XXIV ANNUAL CONVENTION OF INDIAN AGRICULTURAL UNIVERSITIES ASSOCIATION

PROCEEDING

Theme : Agriculture Education in 21st Century

12–13 December, 1997

RAJENDRA AGRICULTURAL UNIVERSITY, BIHAR
PUSA – 848 125

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CONTENTS

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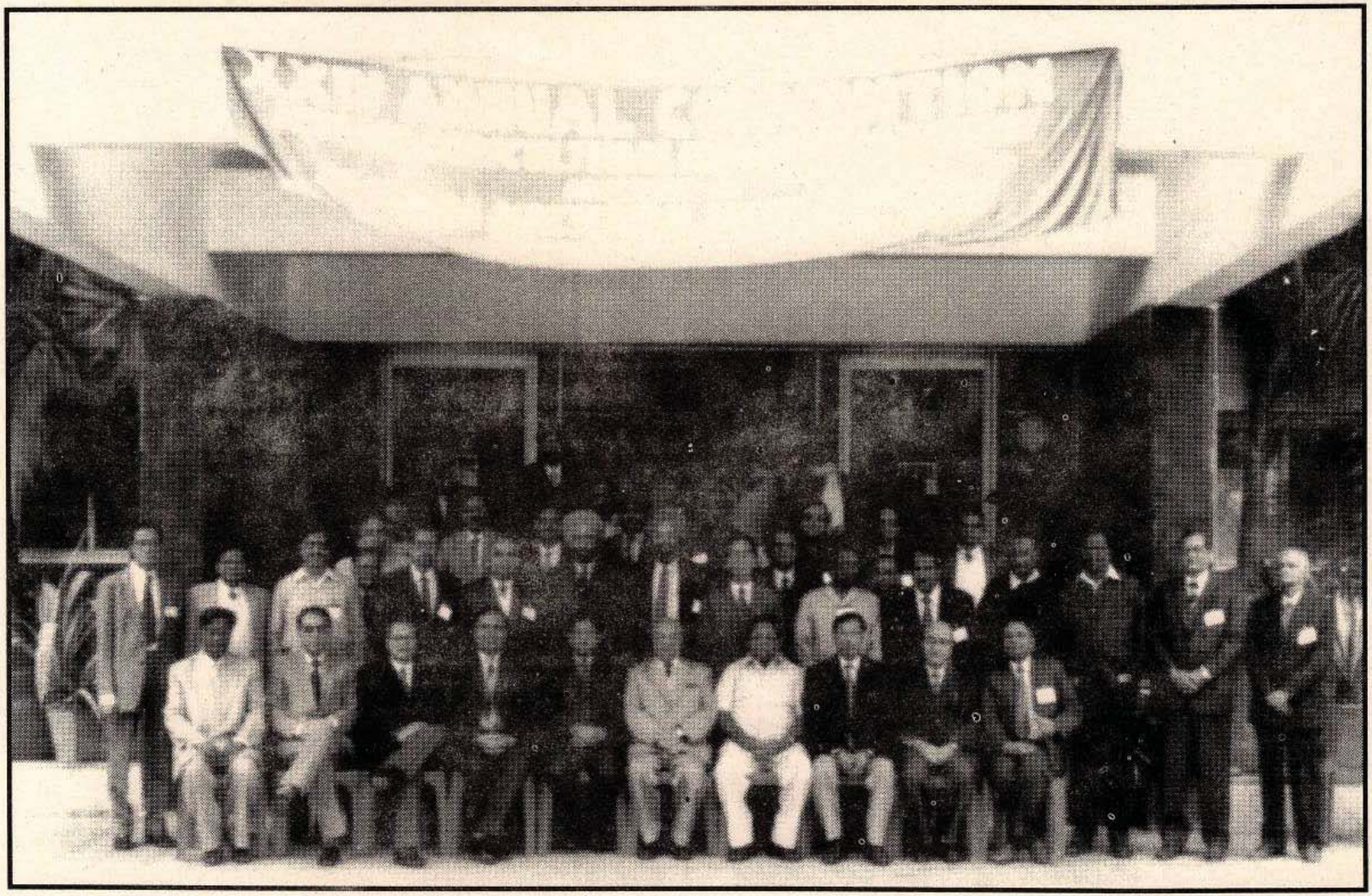
CONTENTS

PARTICIPANTS OF XXIV IAUA ANNUAL CONVENTION



PROGRAMME

12.12.1997

INAUGURAL SESSION

11.00 Hrs. Welcome address by Dr. A. K. Srivastava, Director (Research), Rajendra Agricultural University, Bihar, Pusa, Samastipur-848125.

11.05 Hrs. Address by Dr. K. S. Chauhan, Vice-Chancellor, Rajendra Agricultural University, Bihar, & President, Indian Agricultural Universities Association.

11.15 Hrs. Remarks by Shri D. P. Maheshwari, I.A.S., Agricultural Production Commissioner, Government of Bihar, Patna.

11.25 Hrs. Key note address by Dr. S. L. Mehta, Deputy Director General (Education), ICAR, Krishi Anusandhan Bhawan, New Delhi-110012.

11.40 Hrs. Inaugural address by Shri Chaturanan Mishra, Hon'ble Union Agricultural Minister, Government of India.

11.55 Hrs. Presidential address by Shri Raghunath Jha, Hon'ble Agriculture Minister, Government of Bihar.

12.10 Hrs. Address by the chief guest His Excellency Dr. A. R. Kidwai, Governor of Bihar.

12.25 Hrs. Vote of thanks by Dr. B. K. Singh, Regional Director, Agril. Research Institute (RAU), Lohianagar, Patna - 800 020

12.30 Hrs. TEA

TECHNICAL SESSION

12.12.1997

SESSION I

13.00 Hrs. **Vocational Education for Self-Employment**

Presented by : H. S. Sekhon
Dean, College of Agricultural Engg.
PAU, Ludhiana

Chairperson : Dr. M. A. Moshin
Vice-Chancellor
Birsa Agricultural University, Ranchi

Rapporteur : Dr. S. K. Kanayan
Dean, College of Agriculture
TNAU, Coimbatore

15.00 Hrs. **Education for Sustainability in Agriculture Development**

Presented by : Dr. R. P. Agrawal
Dean, PGS, HAU, Hisar

Chairperson : Dr. A. G. Sawant
Vice-Chancellor
Konkan Krishi Vidyapeeth, Dapoli

Rapporteur : Dr. Ranvir Singh
Dean, College of Agriculture,
GB Pant University of Agriculture &
Technology, Pantnagar (U. P.).

14.30 Hrs. **Lunch Break**

16.00 Hrs. **Agricultural Education for Women in Tamil Nadu**

Presented by : Dr. A. Abdul Kareem
Vice-Chancellor
TNAU, Coimbatore

Chairperson : Dr. S. L. Mehta
DDG (Education)
ICAR, New Delhi

Rapporteur : Dr. H. S. Sekhon
Dean, College of Agric. Engineering
PAU, Ludhiana

SESSION II

13.12.1997

9.00 Hrs. **Partnership between Agricultural Universities, ICAR, NGO's and Industrial & Commercial Enterprises**

Presented by : Dr. G. K. Garg
Dean, CBSH, GB Pant University of Agriculture & Technology, Pantnagar

Chairperson : Dr. L. R. Verma
Vice-chancellor
University of Horticulture and Forestry, Nauni, Solan (H. P)

Rapporteur : Dr. V. R. Reddy
Acharya N. G. Ranga Agricultural University, Hyderabad

9.45 Hrs. **Inter-University Mobility of Teachers and Students—An Approach towards Quality Education and National Integration**

Presented by : Dr. M. P. Singh
Vice-chancellor
Central Agricultural University, Imphal

Chairperson : Dr. B. B. Mallik
Vice-chancellor
West Bengal University of Animal Sciences and Fisheries, Calcutta

Rapporteur : Dr. S. S. Magar
Director of Instructions,
Mahatma Phule Krishi Vidyapeeth,
Rahuri - 413722, Maharashtra

10.30 Hrs. **Agriculture Manpower Planning in India—An overview**

Presented by : Dr. S. S. Magar
Director of Instructions,
Mahatma Phule Krishi Vidyapeeth,
Rahuri - 413722, Maharashtra

Chairperson : Dr. G. M. Khan
Vice-chancellor
Sher-e-Kashmir University
of Agric. Sciences and Technology
45-B Gandhinagar, Jammu Tavi - 180004 (J & K)

Rapporteur : Dr. C. M. Singh
Director, Extension Education
HPKV, Palampur

11.15 Hrs. **Faculty Upgradation and Human Resource Development**

Presented by : Dr. V. N. Pathak
Director
Academic Staff College,
Rajasthan Agricultural University, Bikaner

Chairperson : Dr. A. G. Sawant
Vice-chancellor
Konkan Krishi Vidyapeeth, Dapoli

Rapporteur : Dr. M. C. Prasad
Jt. Director (Research)
IVRI, Izatnagar, (U. P.)

13.30 Hrs. **LUNCH BREAK**

14.30 Hrs. **PLENARY SESSION**

Chairperson : Dr. M. P. Singh
Vice-chancellor
Central Agricultural University, Imphal

Co-Chairperson : Dr. B. B. Mallik
Vice-Chancellor
West Bengal University of Animal Sciences and
Fisheries, Calcutta

Rapporteur : Dr. B. Senapathy
Dean of Research
Orissa Univ. of Agriculture & Technology,
Bhubaneshwar

VOCATIONAL EDUCATION FOR SELF-EMPLOYMENT*

A. S. Khera

Vice-Chancellor
Punjab Agricultural University
LUDHIANA

1. INTRODUCTION

India's population is expected to cross 100 crores at the beginning of the twenty-first century. To achieve the target of full employment during the next 10-20 years, additional employment opportunities have to be created every year for at least 2 crores new job seekers as well as for the existing back-log of unemployed or under-employed. Moreover, at present, the rural population is steadily migrating to the cities in search of jobs, resulting in unmanageable size of most of the cities. To keep the problem of population under control and to create nature friendly eco-system, this migration will have to be stopped. This means a large number of appropriate jobs or self-employment opportunities need to be created in the rural areas.

The present paper seeks to provide a framework for vocational education in the state agricultural universities in India for entrepreneurship development and self-employment. The significance of self-employment in rural area, where about 70% of Indian population lives, may be seen in the context of changing economic environment and globalisation of Indian economy including agriculture.

2. ECONOMIC SCENARIO — CHALLENGES AND OPPORTUNITIES

The world has witnessed tremendous changes, both in economic and socio-political arena, during the last decade of the twentieth century. And, to enter into the new millennium, it is preparing for far more dazzling changes in science and technology, agriculture and allied activities, commerce and industry, resulting in a high-tech multi-revolution and globalisation of economic activities. India cannot keep itself aloof from these global changes. The process of restructuring of Indian economy through the policy of economic liberalisation, privatisation and globalisation may be seen in this context.

Despite the initial problems associated with structural changes of far-reaching consequences, the Indian economy has undergone a metamorphosis. The rate of growth in the GDP which remained, on an average, around 3% p.a. during the first four decades, crossed 6% p.a. mark during the past two years despite political instability and infrastructural problems. At present, we are standing at cross-roads and the next two decades are going to be crucial. It has been estimated that if our economy (GDP) grows at an average rate of 6% p.a., by 2020, India's per capita income will

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★ Presented by Dr. H. S. Sekhon, Dean, College of Agricultural Engineering, PAU, Ludhiana

cross $ 800 and unemployment level will be brought down to 11%— a level of unemployment comparable to the developed countries.

These changes are likely to have far-reaching impact on Indian agriculture – the way we manage it - as also on agricultural research, education and training. Already our agricultural economy is being reshaped by the expanding forces of science and technology on one hand, and by the market economy and globalisation, on the other. Not only are the functions of farming, processing and distribution undergoing great physical evoluation, unprecedented changes are also taking place throughout the rural society – economically, socially, and politically. Indian agriculture that contributes around 36% to the country's GDP and provides direct or indirect sustenance to 70% of the population, unlike the developed countries, must cope up with all the changes that have been taking place in the country's economic scenario.

With the rising agricultural production in the country, especially in the states like Punjab, Haryana, Tamil Nadu, Maharashtra, etc. and the introduction of modern technology in the production and processing of agricultural produce, the concept of farming is shifting from survival and growth to the value-added agri-business approach. Under the circumstances, agro-based food industry has assumed great significance. According to a recent CII - Mckinsey Report on Food and Agriculture Integrated Development and Action (FAIDA), India can be the largest food factory in the world, equal to that of the U. S. A. and second only to China's. Today food is a Rs. 250,000 crore industry in India. By 2005, it will grow to Rs. 480,000 crore. Value added foods will grow from Rs. 80,000 crore to Rs. 225,000 crore during this period. Developing the food chain is likely to have strong benefits for the economy (including agriculture) both in terms of income and employment (including self-employment). The food industry has a very high multiplier effect (2.4), which is greater than that of power and telecom sectors. This will present major opportunities in high growth, mass-based, high volume markets such as processed milk (a Rs. 36,000 crore industry), poultry (Rs. 27,000 crore), packaged atta (Rs. 15,000 crore), and bakery products (Rs. 10,000 crore) in addition to small scale ventures like bee-keeping, fruit processing, dairying, fisheries, etc.

More importantly, food is a predominantly local business. In Europe the top ten international players control just 16% of the industry. In India, over 85% of fruit-processing is confined to small and cottage industry sector. Tremendous opportunities are there for small entrepreneurs and for self-employment in this sector. Moreover, the multiplier effect of growth combines the three components, viz. industry, business (trading), and services. It is in the business and services components that still greater opportunities for self-employment will emerge.

3. SCOPE OF VOCATIONAL EDUCATION IN SAUs

There are three main areas where SAUs can play a key role in promoting vocational education and self-employment. These include (i) vocational training programmes for farmers and educated rural youth, (ii) skill upgradation of graduating students by reorienting the existing curricula, and (iii) training and development programmes for rural entrepreneurs.

The traditional system of agricultural education that created graduate job-seekers and

survived in a sheltered market must yield place to professionally and technically trained young entrepreneurs who will go for self-employment after completion of their degrees. The graduates from State Agricultural Universities can opt for two types of self employment viz. (i) self employment on the farm, or (ii) self employment as an entrepreneur either relating to agricultural inputs or in the area of post-harvest technology and food processing. Besides, the State Agricultural Universities should also devise the programmes for the rural youth who could not pursue higher studies but can form a good entrepreneurial class after 10 + 2 education level. It is to be mentioned here that as far as degree programmes for graduates in agriculture are concerned, these should be organised at the main campuses of State agricultural Universities and the programmes for the non-graduates may be organised at the KVKs at the district headquarters. In addition, the skill and attitude of existing workers / executives of small ventures will have to be upgraded. There is, therefore, need for a well planned multipronged strategy. The most important, of course, is the vocational education for self-employment. At the same time, short-term training courses for existing entrepreneurs and executives of small-scale ventures are also required so at to equip them with the necessary managerial and technical skills to cope up with the highly competitive and fast changing market economy. It is also imperative that the degree level programmes are re-oriented and updated to include courses on entrepreneurship, management and marketing, if we envisage that a large number of graduates should go for self-employment and entrepreneurship.

4. VOCATIONAL TRAINING PROGRAMMES

Small scale rural entrepreneurs have contributed significantly to economic growth of developed as well as developing nations. Traditional agriculture in India is gradually evolving into well developed agri-business with strong linkages among agri-inputs, processing and agro-based industries which result in the wholesale and retail trade. As a result of this, there is a greater need for vocational education at different levels to tap this potential. In fact, several fields in agri-business like poultry, bee-keeping, dairy, mushroom cultivation, piggery, fisheries, rabbit farming, production of biocontrol agents, vegetable and fruit growing, seeds production, agricultural implements, custom hiring units, etc. can be identified for self employment. The objective of these programme should be to supplement the income of the farmers and provide year round gainful employment in the rural areas. State Agricultural Universities can impart necessary knowledge and training through vocational education programmes on these subjects to their graduates as well as to the existing entrepreneur and the educated rural youth so as to enable them in setting up and successfully running their own ventures. The main objectives of organising such vocational courses is to develop a healthy attitude among the graduates / farmers / rural youth towards dignity of work. It also envisages to provide an alternative self-employment concept to the graduates pursuing higher duration. Through vocational education, efforts are made to develop entrepreneurial capabilities with comprehensive understanding of state, national and international agri-business patterns and impart desired skills to streamline the agri-business system for self-employment. The State Agricultural Universities should also organise such courses for the extension functionaries to update their knowledge, attitude and skills.

4.1 Design of vocational training programmes

There is a great need to design vocational programmes in such a way that various entrepreneurial activities involving various related decisions / functions of its growth are taken care of. The essential components of vocational programmes should include :

CONCEPTION : In this phase the main emphasis should be on the development of ability to identify opportunities and selection of projects. The main thrust should be on developing the foresight to visualise the scope for exploitation of identified opportunities, keeping in view the market demands, individual initiative and ability to take risk. Thus, an entrepreneur setting up his own enterprise must think of some product or service or trade which is not available or, if available, there exists more demand than the existing supply, or some methods of production or service that economises on cost, or some marketing techniques for exploiting the market demand / potential.

INCEPTION : In this phase, practical knowledge should be imparted regarding important decisions of agri-business or any other venture like investment decisions, sources of finance, project planning and feasibility, market study, business leadership, understanding of business environment, knowledge and ability to complete formalities / actions under various laws, programmes or policies of government, local bodies, financial institutions and other concerned agencies.

OPERATION : In this phase, the main thrust should be on developing **technical and managerial** skills, production planning and scheduling, resource utilisation, raw material purchasing, inventory management, financial management, budgeting, marketing, man-power planning, etc.

A great deal of time and effort should be devoted to the operational phase which will maximise the operational efficiently and profit. Alongwith this, sufficient financial assistance should be provided keeping in view the market demands and feasibility of each vocation.

4.2 Identification of various vocations in agri-business

Criteria for the selection of different vocations in agri-business should be on the basis of changing demand pattern, keeping in view the future growth potential of different vocations. Many SAUs are already organising training courses for farmers and educated rural youth. These training programmes can be taken as a base for starting vocational educational courses as per fast changing needs of agricultural production and agri-business system.

