average	39.81	65.53	116.67	26.48	23.81	32.86	0.19	0.25	0.30
ALL	81.39	59.06	60.31	93.23	86.00	86.14	46.51	35.09	41.73

Source: Mohapatra and Sahoo (2008).

Table 4.2: Compound Annual Growth Rate of R and E Expenditure of Center and States of India at 1993-1994 Prices.

States	CAGR (%)				
	1960-1970	1971-1980	1981-1990	1991-2004	1960-2004
A P	-7.66*	11.76*	6.23*	4.25*	5.58*
Assam	4.72	-6.53	9.25*	2.72*	1.56*
Bihar	0.58	18.90*	8.30***	5.30*	3.77*
Gujarat	11.38*	0.93	9.45*	4.46*	4.12*
Haryana		28.97*	4.92*	4.76*	8.91*
Karnataka	-8.43	13.27*	7.29*	5.78*	6.85*
Kerala	2.99	25.80*	4.99*	1.07*	7.54*
M P	-7.01*	-7.98*	13.02*	6.55*	2.99*
Maharashtra	13.77*	1.06	6.81*	5.01*	3.41*
Orissa	-2.58	8.09*	6.25*	-0.17	3.65*
Punjab	-0.61	3.76*	10.02*	3.92*	4.65*
Rajasthan	-1.87	3.96*	10.70*	3.66*	5.15*
T N	2.99	4.13*	12.73*	3.64*	6.75*
U P	11.84*	-5.87	5.50	2.52***	1.60*
W B	7.17*	12.48*	2.12*	5.01*	5.73*
CENTRE	-15.11*	54.02*	5.38	7.18*	10.51*
ALL	5.54*	10.01*	6.79*	6.54*	5.62*

*, **, *** Show the level of significance at 1%, 5% and 10% respectively. #. For Haryana, it may be read as 1996-2004.

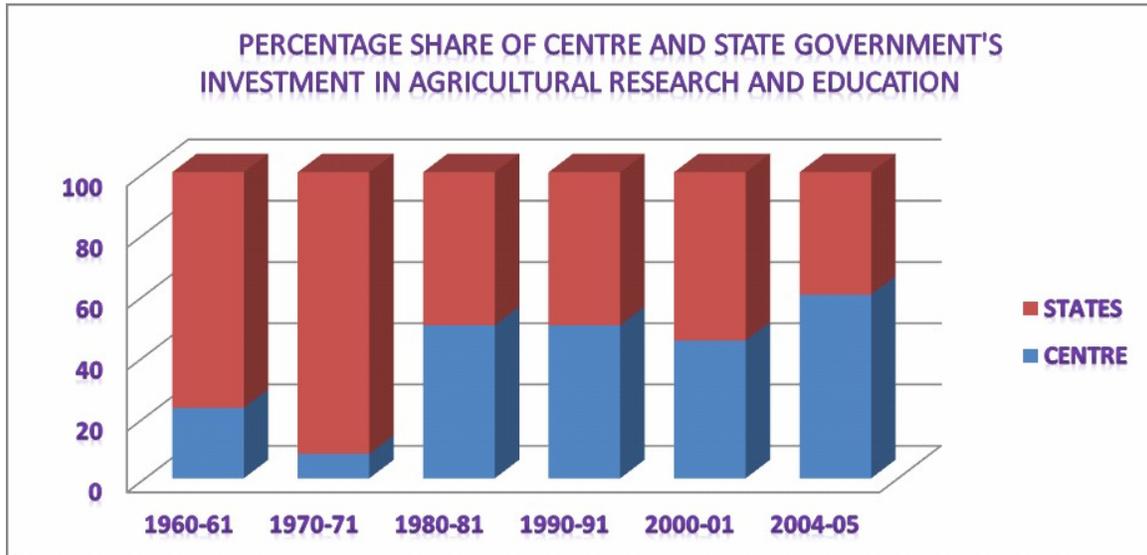
Source: Mohapatra and Sahoo (2008).

Table 4.3: Compound Annual Growth Rate of Agricultural R and E Intensity Ratios.