4.3 Training programmes for farmers and educated rural youth

In order to develop expertise among the farmers and educated rural youth to take up agro-based vocations, short duration programmes in various areas of agriculture should form an important thrust area of vocational education. These should focus on intensification and diversification of agriculture and promotion of subsidiary occupations for employment generation on sustainable basis. The duration of these progrmmes can vary from 1 week to 3 months depending upon the objectives and requirements of the proposed programme. For example, an integrated training programme for young farmers encompassing different aspects of crop production in small scale may be of 3-months

duration whereas specialised training courses, such as small scale dairying, poultry, piggery, mushroom cultivation, etc. may be of one to two weeks duration. A list of such programmes is given in *Annexure-1*. These training programmes should also focus on development of skills like project formulation, record keeping, procurement, marketing, finance etc. in addition to imparting knowledge and skills for a particular area of production agriculture. Besides, these courses should endeavour to develop scientific outlook among the youth regarding agriculture and to develop knowledge and skills for taking up farming as a business on scientific lines.

In order to upgrade knowledge and skills of the people already engaged in a particular vocation, it is imperative to have correspondence courses. These courses should be supplemented with personal contact programmes which may be organised KVK-wise. The primary objective of the personal contact programme should be to clarify the doubts and to answer queries through face-to-face interaction with the experts. Practical demonstrations may be organised coinciding with the personal contact programmes.

Some of the State Agricultural Universities have already set up youth clubs for school students on the pattern of 4-H clubs of USA. These clubs provide opportunities to the members for development of entrepreneurial qualities through work experience. The club members are encouraged to set up individual projects like bee keeping, vegetable production, fruit production, food processing, kitchen gardening, etc. In this way, the members learn the techniques of production and management through real life experiences.

4.4. Role of KVKs

At present the KVKs have the following mandate :

1. Collaborate with the subject matter specialists of the State Agricultural Universities / Regional Research Stations (NARP) and the state extension personnel in **on-farm testing,** refining and documenting technologies for developing region specific sustainable land use systems.
2. Organise training's to update the extension personnel within the area of operation with emerging advances in agricultural research on regular basis.
3. Organise long term vocational training courses in agriculture and allied vocations for the rural youth with emphasis on **learning by doing** for generating self-employment through institutional financing.
4. Organise fort-line demonstrations on various crops to generate production data and feedback information.

However, during the Ninth Plan, Dr. M. V. Rao Committee has proposed the following mandate :

1. To assess, refine and transfer agricultural technology through on farm testing/research, keeping in view the prevailing farming systems and situations through participatory mode.

2. To plan and conduct long term and short term vocational trainings in agriculture and allied vocations.
3. To organise need based and demand-driven inservice trainings/workshops for extension officials.
4. To organise frontline demonstrations on production, processing and value addition technology in various agricultural enterprises.
5. To prepare data base of natural land human resources and identifiable farming systems/ situations and possibilities prevailing in the district and to provide a basis for planning and implementing the mandate of Krishi Vigyan Kendra.
6. To serve as an active link between research, extension and farmers and provide critical feedback to the ICAR-SAU research system on the one hand and the main extension on the other.

These mandates, if adopted, will shift the focus of KVKs from the training of farmers and rural youth to testing and evaluation of technology. The main focus of KVKs should be on the training of farmers and rural youth, demonstration of new technologies, and seed production at KVK farms. In order to improve functional efficiency of the KVKs especially for promoting self employment, it may be imperative to take some of the above mentioned activities out of the scope of KVKs. for example, wherever the Farm Advisory service Scheme is operative, it can continue to be entrusted with the work of testing the new technologies/germplasm on the farmer's fields instead of KVKs. as per ICAR policy, the front-line demonstrations are to be conducted by the concerned scientists. However, the demonstration of new technologies on the KVK farms should be continued so that the participants can themselves see the usefulness and effectiveness of new technologies.

Special emphasis should be laid on strengthening the linkages of KVKs with funding agencies as well a processing and marketing organisations so that they can serve as a useful link between the trainers and these agencies. There is also a need to develop a sound monitoring mechanism whereby the KVKs are able to assess the extent to which the participants have set up different ventures after receiving their training.

At present there are 261 KVKs in the country but most of the KVKs do not have proper infra-structure to provide practical training commensurate with the motto of KVKs i.e. **Teaching by Doing and Learning by Doing.** There is an urgent need to provide sufficient staff and funds for developing requisite infrastructure facilities for establishing functional demonstration units. Such units should be run on commercial scale so as to provide hands on experience to the trainees in real world situations.

The schools which offer vocational courses in agriculture and related areas should have strong linkage with the KVK of the area and the trainers should be imparted latest knowledge and skills by the concerned KVK.

5. SELF-EMPLOYMENT OF GRADUATING STUDENTS

In order to promote self employment among the graduate students, it is necessary to reorient and update the existing course curricula. At national level the Department of Agricultural Research and Education (DARE)/Indian Council of Agricultural Research, as well as the all India Council for Technical Education (AICTE) try to bring some sort of uniformity in the curricula of various degree programmes offered by the State agricultural Universities in agriculture, agricultural engineering and home science. These curricula are updated from time to time keeping in view the changing scenario. Most of the State Agricultural Universities have revised their courses curricula in the recent past or are busy in revising them to meet the emerging challenges. The new challenges can be summarized as follows :

1. Ever-growing quality consciousness coupled with extreme cost competitiveness in all fields of raw and processed foods, and other agricultural products.
2. Constantly declining employment opportunities in government and semi-government organisations, and correspondingly increasing opportunities of employment in private organisations including self-employment.
3. World wide technological boom and developments in all fields of agricultural sciences, engineering and arts to which the students must not only be exposed but also prepared to face the future changes.
4. Necessity of developing eco-friendly and sustainable technologies to conserve natural resources for posterity and at the same time meet the ever increasing demands for more nutritional food and feed at reasonable prices to eradicate hunger at large.
5. Need for inculcating scientific temper, innovative attitude, spirit for excellence and respect for hard work to succeed in the competitive world.

In view of the above, each college or department of an agricultural university should think of reorienting its curricula and make sure that its students can find gainful employment particularly in the private sector or they can start their own ventures. This demands a high degree of practical oriented work with practical applications of theoretical fundamentals. The project courses, normally given towards the end of the bachelor's degree programmes, should be application oriented to encourage young graduates to apply their knowledge of scientific fundamentals and skills developed during their studies, to solve the practical field problems of their respective disciplines including setting up of their own new ventures.

In addition, the undergraduate programmes should not ignore the high academic standards and must endeavour to produce academically sound, thoroughly trained and highly motivated graduates to undertake any relevant field job or pursue higher education within or outside the country, or join some research and development organisation.

The agricultural engineering graduates of PAU, for instance, ventured into the competitive job market and are currently occupying prestigious positions in private organisations in India or abroad. Quite a sizeable percentage (about 10% of over 1200 graduates so far) are currently engaged in

their own entreprenurship activities and nearly 24% are engaged in industries related mainly with tractors and farm machinery, food processing, irrigation and allied equipment, fertilizers and chemicals, automobiles, tea estates, etc. This high percentage of employment in industry and entrepreneurship can be attributed to the well balanced academic and vocational type of training being imparted.

The existing course curricula in most of the State Agricultural Universities are already taking these factors into account but still a fresh look needs to be given to further improvise the curricula as and where necessary. The PAU has already started offering a two credit hour course on agri-business in B. Sc. (Agri.) Honours and B. Tech. (Agril. Engg.) programmes. This has been introduced on the premise that the graduates should not only have knowledge of modern scientific techniques, but should also be given rigorous training in financial, economic, management, marketing and legal aspects of the enterprises.

A system of feedback from the alumni as well as their employers should be devised through a well thought out questionnaire to exactly pinpoint possible shortcomings in the course curricula which should, as far as possible, be rectified within the time constraints of the degree programme.

The course curricula for the bachelor of Veterinary Science & Animal Husbandry programme is regulated under the regulations of Veterinary Council of India (VCI) with the approval of the Government of India. Immediately after graduation, the veterinary students are registered with the State Veterinary Council / Veterinary Council of India and become authorized Veterinary Practitioners. The existing curriculum approved by the Veterinary Council of India ensures the minimum standards for the purpose of self-employment.

6. TRAINING AND DEVELOPMENT PROGRAMMES FOR ENTREPRENEURS

The effective planning and execution of training and development programme for rural entrepreneurs including those of existing rural industries also assume great significance for encouraging and sustaining self-employment and entrepreneurship on a long-term basis. It will have to take into consideration a number of issues. Foremost among these is the question of course contents. *Figure 1* presents the various components of such a progrmme, especially for food industry. This model may also be used for other entrepreneurial ventures, as also for vocational education in general, with some modification.

This model identifies five types of skills which the entrepreneurs / managers have to develop for survival and growth of their ventures in a highly competitive and dynamic world of market economy. These are conceptual, technical, operational, behavioral and environmental skills. Sub-components of each of these skills are also listed, which will help in developing the detailed course contents of the training programmes. In addition, in this age of specialisation, these entrepreneurs / executives are also required to develop specialized skill relating to specific functional disciplines. In commercial organisation, these areas or activities will normally include production operations, marketing, personnel and finance.

The training and development programmes have to be geared up to the requirements of different types of entrepreneurial ventures and levels of trainees. One way in which the programmes could be classified are:

1. **General management Programmes** which are multi-functional and encompass a broad range of entrepreneurial responsibilities in the organisation and may include almost all types of skill and functional areas listed in *Figure 1.* (p. 15). These are basically meant for entrepreneurs, owner-managers, and senior level executives.
2. **Functional programmes** which relate to specialized functional areas of production, marketing, finance, etc. depending upon the types of executives to be trained or skills to be developed.
3. Technical programmes which cover mainly, if not exclusively, the technical skills in the areas of specific entrepreneurial ventures. For example, for food industry entrepreneurs it may include food processing, food engineering and technology, packaging, food chemistry, food safety and quality control standards and processes, etc.

These three dimensions are of considerable importance in formulating the institutional strategy for vocation / training programmes. Another aspect to be considered is the duration of the programme, e.g., more than a month, or less than a month, which will implicitly determine the scope and depth of the programme.

7. INSTRUCTION AND PEDAGOGY

Vocational education and training programmes are designed to meet the needs of specific ventures and their entrepreneurs. Unless, therefore, the lessons are related to the participants' problems and they are allowed to discuss their problems, the process of learning remains at the cognitive level and fails to reach the behavioral and operational levels. Cognitive level learning implies that the participants have only gained theoretical knowledge. Behavioral level learning means that this knowledge is raised to operational skills that can be applied to their jobs and will be reflected in their performance. A trainee does not learn unless he translates his knowledge to practice. Moreover, to be an effective catalyst, a responsible training institution must ensure that its ideas are implemented at the operational level. It must be an **action training** that should not only full the long-term needs of the participants but must also respond to their immediate problems and requirements to establish the credibility of the programmes.

Keeping the above facts in view, the pedagogy used for vocational education and training must be a judicious mix of case studies, talks supported by empirical evidence and practical experience, procedures and rules, business games, syndicates, discussions and demonstrations, audio-visual aids, and industrial visits, etc. Lectures should be used sparsely. Higher the level of training lower shall be the lecture content. The experiences of academicians / scientists and practitioners must be used adequately to make the programmes effective. Research and consultancy findings as well as the actual business / industrial experiences will have to be formalised and used in the programmes. Thus, the faculty have to be carefully chosen, both from practitioners (successful

entrepreneures, executives, bankers, etc.) and academicians from different disciplines. To begin with, the internal faculty will have to be trained through **training the trainers** programmes to effectively meet the demands of vocational education.

8. FEEDBACK AND MONITORING

Another major input, the value of which is quite significant, is feedback from the participants at the end of the programme. Feedback can be obtained in different ways ranging from informal discussions to detailed questionnaire. This will ensure meaningful evaluation of each programme and make them more effective. In addition, a complete data bank of the trainees should be maintained so as to facilitate follow up action to monitor the progress of entrepreneurship and self-employment. Such a feedback system will help the training institutes / SAUs a great deal to judge the efficiency, relevance and effectiveness of vocational education in terms of success rate.

9. STRUCTURAL ARRANGEMENT

Presently vocational training programmes are being organised in most of the state agricultural universities by extension education wing as well as by different colleges or departments of universities. Such an arrangement not only results in overlapping of a programmes but also lacks a clear cut policy decisions and implementation. If vocational training programmes have to succeed in their avowed objective of providing self-employment opportunities to a large proportion of Indian population, particularly in rural areas, the arrangements for organising such programmes will have to be well structured. It is, therefore, suggested that an independent **Vocational Education Cell** should be created, which should be given responsibility of organising these programmes in different areas in each SAU. This cell should periodically conduct market surveys to identify prospective emerging areas for future agri-business ventures and self employment. This information should be used to continuously reorient and upgrade the ongoing programmes. This cell should also develop viable linkages with financial institutions, processing and marketing agencies, etc.

Adequate infrastructure facilities should be provided to make it effective. There is a need for well equipped laboratories for practical training, demonstration rooms, transportation facilities, accommodation for trainees, necessary equipment for developing business skills, audio-visual aids, appropriate funds for demonstrations, field / industrial visits, etc. Moreover, to make vocational education effective it must be recognised by the SAUs and ICAR as an important part of the total education and research system, for which separate funds should be provided.

Each SAU should also develop Agro Industrial Parks to facilitate development, testing and popularization of future viable commercial products.

10. ROLE OF GOVERNMENT

The main objective of vocational practical progrmmes is to encourage self employment. It has been observed that the Government provides some support to establish small scale ventures. The vocational training programme is the first step towards that. However, the small scale entrepreneurs,

have been facing problems in marketing of their produce. It is, therefore, suggested that Government, both at the state and national level, should encourage the entrepreneurs for setting up marketing associations at their level, or provide the marketing support to these organisations. We have success stories of Lizat Papads, Nirma detergent, Amul products where the private organisations and cooperatives have played an important role in developing the small and tinny organisations right from the procurement of materials to the marketing of finished products by creating successful grading and positioning strategies.

The Government may also provide the support to the new entrepreneurs by way of procurement and processing of the agricultural products. The mass media may be used to promote the products of these new entrepreneurs. The technical and management information can be provided to these people on the pattern of UGC programmes already televised in the country. The video cassettes can be made on different technical and management subjects and can be shown to these entrepreneurs not only on the national hook up but also in the premises of their associations.

In the past several programmes were launched by the state and central governments to promote self employment but these did not achieve the desired goals due to lack of adequate infrastructures as well as financial and logistic support particularly at the implementation stage. Proper attention, therefore, must be paid to work out the minute details at the planning stage so as to ensure its execution in a cost effective and time bound manner. It may be fruitful to establish a specialized cell in the appropriate government department for taking policy, legal and other logistic initiatives for promoting self employment through vocational education. It may be necessary to arrange consultancies in emerging hi-tech areas which may be very relevant but unaffordable by the small scale entrepreneurs.

ANNEXURE I

PROPOSED VOCATIONAL EDUCATION COURSES

Sr. No.	*Course Title*	*Duration*
	FOR FARMERS AND RURAL YOUTH	
1.	Entrepreneurship Development Programmes in Agri-Business	Short Duration*
2.	Poultry Farming	"
3.	Dairy Farming	"
4.	Bee-Keeping	"
5.	Mushroom Cultivation	"
6.	Piggery	"
7.	Fisheries	"
8.	Rabbit Farming	"
9.	Vegetable and Fruit Growing	"
10.	Seed Production	"
11.	Integrated Course for Young Farmers	3 months
12.	Lay Inseminators and Semen Bank	3 months
13.	Nursery of Ornamental Plants	1 months
14.	Safe Storage and use of Agricultural Chemicals	6 months
15.	Maintenance of Farm Machinery	1 months

★ Short Duration Programmes vary from 3 to 15 days

Sr. No.	Course Title	Duration
	FOR TECHNICIANS AND ARTISANS	
16.	Refresher Training Course on harvesting	3 days
17.	Micro irrigation	4 days
18.	Grain and Seed Storage Techniques	1 week
19.	Repair and Maintenance of Farm Electrical Motor and Pumps	4 days
20.	On-Farm Water Management	1 week
21.	Repair and Maintenance of Farm Tractors	1 weeks
22.	Use of computers for Educated Agricultural Machinery Manufacturers	4 days
23.	Grain and Seed Storage Structures	1 week
24.	Spraying and Dusting Equipments	3 days
25.	Repair and Maintenance of Diesel Engines	1 weeks
26.	Repair and Maintenance of Tractors	1 weeks
27.	Drainage of Agricultural Lands	1 week
28.	Post-harvest Technology and Agro-Industrial Complexes	4 weeks
29.	Watershed Management	4 days
30.	Improved Farm Machinery and Equipment	2 weeks
31.	Sprinkler and Drip Irrigation	4 days
32.	Ground Water Development	4 days
33.	Repair and Maintenance of Harvester Machines	1 week

Sr. No.	Course Title	Duration
	FOR FARM WOMEN	
34.	Fruit and Vegetable Preservation	6 months
35.	Value Added Foods	3 months
36.	Packaging of Fruits and Vegetables	1 months
37.	Bakery and Confectionery	6 months
38.	Fabric Enrichment	6 months
39.	Garment Construction	3 months
40.	Weaving	6 months
41.	Knitted Garments and Utility Articles	3 months
42.	Household Utility Articles	2 months
43.	Soft Toys and Education Play Materials	2 months
44.	Creche / Day Care Center Management	3 months
45.	Cut Flower Cultivation and Flower Arrangement (Seasonal)	2 months
46.	Communication Material Production	2 months
47.	Textile Dyeing and Printing	3 months
48.	Computer Aided Textile Designing	3 months

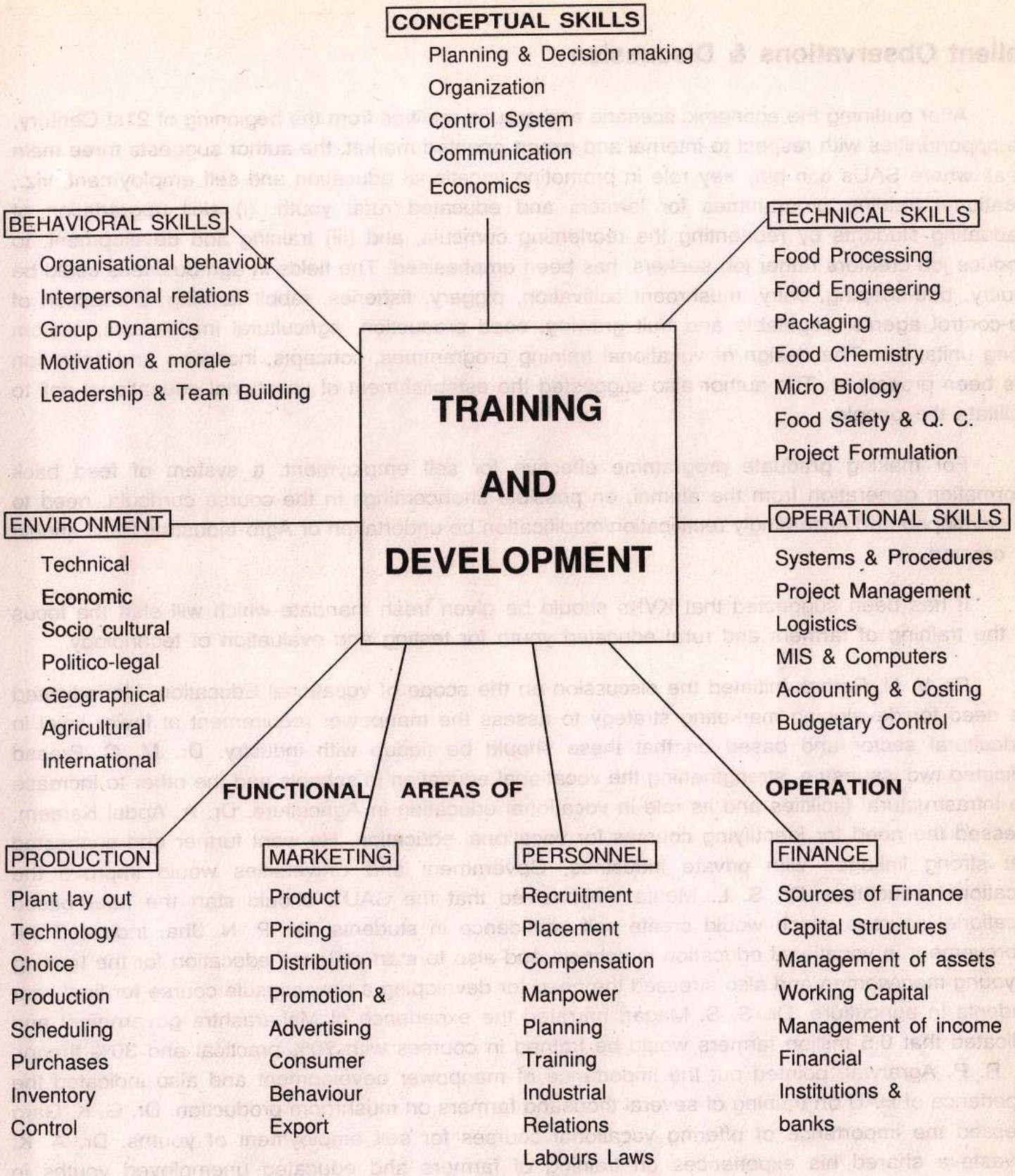

Fig. 1. : Components of training programmes for food industry managers

Salient Observations & Discussion

After outlining the economic scenario and ground realities from the beginning of 21st Century, the opportunities with respect to internal and export oriented market, the author suggests three main areas where SAUs can play key role in promoting vocational education and self employment, viz., vocational training programmes for farmers and educated rural youth, (i) skill upgradation of graduating students by reorienting the reorienting curricula, and (iii) training and development, to produce job creators rather job seekers, has been emphasised. The fields in agri-business could be poultry, bee-keeping, dairy, mushroom cultivation, piggery, fisheries, rabbit farming, production of bio-control agents, vegetable and fruit growing, seed production, agricultural implements, custom hiring units, etc. The design of vocational training programmes, concepts, inception and operation has been presented. The author also suggested the establishment of vocational educational cell to facilitate the people.

For making graduate programme effective for self employment, a system of feed back information generation from the alumni, on possible shortcomings in the course curricula, need to be developed and accordingly rectification/modification be undertaken or Agro-Industrial Pack should be created.

It has been suggested that KVKs should be given fresh mandate which will shift the focus on the training of farmers and rural educated youth for testing and evaluation of technology.

Dr. V. N. Pathak initiated the discussion on the scope of vocational Education. He indicated the need for developing marketing strategy to assess the manpower requirement at lower level in agricultural sector and based on that these should be tiedup with industry. Dr. M. C. Prasad indicated two issues i.e. strengthening the vocational education in schools and the other to increase the infrastructural facilities and its role in vocational education in Agriculture. Dr. A. Abdul Kareem, stressed the need for identifying courses for vocational education. He went further and suggested that strong linkages with private industries, Government and Universities would improve the vocational education. Dr. S. L. Mehta emphasized that the SAU's should start the need-based vocational courses which would create self confidence in students. Dr. P. N. Jha, indicated the improvement in vocational education in schools and also to start distance education for the training of young men/women and also stressed the need for developing a new capsule course for final year students in agriculture. Dr. S. S. Magar, narrated the experience of Maharashtra government and indicated that 0.5 million farmers would be trained in courses with 70% practical and 30% theory. Dr. R. P. Agrarwal, pointed out the importance of manpower development and also indicated the experience of HAU on training of several thousand farmers on mushroom production. Dr. G. K. Garg stressed the importance of offering vocational courses for self employment of youths. Dr. A. K. Srivastava shared his experiences on training of farmers and educated unemployed youths in Mushroom production in Bihar as source of generating self employment. Dr. K. S. Chauhan, expressed the importance of vocational education for self employment. He also emphasized the need for managerial training.

EDUCATION FOR SUSTAINABILITY IN AGRICULTURAL DEVELOPMENT

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1. INTRODUCTION

Agricultural Science integrates knowledge and technology not only from its own subdisciplines, but also from several other diverse fields of applied, basic and social sciences to deliver cost-effective and eco-friendly agro-technological packages for optimum utilization of various resources to increase agricultural production The course curricula developed till now has served its purpose in building up the required trained manpower to cater the needs of agricultural education, research and extension in our country. But in future, agricultural scientists will have to cover much wide spectrum of agricultural activities and social obligations due to changing technological development and agricultural scenario within and outside the country. In future, one has to augment not only the agricultural production commensurate with the growing needs of biotic population (human, animals, wildlife), but also to generate more employment, export surplus and farmer's income on long term basis by allocating the available resources to an array of other options for achieving sustainable progress in agriculture. However, the question arises as to how well our agricultural graduate is trained and equipped. What are his assets to achieve the future challenges. Is he able to exchange the correct messages with the scientists of allied disciplines within and outside the country as well as with the real user of his package of technology ? A few pertinent issues to prepare tomorrow's agricultural graduate in the emerging scenario of agriculture are briefly discussed here. The necessary feedback required from allied disciplines of basic, applied-sciences and social sciences is also partly taken care of for giving a holistic approach to prepare tomorrow's agricultural graduates. The agricultural education in India is at a point where we must evaluate out contributions, find out weaknesses and adopt strategies to meet challenges of sustainable agriculture development.

2. MAJOR ISSUES

Present day agriculture is a very complex activity in which agricultural education, research and extension are complementary to each other. Considering increasing demand for food, fibre, fuel, fodder other agricultural enterprises for biotic population on one hand and deterioration in the environment due to indiscriminate use of available resources on the other hand, concern is often expressed about our sustained, cost-effective and eco-friendly progress in agriculture. We have the responsibility not only to provide nutritional food security economically to the living population of the

country, but also export surplus to earn more foreign exchange, generate more job opportunity as well as self-employment in this sector to gain higher income on long term basis for the farming community. In future, the new approaches of alternate farmings, bio-fertilizers, pressure irrigation, integrated water management, integrated nutrient management, integrated pest management, crop modelling, resource optimization, post harvest technology and value added products should get increased emphasis to achieve desired results from agriculture sector. Now the farmers are looking at agricultural scientists very eagerly to suggest cost-effective employment generating and eco-friendly packages to adopt these new approaches in agriculture for future growth. The Indian economy is also thrown open to global competition. The global warming phenomenon and environmental pollution are now recognized world over. The science of biotechnology is sure to create much bigger revolution in 21st century. These and some other pertinent issues relating to world trade organization should thoroughly be answered and reflected in the subject matter of our revised course circular of agriculture so as to serve the society / nation in a better way beyond 2000 A.D.

3. AGRICULTURAL EDUCATION AT U.G. LEVEL

In majority of agricultural universities, the students are admitted after 10 + 2, who complete their 4 year degree programme generally following semester system of education taking a load of 20–24 credits per semester. There has been a feeling that these students do not posses the required practical knowledge and skills or performing the job of agricultural professional in agricultural departments and other organisations effectively and efficiently. The existing course curricula also do not provide them the desired opportunities for self employment in agro-based industries and on their own farms. Thus, for future there is a need to strengthen and modernise the U.G. programme by incorporating and agro-industry based programmes. Apart from general first degree in agriculture, reorientation is needed, a compulsory course on Computer Science, as well as the following practical to provided specialised degree such as Plant Science, Environmental / Pollution Science, Natural Resource Management, Retailing and Consumer Services, Agri business management, water management etc. according to need.

3.1 Earning while learning

This practical crop production programme has been introduced in several SAUs by allocating about one acre of land to batch of 4–6 students of pre-final year of U.G. programme. The students own this land for one academic year in which all operations starting from field preparations through harvesting and marketing are performed by the students themselves but under the expert guidance of the teachers. The net profit earned at the end of the year after following particular sequence of crop rotation is distributed among students. It may provide them an opportunity to put scientific principles into practice and conduct farming as a business as well as to understand and find the solution of problems faced during actual farming conditions. In this programme, so far major

emphasis has been given only to crop production. However, in future, it is necessary to include the components of floriculture, seed technology, fisheries, bee keeping, mushroom culture and other components of farming systems in this programme to build up confidence and increase the profit while adopting the alternate farming approaches in agriculture.

3.2 Introduction of elective subjects

Keeping in view the modernization of agriculture and open market economy in future, there is an urgent need to introduce various groups of elective subjects consisting of 15–16 credit each during the first semester of final year of U.G. programme. These electives should cover a wide-spectrum of agriculture activities such as food processing technology, agricultural business management, seed technology, high tech-water management, agro-forestry, sericulture, flower gardening, turf grass management, animal science, bioscience, agro-horticulture and vegetables, plant protection, diversification in crop production, rural development and communication, farm power machinery and alternate sources of energy, clothing textile design and production etc. Through these electives it is envisaged to produce two streams of graduates–one for those to pursuing higher studies in a particular discipline, and other for self-employment / employment.

3.3 Internship programme

It is felt that imparting agricultural education has to keep pace with the changes in the socio-economic environment of the rural community. To achieve this goal, internship in agriculture should be introduced to give rural experience under actual farming situation to the U.G. students during the last semester of their degree programme. It should consist of three components, i.e., short term orientation of interns in important areas of agricultural activities, exposure to agro-based industries and rural institutions and village experience. For village experience, a batch of 4–5 students should be allocated to a village under the guidance of KGK / KVK / Regional Research Station. Each intern should be attached to a progressive farmer for 3–4 months duration. The programme should be coordinated by at least one sincere teacher from each discipline through regular visits, while day-to-day problems may be tackled by one of the subject-matter specialist of KGK / KVK / Regional Research Station. It may help the interns to gain knowledge and experience on the operational aspects of agricultural technology, particularly about the constraints in the adoption of latest farm technology. It will also acquaint the interns with functioning or various agricultural development, marketing, extension, research and other organisations involved in rural development.

The internship programme in Veterinary Science has been introduced long back in the SAU's. However, it needs more rural orientation so as to serve the cause of rural community properly. Similar rural work experience is required for graduates of Home Science discipline to equip them for effective implementation of Home Science extension education programme in rural areas.

3.4 Plant clinic

Over the years, it has been experienced that for scientific crop production and management, it is absolutely necessary that agricultural graduates be trained to diagnose most plant disorders which are caused by various biotic (diseases, pests, nematodes, weeds) and abiotic stresses (nutritional deficiencies, soil water and other environmental toxicities, phytoxicities due to pesticides and fertilizers). The College of Agriculture should, therefore, launch a course on Plant Clinic in future with the primary objective of imparting through training to all the students admitted to U.G. programme covering these aspects of plant ailments. This inter-disciplinary course should draw resources from Departments of Plant Pathology, Entomology, Nematology, Soil Science, Agronomy and Plant Physiology.

4. AGRICULTURAL EDUCATION AT P.G. LEVEL

The P.G. programme both at M. Sc. and Ph. D. level, besides teaching, also includes the research component in most of the SAUs. After admission of the student in a particular discipline, he is required to offer a core group courses of his own discipline and minor and supporting courses from other disciplines keeping in view his research problem of thesis as suggested by student's advisory committee. The student is required to complete a total credit load of about 60 credit or more depending upon the need of that particular student as per recommendation of the advisory committee. The PG students should be encouraged to offer their major, minor and supporting courses in those areas which require a greater attention for reshaping our futuristic requirements of trained manpower covering different aspects of sustainable agriculture. The issues which need special attention while framing the new course curricula at PG level to face the challenges of tomorrow are briefly discussed here. It is needless to mention that most of these issues are complex in nature and would require a multi-disciplinary approach, meaning thereby the framing of some multidisciplinary (cross listed courses between disciplines) core group of courses in key areas of agricultural activities for reshaping tomorrow's agriculture on sustainable basis.

4.1 Soil health

The maintenance of good soil health is dependent on the socio-economic aspects and awareness about other alternatives to develop a sound economic base. Shrinking land area, decreasing efficiency of various inputs, increasing danger of residual ill effects of chemicals, imbalanced use of fertilizers, deterioration in the physical properties and soil biology in the rhizosphere and several other aspects of soil degradation are going to be more serious in future than ever before. It is, therefore, necessary to expose our graduates by strengthening the existing PG courses in soil science and / or framing a few inter-disciplinary courses to maintain good soil health. The major aspects which need special attention for course curricula development in this vital field are:

- Integrated Nutrient Management System
- Balance sheet of nutrients under different production systems
- Crop root systems in relation to soil environment
- Organic manures and bio-fertilizers
- Soil and water pollution by different inputs
- GIS application in soil and water resources mapping

4.2. Agricultural water management

Indiscriminate use of this scarce resource has resulted in soil degradation, hydrological imbalances, low efficiency and several other socio-economic and environmental problems. To optimize crop production under limited supply of water, the plant breeding and management strategies should be aimed at maximizing water use efficiency. In addition to crop transpiration, water may be lost from the system in conveyance, application, surface evaporation, transpiration by competing weeds and through run off and deep percolation below root zone. Thus, an efficient utilization of water warrants adoption of better conveyance and application systems, selection of crops / their cultivars and management practices directed to increase water use efficiency. A poorly managed irrigation or rain water discharge system can cause unforeseen social, health and environmental problems—massive migration of people, soil salinization / alkalization, waterlogging and epidemics caused by water borne pests and diseases. So for better future, farmers should be involved and trained in different aspects of water management for maintaining better environment and increased productivity / production on sustainable basis. Though most of the agricultural universities have adequate number of course at PG level to cover various aspects of agricultural water management, the following areas however need special attention in terms of course curricula of development at PG level in SAU's.

- Socio-economic aspects of water management
- Water production functions in relation to availability of water and other inputs
- Soil-plant-atmospheric water relations and irrigation management
- Crop co-efficient and pressure systems of irrigation
- Rain watershed management

4.3 Pest management strategy

Use of pesticides has become an integral part of modern agriculture. However, intensive and indiscriminate pesticide use, resistance build up in certain species to pesticides and increasing public

concern about their entry in food chain and their adverse effects on environment and human health have led to a wide spread appreciation of the integrated pest management (IPM). In IPM, a series of steps are followed to keep the population level below the economic threshold, i.e., adoption of suitable crop sequence, use of disease free seeds of resistance varieties, biological suppression of the pest population, usage of pheromones and timely spray of pesticides to form part of the of the plant protection umbrella. Similarly, the integrated weed management (IWM) concept is the rational use of the direct and indirect methods of weed control to provide cost-effective and eco-friendly approach for IWM. The commonly suggested direct methods are land preparation, water management, crop cover, crop rotation while indirect methods include hand and mechanical weeding, mulching and use of bio and chemical herbicides. Biological control of weeds, insects and even plant pathogens have proved to be highly successful. In Haryana and Punjab, the continuous use of *isoproturon* to control *Phalaris minor* in wheat is slowly becoming less effective, and the farmers are facing a lot of problem on this account. Similar resistance against pesticides is building up to control polyphagus insect *Heliothis*. So in future, efforts should be made to develop bio-control measures against weeds, *Helothis* and soil-borne pathogens such as *Rhizoctonia* and in this endeavour use of *Trichogerma* as egg parasite and Bt as well as NPV as bio-pesticide for *Helothis* control hold great promise. Development of suitable cropping control hold great promise. Development of suitable cropping systems based on IPM / IWM strategies, and transplanting them into action, selecting proper bio-control agents that have enhanced parasitic and survival ability and establishment of plant clinics in the rural areas through suitably trained graduates are some other potential areas needing further intensified efforts. The field of bio-technology and genetic engineering offer a great scope for development of bio-pesticides as well as resistant crop plants to selected herbicides.

The course curricula which need attention in the area of IPM and IWM at PG level should include :

- Integrated Pest Management
- Integrated Weed Management
- Degradation and residue management of pesticides in soil, plant and atmospheric systems
- Bio-technology in relation to pest management
- Plant clinics, application efficiency and quality control of pesticides

4.4 Integrated farming system

Considering the requirements of ever increasing population and technological development, agricultural scientists should suggest suitable packages to the farmers under varied farming situations. In such new agro-technological packages, not only the crop production should be kept

in mind but a holistic approaches of integrated farming systems, having the components of dairy, poultry, fisheries, bee-keeping, floriculture, mushroom culture, agro-horticulature, silvi-pasture, agroforestry, etc. should be added to generate more employment and income of farming community on long term basis. There is also a great scope to augment farmers' income by suggesting suitable crop diversification like growing of export oriented crop commodities (Basmati rice, duram wheat), flowers, fruits, medicinal plants, hybrid seed production and value added products through post harvest technology. All these agro technological changes will demand intensive cropping, greater use of inputs and proper care of soil health and environment for achieving desired results from such intensive agriculture. It will also require a thorough knowledge of the whole system, marketing forces and socio-economic returns which can be solved through the application of advance knowledge of computer science to develop suitable dynamic models for resource optimization. At present to many of us, the use of computers in optimization of resources in agricultural activities seems to be a just fashion, but in reality it focuses our attention about the weak links in our education, research and management system for their further strengthening to achieve sustainable progress in agriculture.