States	Compound Annual Growth Rate (CAGR)					
	Funding / ha		Funding / Agri. Worker		Funding as percent of Ag. GDP	
	1981-1990	1991-2003	1981-1990	1991-2001	1981-1990	1991-2003
A P	5.73*	4.83*	2.84**	3.79*	4.44**	1.59***
Assam	NA	2.54*	NA	2.58***	6.31***	1.61
Bihar	8.24***	7.69*	4.62	3.92	4.95*	2.87
Gujarat	11.01*	4.92*	4.97*	4.97*	10.53***	2.98
Haryana	5.83*	4.84*	2.05*	4.10	0.01	3.10*
Karnataka	6.61*	8.21*	3.52*	3.72*	5.13*	2.32***
Kerala	NA	27.81*	2.27	6.64*	2.20	2.54*
M P	48.59	-15.16*	9.49	3.58***	10.62	5.28***
Maharashtra	7.08*	5.64*	3.07*	4.62*	2.49	2.96**
Orissa	5.71*	0.52**	2.74***	-0.81	4.95***	-0.76
Punjab	8.88*	3.75*	6.93*	3.84*	4.78**	1.77**
Rajasthan	10.82*	5.00*	4.99*	2.33*	6.11**	2.33
T N	13.35*	6.59*	10.15*	7.69*	9.12*	4.49*
U P	5.32	2.30***	1.98*	2.67***	2.71	-0.56
W B	2.43**	5.86*	-1.37**	5.68*	-3.70*	1.85***
Average	11.73*	5.04*	4.58*	3.78*	4.66*	2.21**
*, **, *** Show the level of significance at 1%, 5% and 10% respectively. NA – Not available						

Source: Mohapatra and Sahoo (2008).

Figure 4.3: Percentage Share of Agricultural Research & Education Investments



Source: Mohapatra and Sahoo (2008).

CONCLUSION

Most of the agricultural universities in India continue to be dominated by top-down, monolithic structures that follow a limited extension mandate. None of the post-Training-and-Visit (T&V) system extension reforms could revitalize it to meet the demands of a changing agricultural context. The profusion of uncensored information through mass media and cyber sources has long-term consequences of generating public distrust and alienation from agriculture. This is attributed to the lack of a proper mechanism for verifying the accuracy and viability of the information transmitted. As in most of the developing countries, transfer of technology remained largely in the domain of the State Department of Agriculture (DOA), and SAUs are mandated to serve only a limited extension role in technology dissemination activities (Sulaiman and van den Ban, 2000). Even the limited extension mandates of the SAUs have conventionally been operationalized through the three major units of training, communication and information and KVKs or Farm Science Centers. A single-window facility of the ATIC is also currently established in some SAUs for delivery of research products, information and other services.

All the extension activities of the SAUs are implemented and coordinated by the Director of Extension. The mandated extension role of the SAUs was effective in establishing functional research extension linkages under the T&V system, which is considered the most significant extension management system in India during the mid-1970s (Feder and

Slade, 1986). It was well suited to the rapid dissemination of crop management practices for the high yielding wheat and rice varieties released in India since the mid-1960s. The system largely operated in the interpersonal mode and enabled the professionalism in agricultural technology transfer in India (Picciotto and Anderson, 1997). It helped to evaluate and perfect the two-step communication model in farm technology dissemination through the effective use of progressive farmers as change agents. However, with the withdrawal of World Bank assistance, the T&V system became dysfunctional in almost all the states of the country. The issues of scale, ineffective interaction with the agricultural research systems, inability to attribute benefits, weak accountability and lack of political support attributed to its decline (Anderson et. al., 2006).

Although the post T&V-period saw the emergence of many extension reforms, the role of university extension in the changed scenario was seldom addressed. Most of the changes worked on the limitations of the T and V approach and were aimed at restructuring the extension system followed by the state DOA into a decentralized and farmer-accountable model. As part of this, many innovations that promoted private agro-service providers, fostered a group approach, used broad-based extension to address marketing issues and innovative uses of media and information technology were tried through the state DOA and NGOs in many parts of the country (Sulaiman, 2003). However, the field-level impact of many of these reforms has been highly uneven and inadequate as it required the coordination of different line departments over which the implementing agency had no control. Reduced funding and a shift in national priorities away from agriculture during the liberalization of the economy also impeded the effective implementation and duplication of even the successful models on a large scale.

The state governments must ensure proper financial support to the agricultural universities by allocating to them at least 15% of the total budget of the departments of agriculture, animal husbandry, fishery, horticulture, forestry and any others related to agriculture. The central and state governments may devise a mechanism to provide, to respective agricultural universities, a lump-sum grant as a core fund to be used in the future, exclusively for the maintenance and renewal of existing infrastructure facilities on campus. This will mitigate the effects of uncertain funding. The development grant provided by the ICAR to agricultural universities under plan allocation should be reviewed and adequately enhanced.

Even in recent years with the advent of the ATMA as a national extension model to implement location-specific programs related to agricultural development, the SAUs have been restricted to consultancy roles (MANAGE 1999; Reddy and Swanson, 2006). However, the emerging socio-economic scenario and change in knowledge structure of

agriculture explicitly indicate that the traditional agricultural research and extension roles of the SAUs alone cannot sufficiently address the challenges of the new trends in agricultural development. A suitable mechanism is required for periodic assessment of the scientific and technical work force requirement for agricultural Research and Development (R&D) institutions in the country. This will help maintain a reasonable balance between the work force generated and opportunities for their gainful employment.

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