So for the bright future, the major emphasis in course curricula development should be given to strengthen this important area in which crop commodity based education and research system should take the shape of cropping systems and integrated farming systems' approach. This will need the incorporation of the following aspects in the course curricula of agronomy and allied disciplines.

- Composting and re-cycling of organic farm wastes.
- Ecology of cropping system
- Integrated farming system
- Resource optimization

4.5 Production physiology

There have been concerted efforts in the discipline of plant physiology to study the effects of different biotic and abiotic factors on plant functions and crop productivity and for this generally green house grown plants in pot are utilized without realization of real field situation. It is a known fact that in naturally lit screen houses, there is about 30–40% reduction in incident radiation, high humidity and limited soil volume in pots, and thus the potted plants are relatively weak as compared to field grown plants. Reports in literature indicate substantial differences in crop responses to drought and salinity stresses between pot grown and field grown plants. With limited soil volume and high root density in pots, there is very rapid development of plant water deficit and plants have very little time of adapt under such rapid drying conditions. It also generally happens that the plants with strong root system, which have a greater chance of survival and yield better under field conditions,

are usually poor performer under pot conditions. Similarly, the pattern of salt distribution in soil under pot and field conditions could be different simply because of differences in the frequency and quantity of watering under two situations.

Similarly, one should be very cautious while interpreting the response of transpiration (T) or photosynthesis (PN) to environmental factors recorded on individual leaf and whole crop canopy under field conditions. Productivity (economic yield) may be associated with T so long there is high association between PN and T. However, it is observed that economic yield could vary depending upon variations in water use efficiency and harvest index. Therefore, a full understanding of productivity requires consideration of how each increment of dry matter is allocated to various growing sinks, i.e., root, stem, leaves and seed. Thus in future, we have to reorient our research and education programme in the discipline of plant physiology to make it production physiology and following areas would require strengthening / framing of new courses at P.G. level.

- Crop physiology
- Internal plant water status and crop productivity
- Crop modelling
- Root morphology and physiology in relation to input use efficiency in field crops
- Indentification of potential stress tolerance traits in crop cultivars

4.6. Yield potential and its stability

In the past century the pace of varietal development in different crops has been quite encouraging. The new vistas in Indian agriculture were added in the form of *Green Revolution* by the introduction and development of high yielding dwarf varieties of wheat and rice, and development of a few hybrids in other crops but now yield plateau has been observed in major food grains like wheat and rice even under high input system of agriculture. This in future, break-through in crop improvement programme may come by improving the partitioning of biomass towards useful components from whole plant (root and shoot) rather than shoot alone.

Heterosis or hybrid vigour has been exploited in several crops and a considerable scope exists to increase the productivity of crops through heterosis exploitation. The efficiency of photosynthesis can further be improved if the genes determining the efficiency of light absorption, electron transport and protein pumping, and high energy phosphate bond synthesis in the chloroplast can be reassembled from the best plant resources.

The important constraints facing the Indian agriculture production system indicates that sustain ability under rainfed conditions is perhaps the key issue for India. It is also generally assumed that whatever the variety is produced from single crop commodity oriented research projects under open environment will also perform well in inter cropping system / integrated farming

systems or other conditions of fragile environment. This however, has not come true in several situations. In recent past, there has been a modest progress to incorporate the traits for biotic resistance into suitable agronomic background. However, only very little efforts are made to identify and incorporate the potential traits for different abiotic stresses into high yielding varieties of field crops.

With the fast technological developments, the progress in system physiology has opened new possibilities in identifying potential traits to various environmental stresses and their measurements by relatively simple and impressive means. Recent time has also witnessed an exponential increase in understanding the molecular biology of stress tolerance in plants. The knowledge gathered in the field of stress physiology and bio-technology could permit us to incorporate desired traits through improved breeding techniques to achieve a second green revolution in the country.

There is now an emerging consensus regarding the desirability of the farmers participations in the development and release of variety, particularly for the unfavourable environments. The institutional system of plant breeding and seed productions have been benefited enormously from the genetic diversity of the difficult regions. Now it is time that plant breeding strategies are broadened, recognizing comparative advantage of farmers and plant breeders, to reconcile often conflicting objectives of equity, sustainability and efficiency.

It is recognized that 20–25% yield advantage may be achieved only through the use of good quality seed. In this endeavour, the SAUs, ICAR institutions and other organization have geared up its breeder, foundation and certified seed production programme to enhance the availability of good quality seeds to the farmers. India has also signed the Dunkel draft proposal which involves the issues, like patenting of seeds or other life forms and intellectual property, breeders' and farmers' rights. These and several other above mentioned issues need special consideration while strengthening / framing of new courses at PG level in the discipline of genetics and plant breeding. The areas which need strengthening the teaching programme in the discipline of crop improvement should include :

- Farmer participatory plant breeding for frazile environments
- Breeding for biotic and abiotic stresses
- Management and conservation of plant genetic resources
- Seed technology
- Intellectual property, breeders' and farmers' right in patenting of seeds, other life forms and biobased products
- Biotechnology and genetic engineering.

4.7 Atmospheric environment

Modern agriculture requires precise information on various agro-climatic parameters for harnessing maximum benefit from atmospheric factors by suggesting suitable agro-technology and corrective measures against aberrant weather conditions for sustained development of agriculture. This would require delineation of agro-climatic zones by proper inventory of edaphic and weather parameters, availability of other resources and prevailing cropping systems. It will help not only to intensify the execution of the concept of efficient crop zoning by producing a particular crop commodity in the ecologically optimum zone but also timely warning systems for taking necessary corrective measures against aberrant weather conditions, pest and diseases. In recent years, there has been lot of deliberations on global warming, CO_2 enrichment, depletion of ozone layer, and increased concentration of other green house gases and their probable impact on agriculture and environment. The use of remote sensing techniques in resource monitoring and crop-weather modelling for resource optimization should be advocated to modernize the discipline of agricultural meteorology. These areas should find proper place in PG course curricula to train our graduates in this important discipline. The courses which need strengthening / inclusion in this field include :

- Crop weather forecasting
- Agro-climatic zonation
- Crop weather modelling
- Application of remote sensing techniques in agriculture
- Climatic change, green house effects and Indian agriculture

4.8 Post harvest technology and value added products

There is a great scope to augment farmer's income and employment by proper allocation of resources to an array of option, i.e., proper packing and grading of fruits, vegetables, spices and cut flowers, and preparation / manufacturing of several value added products through post-harvest technology for their proper marketing within and outside the country. There would be great deal of involvement of several developmental agencies to cover this important area of agricultural activity but the subject is particularly important to the discipline of horticulture, vegetables, agro-forestry and other allied disciplines as they may help in developing trained manpower to generate more self-employment, and income for the educated graduates and farmers by fetching better prices for their produce / products in the market. Training and oversea visits should assess the ongoing changes so that right types of changes could be taken up in the course curricula development at PG level to cover these important activities. The course curricula which need strengthening should include :

- Post harvest physiology of fruits and vegetables
- Storage, packaging and marketing of seedlings and cut flowers
- Post harvest technology and value added products of field, tree and vegetable crops
- Spices, condiments and medicinal plants

4.9 Agricultural marketing and communication

The spectacular success achieved by our neighbouring Asian countries such as Japan, South Korea, Taiwan, Thailand, Malaysia and China in the field of agro-industries and agro-business has positively inspired our planners and also the corporate sector to view agriculture in an entirely new light. The current level of export is very meager but the speed at which the export are growing is satisfactory. There can be no doubt about the immense and yet untapped prospects and potentials to view and covert India as an agricultural power. Currently India's share is hardly one percent of global market for agricultural products. But there are positive indications in this direction. Food crops, plantation crops, poultry, dairy, sugar, cotton and oilseed are the areas in which India has made its mark. Sericulture, marine and inland fisheries are other areas in which considerable progress has been made. Fruits, vegetables, medicinals plants and herbs in which attention has been focussed only now. Only a few countries grow such a wide range of fruits, vegetables and flowers and rich variety of medicinal plants and herbs as India. India can also attain a commanding position of highly promising and relatively inexpensive vermiculture, biofertilizers, bio-pesticides, tissue culture propagaged materials, nitrogen fixing shrubs and trees. India is the leading producer of tea, coffee, cashew nuts, spices and jute fibre. With an emphasis on diversification of production, maturity standards, post harvest management, maintaining quality control at all levels, proper planning, rural financing, marketing and competitiveness are required to enter the world market in a big way. There is a vast scope for increasing agricultural exports. With the liberalization of Indian economy and globalization of world markets the immense entrepreneurial talent of Indians have been unleased. India has vast area of land, bright sunshine, diverse range of environments, vast pool of scientists and technocrats, cheap labour, and innovative entrepreneurs. With proper planning and production of greater exportable quality surplus, India can certainly emerge as a modest player in the global market of agricultural products.

Agricultural business management education is relatively new in India but now this has reduced gap of management knowledge and skills to provide proper linkages between agriculture and industry. A few SAUs have taken a lead in identifying this need and decided to extend their education service to prepare competent personnels for careers in teaching, research and consultancy in agri-business oriented enterprises, proper education and training to the farmers is required in the changing scenario. A few State Governments and Chamber of Commerce in collaboration with SAUs are eager to set up *marketing intelligence system* for providing information on national and internatioanal marketing trends and systems about agro based produce / products

for the benefit of the farmers. There would be a great deal of involvement of several rural development and financial agencies to help the farmers in this endeavour, but the subject is of importance to agricultural extension workers for educating the farmers to organize their production and marketing associations to fetch better price of their produce / products in the market. However, a persistance weakness of agricultural extension has been a lack of adequate support from mass media like radio, television and electronic technology. The recent developments in electronics have opened up the new vistas of merger and convergence of mass media, computers and televisions for developing expert system of data base to achieve yet another revolution in the field of agricultural communication. This new technological development will go a long way in improving, monitoring and evaluation of extension service deliveries, their adoption and proper feed back regarding problems faced by extension advisory agencies and farming community for reshaping the Indian agriculture.

Knowledge is growing at the rate of 3000 words per minute and the gap between to developed and developing countries is widening simultaneously. Information is knowledge and knowledge leads to power and wealth. Our graduates, scientists, planners and farmers have to keep pace with newer developments. This is only possible if our institutions are connected to international networking with an access to international database and information on emerging technologies.

Keeping in view the above problems and objectives in view, there is an urgent need to strengthen the existing / framing new courses in SAUs at PG level in the following areas to make the agriculture as business oriented enterprise.

- Multimedia courseware in instruction and education for information networking and management
- Agricultural business management
- Export data base for rural communications and service delivery systems

5. HOW TO BRING THE NECESSARY INNOVATIONS IN AGRICULTURAL EDUCATION

The various steps which are required to bring the necessary innovations in agricultural education to face tomorrow's challenges are briefly discussed here.

5.1 Re-structuring of course curricula

A small sub-committee of educational experts should be set up to revise the course programme at UG level for its discussion / adoption at National level. These course contents should have about 80% uniformity and 20% flexibility for local adjustments in various SAUs. A similar discipline wise sub-committee of experts is required to up-grade the existing courses / develop new

courses in their respective disciplines at PG level to incorporate the technological development and changing scenarios in agriculture.

5.2 Agricultural education council

The proposed Agricultural Education Council to be setup by the ICAR shall have the statutory powers to monitor Agricultural Education in India and will have well developed nation wide infrastructure, clearly defined policies, ready manpower and operational setup.

5.3 Accreditation of all agricultural colleges

Accreditation Board has been set up by the ICAR with powers to set norms and standard of agricultural education. This will ensure uniform standards of education at national level, monitoring and development of course curriculum. The board will also ensure that all SAUs have minimum infrastructure level for imparting quality education. It will be appropriate if the board undertake accreditation of all agricultural colleges (including private colleges) and suggest a strategy for preventing substandard degree.

5.4 Vocation agricultural education

The absence of agricultural vocation educations has created a communication gap in effective transfer of technology from lab to land. Vocational training on a large scale in various fields / subject can partly bridge the gap. Students unable to pursue higher education, college drop outs, women in agriculture who have no facilities of higher education and unemployed youths etc. can easily be oriented towards agricultural vocations as per their traditional occupations. There is a good scope for vocation in animal husbandry and dairying, fisheries, horticulture, floriculture, food preservation, processing, sericulture, agri-business, farm machines etc. Vocational training has to be viewed in its content of curriculum and practical training.

5.5 Recruitment of staff

In order to avoid inbreeding, the recruitment at the level of Assistant Professors in SAUs has to be based on National Eligibility Test (NET). All the three degrees i.e., B.Sc., M. Sc., and Ph. D. from the same University need to be discouraged. It is very important to ensure competence of the faculty at the entrance level.

5.6. Intrastructure facilities and trained manpower

Adequate infrastructure facilities to establish and operate various practical oriented and agro-industry based programmes at UG level should be made available in all SAUs. These units should be allowed to run by a group of students on their own on the pattern of practical crop production

programme *earning while learning.* It may help to build up confidence and inculcate aptitude for enterpreneurship among the graduates leading to their self employment / employment in agriculture sector. Similarly, for modernization of PG programme, adequate funding to strengthen the laboratory and field facilities in terms of procurement of modern equipment, advanced training of the faculty in overseas institutions of repute in selected areas of national importance, and consultancy, short term visits of foreign experts to strengthen intra-institutional linkages will be required. The sandwich exchange programmes of Ph.D. students to complete part of their degree requirements between different SAUs and overseas institutions of repute should be encouraged. The UNDP Advance Centre Model of Post-graduation with slight modifications could be followed to strengthen PG teaching and research programmes in selected areas of national importance.

5.7 Linkages between SAU's, ICAR institutions and agro-based industries

India has given a special thrust to boost its agricultural export. With proper linkages between SAUs, ICAR institutions and agro-based industries, the necessary ongoing modifications in educational and research programmes can be made with a view to plan and produce the desired exportable surplus in agriculture sector. It will also help to build up trained scientific manpower as per requirements of agro-based industries and other organizations engaged in rural development. Agro-based industries should also provide adequate funding for strengthening the research and infrastructure facilities in selected areas of mutual interests.

5.8 Student's counselling and placement cell

The student's councelling and placement cell should be strengthened / set up in each SAU's by equipping them with modern data base systems of question banks along with their solutions in the areas related to awards of various fellowships and competitive examinations of agricultural graduates. These cells should also have proper linkages with various employment agencies with regard to job requirements to help the graduates about their job securities and absorption in various Government and private concerns within and outside the country.

5.9 Modernization of library facilities

The libraries should be modernized with the latest electronic information systems to help the scientists and students to quick accessibility of scientific information and latest development in education, research and extension activities of their interests. The scientific information system should have proper cataloguing, systematic categorisation and proper storage of information as well as good linkages with major libraries and information centres within and outside the country.

5.10 Academic reforms and recruitment of staff

There is an urgent need to introduce the necessary changes in admission, examination and

recuritment systems to improve the quality of education and performance of graduates in agricultural sector. The entrance test should be conducted on all India basis by an independent agency uniformly for admissions both at UG and PG levels. An element of external evaluation system should be introduced in both UG and PG programmes to minimize the tendency of less course coverage, missing of examinations and other forms of indiscipline which is perpetuating among the students due to internal examination and evaluation systems in SAUs. There should be adequate representations of the students of other states in each SAU and care should be taken not to allow a student to complete all the degree from a single university. This will help in National Integration also. Suitable weightage should be given in the award of scholarship and recruitment's to those who are completing / completed their various degree programmes from different SAUs / Overseas institutions. The A.S.R.B. should also be assigned the tasks of recruitment of scientific staff uniformly on all India basis in various SAUs to avoid the increased tendency of inbreeding and biasness in recruitments. Care should be taken not to post the candidates in the same University / institution where he has obtained his highest degree. Only the dedicated and high calibre staff with minimum dislocation / transfers should be assigned the noble task of teaching in various SAUs.

5.11 Staff training academy

Academies or instructional research and development centre should be established with the facilities of core group of resource personnels and supporting staff along with modern facilities of audio-visual aids and other infrastructure in selected SAUs to organize the refresher courses for teaching staff to improve teaching methodology and update their knowledge in important areas of national interest and scientific development.

6. INTEGRATION AND CONCLUSIONS

Proper education is said to be instrumental in effecting changes in human life and solving human problems. At present in most of the SAU's in the country the agricultural education comprised of about a dozen major disciplines. Currently, upper most thought being aired everywhere that the SAUs should develop such course curricula as to cover whole *gamutes* of farming systems, crop diversification and agro-based value added products to generate more employment, export surplus and farmer's income for sustainable progress in agriculture. It will require a broader agricultural base and inclusion of adequate subject matter components from both basic and other applied sciences in course curricula to prepare tomorrow's agricultural graduates. The UG programme should include the courses on computer science and mathematics, agro-based industries, self employment training, plant clinics and village experience. During the internship programme in agriculture, students should have adequate exposure to rural financing agencies, agro-based industries, value added products, and processing units and marketing agencies.

After their exposure to these practical oriented and agro-industry based courses, a proper counselling is needed to inculcate the enterpreneurship skills among the graduates for enabling them to start their own agro-based units in agriculture sector. Only limited number of students with high

calibre should be encouraged to persue PG programmes. However, this goal can be achieved only if adequate job opportunities are made available in various organizations or adequate confidence is build up for self employment among the graduates. There should be a great deal of revision of courses both at UG and PG level keeping in view the various problems and emerging issues related to modern agriculture and globalization of economy. The PG students should be encouraged to offer their minors and supporting courses in basic sciences and other allied disciplines so that they are able to develop adequate knowledge and in-depth understanding of the subject matter to pursue the objectives of their respective thesis research problems.

This would require a lot of flexibility in education system, well trained faculty, adequate modern infrastructure, laboratory and field facilities and concerted efforts for the betterment of our whole education system to face the challenges of tomorrow.

The field of biotechnology is sure to create much bigger revolution in 21st Century than electronics did in the 20th century. Socio-economic and environmental issues as well as intellectual property rights will also dominate in the next century. Therefore, it is the need of hour to prepare ourselves and identify our role in changing scenario of agriculture. No one knows about the future, but some one may ask : Gentleman, I require a package to practice space farming. We can certainly come to the expectations of the people provided our sincere efforts to improve and reshape the agricultural education, research and extension activities continue with zeal and required thrust.

Some of the important points which need more emphasis in this endeavour are briefly summarized below :

All Agricultural graduates should have practical knowledge to run their farms, agro-based industries independently.

Suitable programmes should be developed for INMS, IPM, IWM, IFS and location specific agricultural package of practices.

There should be a uniform course curricula in all Agricultural Institutions throughout India with marginal adjustments for local conditions.

All India uniform entrance test for admission through regional centres should be conducted with adequate representation of students in admissions from other states in all SAUs to induce National Integration.

The Agricultural Institution should invariably be headed by an agriculturists.

There should be a close link between Universities, Department of Agriculture of the State and Agro-based Industries of the region for proper utilization of trained manpower.

There should be a very close links between Agricultural Institutions, Doordarshan, All India Radio and Local Press so that the latest technology passes to the users (farmers) with the minimum delay.

Dr. D. P. Singh and other colleagues from CCS HAU, Hisar are duly acknowledged.

Salient Observations & Discussions

- All graduates should have practical knowledge to run their farms/agro-based industries independently
- Suitable programmes should be developed for Integrated Nutrient Management, Integrated Pest Management, Integrated Weed Management, Integrated Farming System and location specific agricultural package of practice.
- There should be a uniform course curricula in all Agricultural Institutions through out India with marginal adjustments for local conditions. The courses like Agrobiology should be introduced in place of traditional courses in Biology.
- All India Uniform Entrance Test for admission through regional centers should be conducted with adequate representation of students in all missions from other States in all S. A. Us to induce National integration.
- The Agricultural Institutions should invariably be headed by an Agriculturist or Scientists from allied disciplines.
- There should be a close link between Universities, State Department of Agriculture, Agro-based industries of the region for proper Utilization of manpower
- There should be very close links between Agricultural Institutions, Doordarshan, All India Radio and Local Press so that latest technology passes to the users without any delay.

AGRICULTURAL EDUCATION FOR WOMEN IN TAMIL NADU

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INTRODUCTION

India is basically an agricultural country with 70% of the population depending on Agriculture for their existence and sustainability. The growth and development in agricultural sector and higher agricultural education and research would directly reflect better growth and quality of life. India has achieved a substantial progress in agricultural production to feed our 900 million people due to introduction of modern scientific agriculture during the Green Revolution era. It is very important to train the youngsters as agricultural graduates in a modern way not only to increase the agricultural human resource but also to improve the quality of manpower for building up strong Nation free from hunger for food. Therefore, skill oriented and realistic agricultural education enabling them to solve problems would largely enthuse the young graduates for self employment.

"There will never be a generation of great men until there has been a generation of free women of free mothers", wrote Robert Ingersol. Historically, Indian women's subdued status is well known. In all fronts, they are rightfully relegated to backwardness. In a real democracy, man and woman must not only possess one vote but also one value. This is yet to happen. The constitution has gone a long way to grant rights of equal opportunity, status and development entitlement. But the executive, the legislative and the judicative entities have not uninhibitively implemented the provisions.

Gender discrimination in children and female infanticide and their early death due to sheer neglect have resulted in diminishing number of women in proportion to the male population in India. Therefore, Barbara Miller (1997) calls woman as "Endangered Sex". Women are discriminated in matters of sharing food and nutrition, morbidity, medical care, marriage costs, education and employments. For example, in 1995–96, the number of female teachers in India was 14.73 lakhs whereas the number of male was 29.25 lakhs. A study by Women's Policy Research and Advocacy Unit of National Institute of Advanced Studies, Bangalore reports emphatically the lack of control over material resources by Indian women. Furthermore, they have internalised their inferiority status. They lack control over reproduction, physically security and mobility, political space, intangible resources such as information, influence and political clout etc. The policies and programmes aimed to improve women have not, however, yielded significant results.

Women constitute about half of the world population, accounting for 60 per cent of the working hours and contribute nearly 30 percent of the official labour force, yet they receive only

1/10 of the world's income and acquired less than 1/100th of world's property. Along with these, women bear the double burden of paid work and unapid domestic duties and responsibilities of the family.

WOMEN AND EDUCATION

During the present century, India has made spectacular progress in promoting the interests of women. The literacy rate went up from 7 percent in 1901 to 7.9 per cent in 1951, 18 per cent in 1971 to 24.88 per cent in 1981. But there is a wide gap between male and female literacy with male literacy rate always being higher than female.

Table 1 : Literacy Rate in India

Sex	Literacy rate (%)				
	1951	1961	1971	1981	1991
Male	24.90	34.40	39.51	46.74	63.86
Female	7.90	12.90	18.44	24.88	39.43
Average	16.40	23.65	28.96	35.81	51.65

This disparity between men and women in acquiring education becomes greater in case of more advanced levels of education. Eventually, the intake of females in technical and higher education is considerably low.

ARE RURAL WOMEN BETTER-OFF ?

Women are the important segment of Indian population who contribute significantly higher for agriculture production. Two-thirds of rural women hail from small and marginal farm and landless households. They work equally on agricultural and land at home. Women play a major role in decision making regarding various agricultural practices and home activities. They are known to rely on the sources available domestically (Nirmala *et. al.* 1990). Geervani (1995) has shown that the increasing number of adult women are not just housewives but in fact farmers. Women in India are the major producers of food (65% in Asia) in terms of value, volume and hours of work and are therefore an economic asset in agricultural families owing to their contribution to food production as well as family welfare. This is achieved inspite of unequal access to land, seeds, fertilizer and information by women.

Despite women's crucial role in agricultural and rural activities, their status does not seem to be on equal footing with that of men. Still rural female literacy is markedly lower in most parts of the country. The average earning capacity of female agricultural labourer is less than Rs. 10/- per day in backward areas (Kalpana, 1997).

EMPOWERING WOMEN THROUGH EDUCATION

The importance of education in empowering women to achieve real and lasting improvement

in their lives cannot be underestimated. Time and again, several studies have shown that the education of women is the most important factor deciding her marriage age, reproductive behaviour, knowledge and use of contraceptives. More specifically education increases **maternal and economic competence.** Kerala stands as a unique example of how women can contribute for household welfare at micro-level and overall economic growth at macro-level. Educating women facilitates easy access to knowledge and various methods of family planning helping her to determine the family size. Above all, education imparts skills to women ensuring social and economic independence. Education opens up the floodgates of economic opportunities for women. A World Bank study, while emphasizing the increased allocation for women's education, reveals that literacy could ensure three percent growth in developing economics. There is also a significant gap between rural women's potential and actual productivity.

AGRICULTURAL EDUCATION : A PRE-REQUISITE

Agriculture, which is the primary sector of the Indian economy supports nearly 70 percent of rural women for their livelihood. Thus far, rural women were in traditional way in terms of their role in household and income earning activities. Now the scenario has changed as more women are literates, their role in the society is greatly changing and there are more economic opportunities opened up. Women have become more aware of what is happening around because of their exposure to mass media. Imparting skill to women in agriculture and related activities are critically important not only to improve their efficiency in production activities but also to enhance their earning capacity. Apart from the college education in agriculture, short term trainings for skill development to women who are already in work force and introducing agricultural education at school level must form part of the future strategies. Modernisation of agriculture may not move faster unless women depending on agriculture are more skilled and their management capabilities expanded.

NEED FOR KNOWLEDGE AND SKILL BASED EDUCATION

Participation of women in decision making in agriculture can be encouraged only by educating and equipping them with latest agricultural information (Rexlin and Subramanyan, 1990). Subramanian (1997) stressed the importance of study of time use pattern of the women and their skills to design training accordingly. Geervani (1997) indicated more areas where women are to be imparted knowledge and skills.

(i) Most of the farm women spent their time on production oriented work besides cooking and nurturing family members. In future, agriculture will be a business. Hence, women are likely to engage themselves in land based income generating operations. So women need commercial orientation in their skills.

(ii) Women must be exposed to latest knowledge in crop and animal husbandry, post harvest technology and agricultural marketing.

(iii) As there is better scope for export of agricultural commodities, training on national and international standards, packaging and utilization of agricultural wastes and by-products, for women will be of much use for developing their entrepreneurial skills.

(iv) Knowledge on value added agricultural products to fetch better income are also to be taught so as to effectively convert the excessively produced commodities.

(v) Awareness on welfare and development programmes for women, rights of women and important women development activities must be created among rural women.

(vi) Women need greater access to information on new technologies, new opportunities for socioeconomic development and knowledge in agribusiness management.

AGRICULTURAL VOCATIONAL EDUCATION AT SCHOOL LEVEL

Even a cursory examination of facts reveals that at national level, no separate programmes are available exclusively for women to have access to agricultural education, except for Home Science education which encompasses only limited subject area of agriculture. However, agricultural vocational education at school is offered but preference by females is only very low. However, agricultural education at college level is offered without any gender difference. The curriculam however is not flexible to suit to the local needs and only common syllabus is being followed for the entire country. At school level, agriculture subjects are being taught as a vocational course for a period of two years only after the secondary level education and agricultural subjects are rarely offered below higher secondary level. To cite an example, out of six vocational subjects offered at higher secondary level in Tamil Nadu, Agriculture forms the major one comprising 15 subjects followed by Home Science with 9 subjects. As per the census of Statistical Hand Book of School Education Department, the enrollment of girls in agricultural vocational subjects is only 6 percent in Tamil Nadu while in Home Science the enrollment of girls is 97 percent.

AGRICULTURAL DIPLOMA EDUCATION

Above higher secondary level, agriculture education is available as diplomas and degrees. Out of 200 diploma holders coming out each year in Tamil Nadu, only a few candidates are women. The students of higher secondary level both from academic and vocational stream are admitted in Diploma in Agriculture based on merit. The students need not appear for the Entrance Examination conducted by the State Government. A total of 200 students are admitted in four institutions available in Tamil Nadu. Every year, approximately 150 - 180 diploma holders are expected, out of which, the women diploma holders are only very few. The diploma holders are employed in the State Department of Agriculture and Horticulture as Assistant Agricultural Offricers. The women diploma holder who are few in numbers are placed in the Soil Testing and Pesticide Testing Laboratories and also involved in Tamil Nadu Women in Agriculture (TANWA) projects of State Agriculture Department.

AGRICULTURAL EDUCATION AT COLLEGE LEVEL

The students having biology, physics and chemistry bases at higher secondary level are eligible for admission to agricultural courses. The appearance in Tamil Nadu Professional Courses Entrance Examinations is essential. The students are admitted based on the marks secured in

subjects and in the Entrance Examination. The marks in mathematics, physics and chemistry are essential for admission to B.E. (Agriculture) besides the entrance marks. Approximately 500 candidates are admitted in Tamil Nadu Agricultural University, besides 150 candidates in Annamalai University.

However, in recent years the girl students secured admission to agriculture degree courses in large numbers. Since 1980, the inflow of girl students to agriculture course is on the increase because of their academic performance. More and more number of girl students are keen in joining agriculture, horticulture, veterinary, agricultural engineering and forestry courses. In Tamil Nadu Agricultural University, the male : female ratio is almost 50 : 50 (Table 2).

Table 2 : Students Enrolment in Various Undergraduate Degree Programmes

Course	1992		1993		1994		1995		1996		1997	
	Boys	**Girls**	Boys	**Girls**	Boys	**Girls**	Boys	**Girls**	Boys	**Girls**	Boys	**Girls**
Agriculture	231	**148**	200	**153**	246	**185**	186	**172**	176	**184**	195	**180**
Horticulture	42	**24**	17	**25**	26	**30**	32	**29**	31	**37**	36	**35**
Forestry	17	**1**	16	**2**	15	**3**	18	**1**	16	—	16	**4**
Engineering	56	**13**	16	**8**	22	**11**	25	**10**	21	**12**	24	**13**
Grand Total	532		437		538		464		477		503	
Ratio	65 : **35**		56 : **44**		57 : **43**		56 : **54**		51 : **49**		53 : **47**	

PERFORMANCE OF GIRLS IN AGRICULTURAL EDUCATION

The performance level of girls is significantly far better than boys. They excel in practical oriented subjects such as Commercial Agriculture and Crop Production courses. The performance of the girls in Village Stay Programme and their approach in learning process with farmers was outstanding (Kannaiyan, 1997). The mind sets and attitudes are the real reasons for the success of the girls in Village Stay Programme under Rural Agricultural Work Experience (RAWE). They are highly competitive in their approach in RAWE Programme. This is purely due to their sense of commitment by way of real involvement and participation. In general the concentration, focus and real interest in learning are much better in the girl students than boys. The performance index of girls in examination is also comparatively higher than their counterparts.

EMPLOYMENT OPPORTUNITIES

The syllabus for agriculture courses were earlier designed on a common base to equip graduates to government employment mainly as extension functionaries, subject matter specialist and for vertical mobility to take up higher studies. Somasundaram *et al.* (1990) assessed that about two thirds of the employed women agricultural graduates are working as Agricultural Officers in the

State Department of Agriculture in Tamil Nadu. A study on the "Perspective roles of women farm graduates for agricultural development" (Karthikeyan and Nagabhushanm, 1996) revealed that majority of the women farm graduates hailed from town and non agricultural families. The state Department of Agriculture has taken up a new venture of transferring new technologies of agriculture through women under the TANWA scheme and the results of the programme is quite encouraging.

In late eighties and early nineties, the unemployment for agricultural graduates in public sector was a mounting problem throughout the country. Consequently, the SAUs are modifying the curriculum to be helpful for the self-employment. As a result, new courses on commercial agriculture are offered on mushroom production, biofertilizer production, broiler production, seed production, horticultural nursery technology and food processing. The importance of "Hands on Training" in agricultural technologies is also being felt essential. Realising this, SAUs are in the process of increasing the credits for practical components. Accordingly, in TNAU, total credit load for the practical portion has been enhanced to 48 percent from 37 percent. Of the available commercial agriculture courses, women students prefer mushroom production, food processing and horticultural nursery. Some of the women graduates have set up private mushroom production units on their own.

APPROPRIATE TECHNOLOGY DEVELOPMENT FOR WOMEN

Agriculture alone cannot help to sustain development of small and marginal farmers. Development of entrepreneurial skills in rural community will be a challenging task for women extension workers. Those involved in extension activities should be knowledgeable and resourceful in transfer of technology and also in supporting rural enterprises. There is an urgent need to develop appropriate technology for women to reduce their physical work in agricultural activities. It is very important to educate the rural women on sanitation, environmental issues, home economics, health and nutritional status etc. Proper training of rural women would increase their competence and capability in dealing rural issues. The technologies developed should be simple for easy handling for income generation by the rural women for maintaining their social value in the rural society.

FUTURE THRUSTS

Considering the importance of agriculture at national and international level and the capabilities of men, there is an immense need to educate women in agriculture. This may be achieved by short term and long term planning.

(a) Mini trainings

Under short term planning, women may be given trainings, based on needs and situations. The long term planning involves policy decisions of government to impart education through regular academic specific programmes. Again the education may be differentiated for women with various levels of literacy and according to their needs. Training is one of the ways to impart knowledge and skills to the ultimate clients. Training of farm women will be effective and purposeful if it is synchronized with their needs and with respect to various strategies like venue, duration and methodology etc. (Ponnusamy *et al.*, 1990). The short term training may be for school dropout farm

women. This group can be infused with latest farm technologies by training them for a week or for a fortnight only. The training must be need based and preferably taken up in the panchayat level covering nearby villages as they may not prefer to come out of their villages continuously. However, they may be exposed to standing crops and experimental results available in the University or research stations on few days tour.

(b) Entrepreneurial development

Entrepreneurial training may be organized to womenfolk who completed the schooling. This may be conducted at the educational institutes or in the research stations in coordination with Krishi Vigyan Kendras. At present, mushroom production technology training is being offered by the Tamil Nadu Agricultural University every month. The interested participants not only from rural, but also from urban areas attend the training and get benefited. Similar trainings based on the social needs are to be identified and organized for required period of time. A certificate of participation will encouarge the enrollment and help also in self employment for income generation. Women may also be encouraged in input supply markets such as fertilizers, chemicals, biofertilizers etc.

In long term planning, six months or one year diploma course for farm women who have completed schooling will be of great use. The course has to be structured and offered at teaching campuses and research stations by creating required infrastructural facilities. The areas of training may include post harvest technology, utilization of waste products, value added products, mushroom cultivation, seed production, broiler production, cut flower technology, water management, food processing, packaging and other related training with export orientation. Every training must include financial management, details of beneficiary schemes, loan facilities from scheduled banks etc.

(c) Opening up new vistas

Another important sector in longer planning is diversification of curriculum at degree level for women.

(i) Introducing agriculture education in schools will help to orient the students towards agriculture. The school dropouts at village level will be benefited by this programme. Rural school going girls perform both farm and home activities and they will be benefited greatly if agricultural subjects are introduced. The girls have shown better aptitude for agricultural oriented subjects (Santha Govind *et. al, 1990)* . Presently, Tamil Nadu government is planning to introduce agriculture as one of the subjects at middle school and in higher secondary school based on the recommendations proposed by TNAU.

(ii) Common syllabus for students of degree for first two years and diversification in the last two years for women's interests to specialise on select area needs scrutiny. Those women who want to move up vertically can stick on to regular syllabus.

(iii) The feasibility of running separate agricultural education programmes exclusively for women is very difficult as now-a days women compete in all the fields of activities and also perform well. As indicated earlier, a few commercial agricultural courses suitable for

women may be introduced in all the agricultural universities so that the students can opt for them according to their choice and master in the field for the purpose of self employment.

(d) Opportunities and Constraints

A critical analysis on agricultural education for women reveals that certain components need close attention :

Strengths :

(i) Availability of manpower (women) for training.

(ii) Infrastructure for training them at educational institute.

(iii) Financial supports from nationalized banks.

Weaknesses :

(i) Reluctance of women for getting training as they are satisfied with home management.

(ii) Lack of financial assistance to carry out training by the host institute.

(iii) Lack of technology to suit the varied social needs.

Opportunities :

(i) Government support for educating women.

(ii) Emerging needs of export oriented agriculture and other related fields.

(iii) India mainly being out an agriculture country.

Threats :

(i) Social customs restricting the women in getting training.

(ii) Poverty level which may not allow them to get training for a week period.

(iii) Labour force scarcity.

A NATIONAL EFFORT–NEED OF THE HOUR

The agricultural education for women could be effectively taken up only when it is considered at national level. ICAR, State Agricultural Universities (SAU) and state departments of agriculture, horticulture, animal husbandry and social welfare departments should work together to achieve this task. The programme could be effectively taken up only when a separate body of academic and management personnel within the existing framework may be set exclusively for this purpose.

Further, on-going farming systems research or on-farm research programmes must take into account of women employment, income and the livelihood security. Care should be taken to ensure

that innovative technologies do not displace women from their income earning activities. In addition, the following aspects pertaining to womenfolk are to be given due consideration.

(i) Sensitizing the gender issues among policy makers and development planners and public at large.

(ii) Research suitable for farm women.

(iii) Joint action research programme based on feed back relationship.

(iv) Strengthening of communication systems.

(v) Suitable financial and legislative measures.

(vi) Empowerment through cooperatives and associations.

CONCLUSION

It is evident that the women enjoy less priorities in all the spheres including agriculture in developing countries. There is a general awareness now in the society to uplift the womenfolk. Though there is a considerable improvement in the urban areas, rural area suffers for want of better focus. Under the prevailing circumstances, agricultural education will empower rural women to take up self employment. Under the liberalized economic environment, special programmes may be designed to pave the way for women based activities to make higher wage earnings.

It is right time that the institutions in India offering Agricultural Education should develop a strategy for increasing capabilities of girls in Agricultural Education by starting new courses exclusively lined for women which would directly influence the agricultural production and economic growth. If short term or long term special training programmes are developed focusing more attention for the career development of women farm graduates, then competence and self confidence for taking up their career would automatically enhance.

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Salient Observation & Discussions

In his presentation Dr. A. A. Kareem, analysed the status of education for women in Tamil Nadu. He mentioned that there are now about 50% girl students in agricultural colleges. He highlighted the sad plight of educational opportunities available to women. The role of women in agriculture is more important than realised. Dr. Kareem further stated that Home Science Colleges are the only institution presently available for educating women and the emphasis at higher secondary level is too inadequate. Further, few Diploma courses are also available for women, Commenting on his paper, Dr. P. N. Jha, Dean (Ag.) RAU, Pusa made following remarks :

* Home Science curricula be revised
* Courses like information technology and biotechnology be also included in the curriculum

Dr. S. L. Mehta, DDG (Edn) ICAR commented :

* A workshop on technological empowerment of women will be organised soon in Delhi
* More educational programmes be structured for women

* Women college of Home Science needs to be Changed to College of Agricultural Technology & Nutrition for women or college of women Resource Management

* Distant education may be the cause for women drop outs

* Have informal credit hours in education available for women.

* ICAR would provide support for construction of girls hostel at various SAUs

Dr. L. R. Verma, Vice-Chancellor, Univ. of Hort. & forestry, Solan commented given the example of Himachal Pradesh that :

* 80% farm operations are carried out by women

* Number of girls students is more than 50% in colleges

* For girl students drop outs, courses like mushroom cultivation & bee keeping are being offered by University of Horticulture and Forestry, Solan

PARTNERSHIP BETWEEN STATE AGRICULTURAL UNIVERSITIES, ICAR, NGO's AND INDUSTRIAL AND COMMERCIAL ENTERPRISES*

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Indian agriculture is a major success story of independent India. It has undergone a major transformation in the last 50 years since Independence. Indian farming was truly a 'subsistence farming'. where farmers seeked out meagre production often not enough to meet their essential needs and the government had to resort to large scale import and rationed distribution. The scenario has undergone a sea-change with a buoyant production system which sustains itself even through natural calamities. In recent years the country is poised for export of surplus food grains. The agricultural education adopted with the establishment of State Agricultural Universities (SAUs) served as a major tool to achieves this transformation by promoting science driven intensive farming. However, in the changing scenario due to introduction of economic reforms and trade liberalization a fresh orientation in agriculture education is necessitated. The agriculture needs to be highly competitive. More so, in an egalitarian society it must yield higher income. Today, in India about 70% population is engaged in agriculture which contributes only about 30% to the GDP. The average per capitall income remains the lowest amongst South-East Asian countries, so is the food availability. The 'Green Revolution' has assured food security to the country but no nutritional security to its citizens. The greatest challenge that lies ahead for 21st century is how to ensure generation of wealth and employment that would see the rural prosperity in tune with other developing and developed countries. The answer lies in well synchronized partnership in SAUs, ICAR, NGOs and Industry to ensure shift in emphasis from production alone to a holistic approach to develop agriculture as business and industry. Obviously the paradigms of education inclusive of teaching, research and extension need to be redefined. This paper thus purports to be an attempt to brainstorm rather than offer a summary solution to this complex issue.

GAPS IN ACTUAL PRODUCTION AND PRODUCTION POTENTIAL

Achievements of Indian agriculture are phenomenal in terms of quality but pathetic in terms of productivity. India produces almost 90 million tons of rice and 70 million tons of wheat and has the distinction of being the second largest producer of these commodities in the world. Despite the fact that there are varieties that have on field potential of greater than 6 tons for rice and 4 tons for wheat, our national average stands at about 1·9 tons for rice and 2·78 tons for wheat. The

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★ Presented by Dr. G. K. Garg, Dean, College of Basic Sciences and Humanities, G. B. Pant University of Agriculture & Technology, Pantnagar

disparity between potential and fulfillmeant is further brought forth by the fact that in terms of productivity per hectare, India stands 54th and 38th, respectively. It is true that the nation has only 1/3 of its irrigation potential fulfilled but interestingly India with 60 million her irrigated land produces only 40% of what China produces with 47 million hectare of irrigated land. Does this gap filling require technological innovation or a fresh look at the linkages and approaches to reach the appropriate technology to the farmers ? A faster transfer of technology will need greater level of public confidence in the veracity of scientific claims. NGOs can serve as a major intermediary in confidence building.

ROLE OF NGOs AND INDUSTRY IN TECHNOLOGY DEVELOPMENT AND TRANSFER

On field demonstration has been considered a major strategy for the transfer of technology to the farmer. Experience in G. B. Pant University has shown that NGOs and private sector can serve a very useful role. The effectiveness of the concept of KVKs could be further enhanced if NGOs were used for training and motivation of farmers. At present University is interacting with 14 recognized NGOs in the hill region through training programmes organized at Pantnagar. The Subject Matter Specialists posted by the University in their area participate of influence, in the Vichar Goshthies organized by these NGOs. It is also heartening to note ICAR has awarded several KVKs to NGOs themselves but in such cases also the symbiotic relationship with the concerned SAUs must be ensured. Private sector can be partner in providing the necessary input and financial assistance.

CHALLENGES OF AGRICULTURAL EXPORTS

The growing surplus of food grains and economic liberalization catalysed country's imagination toward export. It brought in welcome diversification in agriculture and land usage. To the traditional items like tea, coffee and species, exports of grains, vegetable fruits and floriculture were added. The exports have been growing at a rapid rate. India exports 5 million ton rice, and will have capacity to achieve 25 million tons of wheat export on sustainable in next few years. The total floriculture export have risen from 14·5 crores in 1991 to almost 60 crores in 1996. Impressive as these may seem but the fact remains despite a 50% growth in last one decade the share of India in world agriculture market remains minuscule. It enjoys less than 1% share in world market.

A second weak link is lack of processing technology. Although India's share of production of fruits and vegetables constitute 7 and 11 per cent respectively, but it processes less than 1% of what is produced. In sharp contrast Brazil processes 70% of its produce, Malaysia 83% and Philippines 75%. It is, therefore, crucial that India adopts strategies that would give more emphasis on value addition technologies. This low value, high volume exports should be replaced with high value commodities. Agriculture production needs to be made consumerate to commercial needs. Farmers needs to be sensitized towards the need of consumer and entire system should be revamped to evolve agribusiness.

CONCERN FOR QUALITY CONTROL

One major limitation is export of processed food is their uneven quality in terms of ingredients, texture, aroma etc. The scope of transparent testing of quality and efficacy of the product needs to be encouraged again as joint exercise to build mutual confidence. G. B. Pant University has initiated this interaction through establishment of Analytical Quality Control Laboratory with equal support from Ministry of Food Processing, Center for Technology Development, a Bangalore based NGO and the University.

COLLEGE OF AGRI-BUSINESS TO ACCELERATE COMMERCIALIZATION OF AGRICULTURE

At least two agriculture universities viz., Punjab Agricultural University and G. B. Pant University of Agriculture and Technology have taken bold initiative to establish a separate College of Agri-Business Management. At Pantnager partnership is being sought from the private sector. Establishment of such school will greatly facilitate formal commercialization of agriculture. It is expected that industry will come up with mechanism to scout opportunities for business and provide feed back to universities for developing appropriate production and/or processing technologies. Besides seed industry, biofertilizers, biopesticides, horticulture, tissue culture, mushroom cultivation, improve tools and machinery, food processing, agri electronics, refrigeration are upcoming areas to promote agribusiness.

INTRODUCTION OF CONTRACTUAL RESEARCH

The ICAR has come up with detailed guidelines to promote university industry interaction through contractual research with enough built-in incentives. The uniform adoption of these guidelines by all the SAUs will forge a strong university-industry linkage that would be in cooperative mode. The formalization of linkage ensures and use of research efforts of the University and proper return of the investment of industry in the R & D efforts of the university.

The universities will have to come up with HRD programms that may complement and supplement the existing programmes but develop ethos that would lead to creation of agribusiness. Pantnagar in the last few years has introduced major PG Programmes in areas of Food Biotechnology Engineering, Biotechnology, Seed Technology, Vegetable Sciences and revamped Horticulture and Food Technology departments so that appropriate manpower can be created. Similar initiatives should be taken in almost all SAUs. Again the benefit from such programs can be optimized if these programs are opened to industry sponsored candidates. The real merit of this system will not lie in self financing of the programs but the feed back provided from industry persons can assist in evolving and fine tuning the programs.

BUILDING INSTITUTIONAL CORE COMPETENCE

Time has come when each institute should; recognize its strength and opportunities in the region it is located. Every SAU and ICAR must decide priority areas where the institution will develop core competence. Even today there are institutions within SAU which excel in areas like Biotechnology, Horticulture, rainfed agriculture etc. and these have been strengthened selectively by

ICAR through special assistance under Centre of Excellence. Befittingly the same model is being extended to NATP and it is expected that with inter-institutional linkages established it should be possible to develop focused programmes cutting across the disciplines to solve identified problem. This mutual interaction is must. Everyone should not reinvent wheel.

SABBATICAL LEAVE TO FORGE LINKAGES

The concept of sabbatical leave should be adopted and its scope enlarged so that experts from institution can be mobilized to the needy institution - be it a university, an industry or NGO. This matrix exchange of manpower will be cheaper in long run. It will require movement of a single trainer than may trainees. It will also permit time bound input in the research or technology development them without need of carrying permanent liability. On other hand it will also provide an opportunity to an expert to sharpen his skills on variety of problems.

ESTABLISHMENT OF TECHNOLOGY CELL

Creation of Agri-Business will require a highly organized and concerted effort. IAUA/ICAR must promote establishment of a Technology Cell with adequate infrastructure. The purpose of this cell would be to maintain an up-to-date data based on all the agro-technologies that are available or in pipe-line with SAUs and other research institutions in India. It will also maintain a list of all agro-industries in the country. Various industries should be able to reach the Cell through Internet not only for surfing the data base but also contribute to it by listing specific opportunities for technology development. NGOs can be linked to provide feedback on location specific problems and raise an alarm in case of problem needs immediate intervention. Each SAU should also be encoureged to establish such a sub-centre within its campus. These sub-centres must then be networked to the Cell through 'ARIS'. This simple concept will go a long way in developing partnership amongst SAUs, ICAR, NGO and Industry to achieve agro-based prosperity of India. A strong partnership amongst above players where each one plays its role with purpose will ensure that education in SAUs becomes socially relevant and leads to generation of wealth and employment by promoting commercialization of agriculture.

LINKAGES MATRIX : ACTIVITIES, AGENCIES AND THEIR ROLE

ACTIVITIES / ORGANIZATION	HRD	IMPROVEMENT IN PRODUCTIVITY	PRODUCTION TECHNOLOGY	AGRIBUSINESS	POLICIES AND PLANNING
University	Major player Trainer's training Interdisciplinary programmes	Research and variety development	Technology development	HRD Technology	Intellectual input
ICAR	Facilitator	Testing network	Facilitate transfer of technology	Date Base	Major player Provide Common platform
NGO	Linkage between University and Farmer	Facilitate demonstration and awareness	Intermediate in transfer of technology	Training Organize market networking	Social and political support
Industry	Employer Feedback	Multiplication and distribution	Provide requisite input Cooperation in quality control Assist in demonstration	Marker projections Enterpreneurship Employer for trained man power Facilitate technology Finance Feed back	Feed back

Salient Observations & Discussions

The salient points emerged out from the presentation of the theme reveal that unless available surplus is channeled into value addition for creating agri-business and for generating of additional employment, the rural prosperity will be difficult to achieve. Following specific suggestions were made to bring the related functionaries closer and well-knit for satisfying the mandate :

- There is a need to link industry and NGO's as partner in research and transfer of technology
- Each individual university should devise a plan to define its area of competence rather than sticking to all the areas and ultimately failing only for want of competence.
- The interaction may be enhanced by opening up courses to Industry sponsored candidates and enlarge the scope of Sabbatical to include the time spent with industry
- Schools of agri-business be established. That will have linkages and support from private sector
- Technology centres be established in all SAU's, listing the technologies available and developed. The data base be open to Industry and NGO's for their inputs
- Each university should design a plan as to how specific role can be defined for NGO's and private sector in their activities.

Dr. Abdul Kareem, stressed that success in Biotechnology & Such high tech. areas can lead for export oriented courses in the universities.

Dr. Kanayan, stress the importance of quality in export promotion and the need of tissue culture technology in area of Banana & Sugarcane.

Dr. Pathak, narrated that the Agri-business college has started in his University to promote enterpreneurship and also emphasized that the universities should play a major role, not limited only to technology development.

INTER-UNIVERSITY MOBILITY OF TEACHERS AND STUDENTS—AN APPROACH TOWARDS QUALITY EDUCATION AND NATIONAL INTEGRATION

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Quality education is a cry among the mandates of University today, while national integration is indispensable for building a strong and independent India occupying a place of honour in the community of nations. A number of suggestions, ideas and opinions for achieving quality education in the universities and for promoting national integration among university students have been put-forth from time to time. A careful perusal of available literature has revealed that there is at least unanimity on one count, namely, that no single approach could be successful in achieving aforesaid twin objectives.

Since achieving quality education and promoting national integration required multi-prone approaches, several steps, both big and small, are required to be taken to achieve the two goals. Inter-University mobility of teachers and students, although look small, may be one of the plausible and effective approaches towards achieving quality education in the universities as well as for promoting national integration.

Inter-University Mobility of Teachers and Students—What does it mean ?

Inter-University mobility of teachers, in the present paper, means the movement of teachers of all categories from one University to another for a specific period or/on permanent basis for imparting and/or acquiring knowledge, skill, attitude, aptitude, expertise, etc. without adversely affecting his/her service through and under a bilateral or multilateral memorandum of understanding between the two or more participating universities with regards to the *modus operandi* of the scheme(s). This could be also through a multilateral memorandum of understanding under the aegis of central agency which, in case of the agricultural universities, could be the Indian Council of Agricultural Research (ICAR).

Inter-University mobility of students implies movement of students, either singly or in groups, from one university to another for a specific period, in order to, *inter alia,* bring about better

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understanding among the students and other communities of different universities and region in respect of academic, socio-cultural lives as also to make use of the lab., library and other facilities available in the different institutions for better understanding of the problems and finding solutions to his/her/their problems under study. As in the case of teachers, this could be achieved through or under a bilateral and/or multilateral memorandum of understanding among the participating universities with regards to the *modus operandi.* For short visits, however, initiative on the part of individual institutions is required.

WHY PROMOTE MOBILITY OF TEACHERS AND STUDENTS ?

Education is a process of teaching and learning in which, *inter alia,* two essential human components and elements are involved, viz., teacher and student. When one talks of quality education, in addition to physical infrastructures, teaching aids, course curriculum, etc. required for creating an ideal and effective teaching and learning situation, the question of quality teachers and receptive students invariable arise. While other elements can be created locally, human elements—teachers and learners—require special attention in order to achieve desired objectives as the human elements are comparatively more important vis-a-vis other ones.

A quality teacher should possess not only the knowledge and skill in the concerned subject matter, but also such characteristics like broad mental horizon, ability, attitude and aptitude to look to the subject-matter and problems from different points of view, willingness to try new idea, etc., besides possessing such other traits as punctuality, sincerity, honesty, devotion, understanding of learners and their situations, etc. Allowing and facilitating teachers mobility for a specified period of time from one university to another will not only be beneficial to the teacher concerned but also to others in the University for inculcating and fostering the desired traits. Similarly, students/ learners should not only possess the ability to learn quickly the subject matters being taught, but attitude and aptitude to look to the problem and the subject matter from a broad angle, besides acquiring other desirable human traits. Movement of students from one University to another will help in building and fostering desirable qualities among students in both lending as well as host institution(s).

Unity in diversity is not only corner stone of our national integration policy but also essence of our culture and civilization, which, from time immemorial, has accepted and preached the principle that the world and the entire humanity is a family, *Vashudhev Kutumbakam.* This, in essence, means that notwithstanding differences in caste, creed, skin colour, religion, etc., we are one.

The social, cultural and religions understanding among people could be achieved only when people of different ethnic groups frequently interact with each other informally and formally thereby sharing their social, cultural and religious feelings and consequently developing appreciation for the good qualities of each other. One of the best places for enabling the people to develop appreciative understanding for each other is schools/ colleges/ universities in the formative years of life. By allowing different people to interact with each other in the university, the sense of oneness, national integration and *Vashudhev Kutumbakam,* could be aroused and strengthened.

WAYS TO PROMOTE INTER-UNIVERSITY MOBILITY OF TEACHERS AND STUDENTS

Teachers' Mobility

The Indian Council of Agricultural Research (ICAR) has recently taken several steps and introduced a number of schemes for facilitating and promoting inter-university mobility of teachers. These are, *inter alia,* Sabbatical leave scheme, Internal consultancy scheme, Training of faculty members within the country and abroad under NARP/AHRD schemes, to mention a few. These are in addition to a number of initiatives taken by the ICAR during last two-three decades for promotion short-term interactions and sharing of experiences, etc. besides introducing mechanism for continuous flow of information among the scientists of the participating institutions. They together not only helped to promote more meaningful interaction on the continuous basis, but also accelerated the pace of research and generation of new useful technologies.

Following additional provisions or modification/strengthening of the existing ones may help to promote inter-university mobility of teachers of agricultural universities and institutions. These are in addition to such provisions as counting of services rendered by teachers/scientists in one agricultural university by other universities for pension and other terminal benefits. Earlier when CPF scheme was in vogue, there used to be greater mobility of teachers from one university to another. But with the introduction of the pension and other schemes without providing for counting of services rendered in other universities for pension and other terminal benefits has led to sharp decrease in the mobility of teachers.

(a) **Visiting Teachers Scheme :** Visiting teachers scheme with the sabbatical leave, as operated by ICAR, may be extened to all categories of teachers with suitable modification or improvements, wherever necessary, by providing additional facilities or benefits to the visiting teacher(s) as also to the host institutions. Many agricultural universities are not well-equipped to welcome teachers from other sister universities due to lack of required facilities.

(b) **Deputation of Teachers :** Teachers of all categories who are willing to work on deputation in another university may be given the opportunity on mutually acceptable terms and conditions between the lending and borrowing universities. Such conditions should be attractive enough to the person himself so that he is motivated enough to move to the other university. In fact, as also recommended by the Rastogi Committee, 20% of all teaching posts in all universities should be reserved for outsiders for short term deputation and/or regular appointments.

(c) **University Teachers Post-Doctoral Fellowship :** Post-Doctoral Fellowship programme for teaching and research personnel for a fixed tenure may be provided to equip them with the latest scientific knowledge. The teachers availing the post-doctoral fellowship may be allowed to avail his salary as well for a period of upto 2-year or so in the entire service period. This may be linked to sabbatical leave scheme.

(d) **Short-term Attachment with Centers of Advance Studies :** The ICAR has created./ sanctioned several centers of advanced studied in a number of leading universities during

last two decades or so and a large number of them have been equipped well in terms of facilities and trained manpower. They have been lately offering short term courses to teachers of other universities and institutions. In addition, there should be provision for attachment of a few selected teachers of other institutions to these centers so that they may acquire both knowledge and skill in order to bring qualitative improvements in the labs and teaching/research programmes of the lending institutions.

Students' Mobility

The Indian Council of Agricultural Research (ICAR) has reserved 15% seats at U.G. level and 25% at P.G. level for admission to these programmes through all-India entrance test. This is a major step in promoting inter-state and inter-university mobility among students. By further providing that the Junior Fellowship shall be awarded to only such students who agree to move to a state other than to which he/she may belong or from where he/she may have graduated is another major step in this direction. This provision may also be extended in case of the Senior Research Fellowship Scheme. Apart from these, following additional steps are being suggested for promoting inter state/ university mobility among students.

(a) Compulsory Study Tour at the U. G. Level : Compulsory study tours, once at the regional level, another at the national level may be provided during the graduation programme to facilitate the students to see/visit other states/region and acquaint themselves with, *inter alia,* the farming systems and practices being followed in other parts of the country. The Central Agricultural University has already adopted this scheme since its inception in 1993 and it is already conducting a study tour for NE region for pre-final year students and one three week national study tour for the final year B.Sc. (Agri) Students. The ICAR may support such mobility.

(b) Inter-University Transfer of Students : Inter-University transfer of students at U. G. and P. G. levels according to the availability of seats, rules and regulations applicable; for such a transfer may be provided for the deserving and willing student(s) after implementation of the revised 3rd Deans Committee Course curriculum which has tentatively provided for having common course curriculum at graduation level for the first six semesters.

(c) Providing Research Facilities to the Students at the Centre of Excellence/ Centres of Advanced Studies : P. G. students of agricultural university where there is no center of Excellence/Advanced studies in a particular discipline may be allowed to avail the facilities of the Centre of Advanced Studies, if his/her research work warrant conduct of such experiments(s).

(d) Providing that not more than One Degree be Acquired from One University for ARS/ NET Examinations : For the purpose of appointment in ARS or appearing in the NET examination, it may also be provided that the candidates appearing in these examinations must not have got more than one degree from a single University. This would also motivate students to move to other institutions and thereby get exposed to the teaching and research guidance at more than one University/Institution or work with scientists from

more than one university. This would also help in facilitating students and research scholars to see the problem(s) under study from different angles and from different perspectives.

The agricultural university system achieved excellent results in sixties and seventies as there used to be high mobility of both teachers and students from one institution to another and from one region to another. Excessive in-breeding in both appointments on faculty positions as well as in admission of students is one of the main reasons for its slow decline. These trends are required not only to be arrested by reversed both for promoting quality education as well as national integration.

Salient Observations & Discussions

The paper was presented in perspective of upliftment of educational quality and excellent national integration amongst teachers and students of SAUs in the country. The conclusion drawn and concrete recommendations made are illustrated as indicated below :

- The mobility concerns with short and long term stays for students and teachers including permanent absorption of faculty, for completion of graduation by students, preferably from other SAUs outside the state
- Mobility of teachers and students is absolutely necessary for the purpose of quality improvement and national integration
- Despite the excellent efforts made by ICAR there is poor response from SAUs for teachers mobility under the schemes related to visiting professors and sabbatical leave under short term mobility.
- It is recommended that ideal teacher's home should be made available in each SAUs so that family welfare of mobile teachers could be maintained.
- Under long term mobility programme, ICAR should take lead in the formulation of common understanding for framing rules so that earlier service benefits can be credited for new opportunities in other SAUs/ICAR institutions. Moreover, there is necessity of providing some incentives in terms of educational benefits
- A programme of post doctoral fellowships be encouraged only for short period under center of excellence for Advanced studies (CAS)
- Student's mobility under long-term programme (graduation or post graduation) be encouraged through student's guidance & counseling centre

- Educational study tours to north and south India should be made as mandatory under UG short mobility programme

- Inter-University transfer of students may be entertained in any semester of the academic years. There should be provision for the deficiency courses in the curricula to be either offered on demand or to be treated as pre-requisite requirement

- Under short mobility programme, P. G. research projects may be completed in other SAUs with due understanding of research guide and concerned teacher(s) in other SAUs preferably in centre of excellence or CAS create by ICAR

- National Eligibility Test (NET) may be given preference at the time of recruitment. Similarly, the preference needs to be given to those who have completed at least one degree programme out of 3 from other SAUs

- There should also be a mobility from ICAR to SAUs and vice-versa and SAUs to SAUs. They should be given priority while siging MOU with State Government under HRD Phase-II programme

- ICAR should not admit students under 15% UG and 25% PG quota from the same SAUs from where these students have completed 10 + 2 standard Examination

- Dr. S. L. Mehta, DDG (Edn.), ICAR, Dr. A. G. Savant, Vice-Chancellor, KKV, Dapoli, Dr. M. C. Prasad, Jt. Director Research, IVRI, Izatnagar, Dr. G. M. Khan, Vice-Chancellor Shere Kashmir University of Agril. & Tech., Jammu-Kashmir have taken part in discussion for bringing out the above recommendations.

AGRICULTURAL MANPOWER PLANNING IN INDIA – AN OVERVIEW

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India is the seventh largest country in the world in respect of area and second in respect of population. Since Independence India has made a rapid stride in agricultural production, where from an era of 'Begging basket', we have attained an era of self-sufficiency. The progress in respect of agriculture research, education and extension is very well reflected in terms of production and productivity of various crops and educational, social and economical development in rural area. The food grain production has increased almost four times from about 50 MT in 1950–51 to 197 MT in 1996–97. Inspite of significant contribution made in agriculture development there is always fear of shortage of food grain production due to continuous increase in the population. In India the land to man ratio is already around 0.140 ha have per person and when population would be around 1.5 billion by the middle of next century, the availability of land would reduce to meagre 0.05 ha i.e. 500 m^2 per capita. With the present level of food intake we shall have to produce an average of 4000 kg of foodgrains per ha, which at present is only 1500 kg/ha.

No doubt such a commendable progress could only be attributed to the sound planning in research and effective adoption of research achievements through the network agricultural extension and development department of Central and State Governments. However, despite of our good progress;, there is a great cause to meet out the increasing food demand with human population in the country. Indian population is likely to touch one billion more by the end of the century which demands about 230 MT of foodgrains, 9 MT of edible oil, 13 million bales of cotton. The very basic question is whether our research base can meet the anticipated requirements for which systematic planning of available manpower coupled with natural resources in the country would be a key not only meeting the newer challenges that our agriculture faces today but would enter the second green revolution phase. In the country sound manpower planning is required to provide in agriculture sector to achieve the future target. At present there is no much relation between need and supply of agriculture manpower. It required more than the usual mechanisms of the market to strike a balance between supply and demand. However, it would take a long time since the size and contents of professional education should necessarily confirm to be development needs over a period of time and since the gestation period of production of scientific manpower is relatively long. There has to be calculated margin of time between present education planning and future development. In effective manpower planning proper coordination of the time schedule of implementation of education and development plan is important. In view of this the problem of need of scientific manpower in agriculture by 2010 needs to be considered.

agricultural graduates (13.85%) than postgraduate agricultural scientist (4.46%). As far as nature of employment of agricultural graduate is concerned as many as nearly 77 per cent of agricultural scientific personnel were engaged in managerial and administrative jobs in the State of Bihar whereas the corresponding proportion was nearly 36 per cent in the country. A majority of agricultural scientific persons are responsible for activities (jobs) where there is little scope for utilizing their scientific knowledge. Analysis further revealed that the proportion of agricultural scientific personnel employed in teaching and research has comparatively been lower in Bihar (9.89%) than the corresponding proportion in the country (27.51%) indicting comparatively less priority to agricultural teaching and research in the State. Development and marketing have also been less important area of employment for agricultural graduates in the State of Bihar (7.75%). It is probably due to less development of secondary and tertiary sectors in the State.

FUTURE TREND

An analysis has also been undertaken to get an idea of expected opportunities of employment of agricultural scientific personnel in the State of Bihar by 2010 AD. In Bihar, as many as 370 agricultural scientific personnel have retired during 1990–95 and the number would further increase to 575 persons during 1995–2000, 960 persons during 2000–2005 and 800 persons during 2005–2010.

Analysis of availability of agricultural scientific persons and replacement needed due to retirement during 1990–2010 revealed that there would be cumulative deficit of 662 agricultural scientific persons in the State by 2010 AD.

Table : Estimated Requirement of S & T Personnel in Bihar :

	Total Requirement	Available strength	Actual requirement	Estimated supply of S & T man-power	Short fall
Agriculture	24,840	1848	22,992	2,550	20,442
Agril. Engg.	271	3	468	425	43
Vet. & A. H.	10,266	167	10,099	1,700	8,399
Fisheries	1,519	193	1,326	170	1,156
Home Science	1,200	—	—	425	775

Based on report of Dr. U. C. Upadhyay on Manpower Requirements -Agriculture, Animal Science and Home Science by 2010.

Hence, it may be concluded that there is an urgent need of proper planning for training and employment of agricultural scientific personnel in the State of Bihar so that an adequate number of persons are trained for right job which is almost pre-requisite for increasing agricultural production in backward state like Bihar.

MAHARASHTRA

The State Agricultural Universities cater the agricultural needs of 30 district covering 78.9 million populations and 308000 sq. km. area. The state is endowed with great diversity of agriculture with high productivity and modern techniques related to horticulture, green house technology, biotechnology, biological plant protection and cash crops adoption. There is tremendous scope for self-employment of Agriculture Human Resource in Government and semi government sector in addition to enormous NGO potential.

There are 38 colleges in the jurisdiction of 4 SAU's in the State with intake capacity of 2036 (UG), 623 (PG) and 81 (Ph. D). Moreover there are 39 constituent and 103 affiliated agricultural schools with intake capacity of 5250. The Minimum Competition Vocational Courses (MCVC + 2 programme) sponsored by Central Government in Junior Colleges of traditional Universities are being implemented in the subject of horticulture (4380) Crop Science (2760), Seed production Technology (180), Agril. Chemicals (20), Sericulture (260), Poultry production (600), Land protection (300) and Dairy Technology (1400). The total intake capacity under MCVC comes to 9900 personnel.

.The Expert group of IX Five-Year Plan formulation Committee for Agricultural Human Resource Development has estimated the requirement which is given below.

Sr. No.	Area	Existing AHRD 1989–90	Expected AHR 2000	2010
A)	Agritechnical Human Resource			
1.	Agril. & Allied Departments, GOM.	6022	9542	15232
2.	SAU's	3252	4052	5007
	Total :	9274	13594	20239
B)	Total Human Resource			
1.	Agril. & Allied Depts. GOM	28202	34337	42479
2.	SAU's	15659	18191	21101
	Total :	43371	52528	63580

(Ref. :Sawant A. G. 1997. Report on Agricultural Human Resource Development in Maharashtra State submitted to the State Planning Commission, Mantralaya, Mumbai.)

ORISSA :

Agriculture and its allied sectors dominate in the State's economy contributing 33 % to the net state domestic product. Nearly 64% of the total working force are engaged in such activities. Agriculture is fast changing. In the recent years, the national and international scenario of agriculture

ASSAM :

In estimate made by the State Department of Agriculture the additional requirements of the department alone during the VIIth Plan was placed at 940 including vacant posts. With the addition of the requirements of AAU, the tea industry and the banks the sum of total of addition requirement of trained manpower worked out to more than 1500. The requirement of veterinary personnel was likewise estimated at 1545 over the bases (1984–85) level. To meet this requirement as far as possible the AAU enhanced the intake capacity of the college of Agriculture from 120 to 170 and that of the College of Veterinary Science from 90 to 155. The outturn of graduates was estimated at 600 in agriculture and 525 in veterinary science, thus leaving a gap of 700 and 1000 respectively in the supply of agriculture and veterinary science graduates.

In a study for assessment of manpower in the N.E. region the Institute of Applied. Manpower Research observed that additional manpower needs as the sum of employment likely to be created in routine administration and development activities. Based on the above principle the study arrived at the following figures after making necessary allowances for pitfalls and revisions in the allocation of plan resources :

Education Level	Total estimates requirement		Estimated outturn	Surplus/defi (+) (–)
	VIIIth Plan	IXth Plan		
First degree or above In agriculture	700	1063	1120	– 643
First degree or above in Vety. Science	641	808	428	– 1021

By this reckoning the shortfall in supply of Graduates and postgraduates works out to 140 in agriculture and 213 in Veterinary Science in the VIIIth Plan period.

KERALA :

The projections for the State of Kerala are based on the agricultural development trend in terms of multiplicity of State and Central sector programmes as also on the presumption of a flat 10% retirement vacancies in all the line deaprments. The projected figures work out as follows :

	Agriculture	Animal Husbandry	Home Science	Total
Agril. Edn. & Research	1650	450	50	2150
Development Departments	5455	3909	975	10339
Private Sector and others	1000	200	100	1300
Total :	8105	4559	1125	13789

KARNATAKA :

The premises followed in the presentation of the case in Karnataka are broadly as follows :

1. That 84% of scientific personnel are absorbed in the public sector, 12.2% in the private sector and 3.8% are self employed.
2. That the sate domestic product would grow at the rate of 5.5% and given 0.22% growth in employment for every 1% growth in S. D. P. employment likely to be generated through plan programme would be of the order 11794. With private sector employment added, the number could be around 1472.
3. That structural adjustments being made in the country in the wake of liberalization which entails progressive reduction of revenue expenditure of the government would eventually result in diminution of the share of public sector employment from 84% to 50%.

The picture that emerges after consideration of the above is as given below :

Sector		Requirement by 2010 AD
Agriculture	—	45,389
Animal Husbandry	—	7,546
Home Science	—	750
	Total	53,685

ANDHRA PRADESH :

Manpower projections for Andhra Pradesh are mainly program based confirming to specified norms. For instance, the requirement of scientific hands for rainfed agriculture is based on certain target of watershed development within a specified time, the requirement for routine extension programme is based on certain norms such as one VEO for every 900 farm holdings, one A.O. for every 7 VEO's etc., the requirements for other programmes are based on long term physical targets envisaged, the requirement of veterinary personnel is based on the norm of one veterinary doctor for every 5000 cattle units. In case of home science graduates the requirement is worked out assuming a flat 10% increase in the growth in number. Thus calculated the requirement of scientific manpower in different areas of the agricultural sector of the State work out to 10060 in agriculture, 8845 in veterinary and animal husbandry, 640 in fisheries and 774 in home science as detailed below :

Estimates of scientific/technical manpower requirements by 2010 AD in Andhra Pradesh

Particulars	Existing	Estimated
Agriculture	3926	8300
Horticulture	281	1760
Veterinary & Fisheries	3258	8280
Home Science	180	774

HIMACHAL PRADESH :

The H.P.K.V.V. in its report has estimated the supply of S & T personnel in the field of Agriculture, Veterinary Science and Home Science at 1125, 565 and 345 respectively and anticipated as much demands from government departments, input manufactures and financial institutions to match the supply.

RAJASTHAN :

The estimates given by Rajasthan Agricultural University places the requirement of agricultural and veterinary personnel in the State at around 3000 each and of Home Science personnel at 900. The report does not indicate the basis for the above projections.

REVIEW AND CONCLUSION :

The assessment of technical manpower requirements of the agricultural sector at the national and state levels presented in the foregoing sections leaves much to be desired. The man power projections given in the reports are largely of the nature of conjecture and are not based on scientific analysis of objective situations. In the absence of definite correlation between employment and the chosen parameters manpower demand projections are bound to become unscientific and untenable.

The creation of comprehensive database for macro-analysis of manpower supply and demand on a long-term basis is possible only when manpower planning gets duly institutionalized. Therefore, it is high time that a nodal institution at the national level is built up and exclusively entrusted with manpower planning in the country in the field of agriculture affiliated and/or subsidiary units established in each SAU's for undertaking state level exercises. Manpower planning will remain an academic exercise unless the ground realities are brought to the focus. The conventional avenues of employment of scientific personnel in agricultural and allied fields have nearly reached the saturation point. Even the vacant positions in the concerned government departments of most of the states not filled. We have to break new paths not only to create new avenue of employment but also to make agricultural education, ever growing. Time has now come to restructure and reorient education in the SAU's with tilt towards trade oriented courses of specialization. Students in any faculty may be divided into different trade streams depending on their choice after completion of the basic course. Such a system will at once meet the trade related demand of the sector and stand guarantee for assured employment of the products of the SAU's. Manpower Planning area should be looked at from both a short and a long term perspective. In the long term, the aim should be to have at least one farm graduate available to each Panchayat and Nagar Palika to serve as a multi-purpose farm consultant. Initially they can work either whole time or part time depending on needs and circumstances. Sustainable agriculture is highly knowledge intensive and hence, it is important that in the long term, all Gram Panchayats/Zilla Parishads and Nagar Palikas have at least one agricultural consultant on a regular basis. If this pattern is to be followed the requirement for farm graduates will be over seven lakhs. This should be our ultimate goal. During the 9th five-year plan, the estimates made by NAARM on the demand for farm graduates and postgraduates could be taken as the basis for deciding admission policies. However, further detailed discipline by

discipline analysis will be needed at the post-graduate level. There is at present a high degree of regional variation in the availability of farm graduates. Almost one farm graduate is available for every 2 to 3 villages in Kerala. In contrast, in Bihar one farm graduate is available only for every 100 villages. While deciding on investment in further agricultural education, such regional disparities should be kept in view. There should also be a method by which the knowledge and skills of such graduates are continuously updated (Swami Nathan, 1997).

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Salient Observations & Discussions

The man power projections given in the reports are largely of the nature of conjecture and are not based on scientific analysis of objective situations. In the absence of definite correlation between employment and the chosen parameters, manpower demand projections are bound to become unscientific and untenable.

- It is high time that a nodal institution (Man power planning Cell) at the national level is built up and exclusively entrusted with manpower planning in the country in the field of agriculture and to facilitate the nodal institutions affiliated and/or subsidiary units be established in each SAUs for undertaking State level exercises

- The conventional avenues of employment of scientific personnel in agricultural and allied fields have nearly reached the saturation point

- Time has now come to restructure and reorient education in the SAUs with a tilt towards trade oriented courses of specialization. Students in any faculty may be divided into different trade streams depending on their choice after completion of the basic courses. Such a system will at once meet the trade related demand of the sector and stand guarantee for assured employment of the products of the SAUs

- In the long term, the aim should be to have at least one farm graduate available to each Panchayt and Nagar Palika to serve as multipurpose farm consultant. All Gram

Panchayats/Zila Parishads and Nagar Palikas have at least one agricultural consultant on a regular basis

- During the 9th Five year plan, the estimates made by NAQRM on the demand for farm graduates and post graduates could be taken as the basis for deciding admission policies.

- While deciding on the investments to be incurred in agricultural education, emphasis need to be given on regional disparities. There should also be a method by which the knowledge and skills of such graduates are continuously being updated.

- In view of the nature of agricultural work and consistency existing in women power, it is recommended that some percentage of reservations for women (based on the nature of duties) be made at recruitment level in both the State Agril. Department and SAUs in the country.

FACULTY UPGRADATION AND HUMAN RESOURCE DEVELOPMENT*

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AGRICULTURAL EDUCATION IN RETROSPECT

Tracing back the history of Agricultural Education in the country, five agricultural colleges were established as early as 1902-1907 which were imparting only diploma courses and they were subsequently upgraded to offer degree programmes in Agriculture. With the establishment of the Imperial Council of Agricultural Research in the year 1929, as a sequel to the directives given by the Royal Commission on Agriculture, Agricultural Education and Research started to gain increasing attention. Post-graduate Courses in the faculties of Agriculture and Veterinary Sciences were unknown till 1930. The Imperial (now Indian) Veterinary Research Institute were established around the year 1930 primarily for conducting research and for imparting Post-graduate training in the respective disciplines. By the year 1947, there were 17 institutions offering basic degree programme in agriculture with an enrollment of 1500.

Eversince the concept of State Agriculture Universities has been adopted in India, based on the Land Grant College pattern of the United States of America, the complexion of Agricultural education and training has undergone perceptible change in the country. The need for reforming agricultural education was voiced unequivocally by the Radhakrishnan Committee on educational reforms as early as in the year 1949, who recommended establishment of rural Universities in the country. The foundation for reorienting agricultural education was laid in the year 1960 with the establishment of the first agricultural University at Pantnagar in Uttar Pradesh. Subsequently, over the years, each State has established at least one Agricultural University by now; and some states such as Maharashtra, Uttar Pradesh, Bihar, Karnataka, Tamil Nadu, West Bengal and Madhya Pradesh have more than one SAU.

The constitution of the Joint Indo-American Team in the year 1954 by the Govt. of India to study the Agricultural Education system in the country paved way for establishment of State Agricultural Universities. The Indo-American Joint Team, while endorsing the views of the University Education Commission of 1947, also emphasised the need to establish rural Universities. The constitution of Second Joint Indo-American Team in 1960 and the Agricultural Research Review Team in 1963 and their recommendations resulted in the reorganization of the Indian Council of

★ Paper presented by Dr. V. N. Pathak, Director Academic Staff College, RAU, Bikaner.

(Pre-service) and in-service training were provided by the National Commission on Agriculture appointed by the Govt. of India. In their report on Research, Education and Extension published in 1976 (Part XI P 156) the operational aspects of pre-service and in-service training have been outlined in detail. The major recommendations of the Commission are :

* The professional training of the job aspirants in SAUs which they receive in academic in-situations before induction into service and the preservice or induction training should be complementary. Both these types of training should be flexible and be open to adjustments as the situation demands.

* The In-service training should enable the faculty to update their knowledge effectively and this training should be imparted after the functionaries are in position for a minimum of 3 to 4 years.

As early as in 1928, the Royal Commission on Agriculture deliberated extensively on in-service training of teachers in their recommendations for improving agricultural education in the country. Later, the Second Joint Indo-American Team (1960) and Education Commission (1964-66), both appointed by the Government of India have recommended the organisation of In-service Training for teachers by way of Summer Institutes and specially designed courses for specific target groups.

The rapid strides in science and technology underscore the need for professional in-service training of the faculty.

INDUCTION TRAINING—NEEDS AND EXPECTATIONS

The Induction training which should become an integral component of SAU, has to aim at reorienting the freshly appointed faculty to the organisation structure, mandate and functions of SAUs and the expectation of farmers, line departments, industries and commercial organisations from the University. All fresh appointees, whether they are placed in research, teaching or extension should be trained in pedagogy and extension methods. This may enable them to perform their tasks as teachers or extension workers much better. Knowledge base of a fresh recruit to a teaching, research or extension, profession of the University has to be widened to be in tune with the needs of the organisation and aspirations of the end users. The Induction Training should, therefore, include at least four separate modules which can be :

* Pedagogy—Including effective teaching methods and use of Audio-visual Aids.

* Recent Advance in Agriculture, Horticulture, Animal Husbandry, Agril. Engineering, Dairying Etc. and recent developments in the candidates Specialisation.

* Agriculture, Animal Husbandry and Gender Issues, Status of development and future strategies both in India and the State.

* Filing, file movement, administrative set up and general administration and personnel management.

* Accounting procedures in vogue and the Administrative and Accounting mechanisms which the different SAUs have been adopting.

In a few universities even though a system of pre-induction training is existing, the training modules have not been prepared appropriately. There is, therefore, a reason to consider whether it is appropriate and logistically preferable to entrust this responsibility of pre-induction training to the fresh recruits to faculty positions of SAUs to organisations which have expertise in these fields.

The minimum period of training could be of 12 weeks duration and can even be extended to 16 to 20 weeks based on the needs and the requirements of the recruitees to the faculty positions.

IN–SERVICE TRAINING

As has been pointed out earlier, the inservice training to faculty can be offered only 3 to 4 or 5 years after their induction into the SAU's service. Such training's have already been formalized through organisation of Summer and Winter Institutes/Schools. Organisations which look ahead, identify their training needs rather carefully to prepare their personnel for the next job. This may call for a complete reorientation of the employees knowledge base and skills to meet the future requirements and challenges. A careful introspection by the organisation so as to enable it to forecast what new competencies are required by the changing scenario in Science and Technology development is essential. For example, the current stress on production oriented agriculture and animal husbandry practices may give way to ecologically sustainable protection (of resources) oriented practices. Fossil energy use may become a practice of the past. Information technology is witnessing an unparalleled progress and development. Traditional Meteorological methods are already obsolete giving way to satellite based weather forecasting. Everywhere computers are replacing paper based data acquisition, retrieval and analysis procedures. Post harvest processing and storage operations are becoming high-tech. The need for exports of Agricultural/Animal Husbandry products is being felt increasingly. The Geographic Information Systems are becoming handy for several applications in agricultural and allied areas of activity. Biotechnology is now the pass word in biological sciences including animal sciences. Rapid progress is being witnessed in the fields of veterinary sciences and animal sciences including fisheries. Qualifications of the faculty alone do not always meet the requirements of the organisation or its future needs. If academic excellence has to be pursued, inservice training becomes an essential component of faculty upgradation and human resource development. Yet, another aspect which needs consideration is the selection of faculty for inservice training and a follow-up of the extent to which the training has helped in serving the interests of the organisation. There is a need for greater introspection on these issues. Those who are committed to serve the interests of the organisation are innovative and capable of putting into practice the knowledge and skills acquired through inservice training, should not be left out in preference to other who have no aptitude and lack initiative commitment and creativity.

IN-SERVICE TRAINING FOR MANAGERIAL POSITIONS

As the faculty goes up the ladder by virtue of their service or are required by the organisation to shoulder managerial responsibilities, the need to train faculty as Managers becomes obvious. They have to manage resources - physical, financial and human. This calls for a high degree of professionalism and creativity. Often it is assumed that most people are static, non-creative and do not have the capacity to develop new ideas. Such as assumption is at best be suicidal and at worst be detrimental to the organisation. If an appropriate and encouraging environment is provided, most people can exhibit creativity which of course may vary. The cardinal requirement of managers is that they should be capable of independent judgment, be innovative, confident and enthuse others by their leadership qualities. It is beyond doubt that all progressive - looking organisations are thriving because of creative individuals and managers. Unlike in the traditional university systems, in the SAU's it is imperative that Managers are trained to assume responsibilities which have multifunmctional and multi-dimensional tasks. Opinions differ as to what exactly constitutes a 'Managerial Job'. The requirements of Managerial tasks have to be viewed from different perspectives. One school of thought, known as the "Great Man School" documented the behavioral characters of highly successful managers, without providing the reasons for their success as Managers. Economists have a tendency to view managers with coloured glasses and focus on entrepreneurial behaviour of good managers, the emphasis being on profit maximization, risk taking and innovation. A group of behavioural scientists view leadership qualities as essential for managerial tasks. However, a study of different view points about the requirements of good managers ultimately crystallizes to five functions viz., Planning, Organizational ability, Human Resource Development, Leadership and overall control.

OPERATIONALIZATION FACULTY UPGRADATION (FU) IN SAUs

Current Status

Some specific issues which have to be considered for enhancing the benefits of faculty upgradation in SAU's are discussed below :

The aspect of faculty upgradation suffers from many ills in most SAU's. there is no proper planning in place for faculty upgradation. Budgetary allocation is either non-existent or if available, very meagre. The responsibility for faculty upgradation is shared by none. It is no-body's baby. In most SAU's grant of sabbatical leave is viewed with suspicion. Faculty exchange from one SAU to another is non-existing. The faculty desire to complete their doctoral studies in their own universities and there are not takers for the offer of grants by some SAUs to encourage their faculty to pursue higher studies in identified deficiency areas. There is a clamour for reservation of seats for inservice candidates and for foreign training programes. Inbreeding is eating away at the base of the academic structure. Low motivation and morale, one has to admit frankly, is creeping in. Quality of research, teaching and other academic activities is gradually declining. Very few among the faculty

are impressed with the advances in Science and Technology, particularly information technology, computer based literacy. Wide vistas have opened up due to the recent developments in information technology and computer based learning. How many among the faculty are eager to prepare themselves for the future as we enter the 21st century ? I would not like to hazard an opinion as it may be unpalatable. Unpalatable as it may be, we cannot run away from truth. If we do, the clientele of the SAU's consisting of future generations of students. farmers and entrepreneurs will not oblige to pardon us. The time is ripe to do some soul searching. Procrastination any further, breeds inefficiency, inbreeding, low motivation and moral which are eating at the vitals of the academic structure of SAU's. I would like to put forward some points for action.

Faculty upgradation - Future tasks

The existing mechanisms for faculty upgradation in several SAUs are grossly inadequate. The overall system which is in place (if at all there is a system), procedures and budgetary allocations may not be sufficient. A separate system for faculty upgradation being non-existent at the institution level, the procedures adopted are, therefore, haphazard. Several universities are generous in debuting their faculty to conferences, seminars, summer schools, training programmes and such other events. These need to be systematized.

Sabbatical assignments and faculty exchange are unknown phenomenon in Indian Universities including SAUs. A majority of the faculty members are not keen on utilizing this facility, perhaps, because of temporary dislocation of settled familial links. There should be a way out to promote movement of faculty from one University to another. The same facility when offered for foreign assignments is grabbed but not when it involves moving to another SAU or institution next door. One of the reasons also may be that the recipient institution may not provide willingly all the required facilities for work and living of the sponsored candidates. This aspect needs serious consideration.

Lack of motivation and accountability, depressed morale, inadequacy of facilities, the existing promotion policies have all been adding up to the malaise of inbreeding and faculty degradation.

Study leave for prosecuting higher studies is a boon for faculty upgradation. This programmes has been utlized with varying degrees of success in SAU's. A comparable scheme known as the Faculty Improvement Programme (FIP) is in place in traditional Universities, the only and perhaps the critical difference being that this is offered to the faculty if the higher studies are prosecuted in any institution other than the host institution/University. In the absence of this regulatory rider in the SAUs, most of the faculty members out to prosecute their higher studies in their own universities. They do not like to move even to other campuses within the universities. Even though this scheme has succeeded in satisfying the individual's academic aspirations, it has led to serious inbreeding. At the Acharya N. G. Ranga Agricultural University, there is yet another scheme in place for faculty upgradation, where the faculty members are encouraged to prosecute higher studies in other SAUs

in specific identified deficiency areas. But this offer is not being utilized to the fullest by the faculty whose preference is for facilities to study in the same University, even at the cost of inbreeding. In the light of this realistic situation the issue for consideration is faculty upgradation for the benefit of whom - the institution or the individual beneficiary. Ways and means have to be found to ensure that faculty upgradation benefits the institution first and the individual next. A lot of distortions have taken place in the existing FU system ultimately leading to help personal preferences and comforts and the dangerous portents of inbreeding and ill effects. This malady is more than evident in most SAUs.

Misuse of several Faculty Improvement and Faculty upgrading programmes initiated by SAUs is yet another aspect which requires serious consideration. Study Leave for completing the course work with full salary benefit and opportunities to pursue research work for Ph. D. are being offered for the benefit of in-service faculty members of SAUs. Several faculty members who are selected to prosecute studies under this programme complete the course work and do not complete their thesis research work. Some sort of mandatory check has to be introduced to prevent this in discipline. This is perhaps a common phenomenon in several SAUs which is discrediting the system. It is, therefore, preferable to select candidates not merely based on seniority but have aptitude for research and his record of contributions as a teacher/research worker. There can even be a screening test for the purpose. A periodic review of thesis recearch work, perhaps, is also necessary which largely depends on the Major Advisor and the Advisory Committee of the student. It should be made obligatory on the part of the candidate that he should complete his research work satisfactorily and submit the thesis within reasonable time limit.

The existing situation in most SAUs, calls for serious introspection. Faculty upgradation not only involves supporting the faculty to acquire higher degrees. It involves deputation to several other training programmes, seminars, symposia, summer and winter institutes, foreign assignments etc. Here again it should not be a one-way traffic. The institutions expectations are that the faculty itself should also strive for academic upgradation. Such self upgradation occurs when the faculty has the confidence to propose research projects, new academic programmes, conduct training programmes and summer institutes, organise seminars and become academically competent to get recognised by the scientific fraternity. Faculty upgradation therefore should promote these activities too. If a department or an individual faculty member by virtue of his or her hard work and contributions can get any of the above credits or if a department has done sufficient enough to get recognised as an Advanced Centre, the requirements for faculty upgradation can be considered as more than served. To ensure success of faculty upgradation tasks, the SAUs may consider the following which may be essential.

* Establish complete data base of all the faculty members including teachers, researchers, extension workers, technical and par technical personnel.
* Identify appropriate individuals for deputation to various programmes including higher studies.

* Monitor the contributions of the individual to the institution after his return from faculty upgradation activity.

* Encourage the personnel to propose independent research projects and promote creation of teams of excellence.

* Inculcate sense of multidisciplinary approach for fostering academic activities.

* Develop long-range, time-bound faculty development plans and Annual work plan schedules which should be specific, incorporating the nature of responsibility and sharing, academic goals, professional development objectives and other initiatives proposed during the year.

* Make specific budgetary provision for faculty improvement activities.

* Establish a cell for faculty upgradation to function with one of the University officers.

* Establish a fool-proof monitoring and evaluation system.

Some specific requirements which need urgent attention for faculty upgradation are :

* To make the faculty computer literate.

* Enable all faculty members to access information world wide through internet.

* Improve the spoken and writing skills of the faculty.

* Those involved in teaching functions should improve communication skill and use the emerging developments in information technology. They should be proficient in curriculum design and development. Researchers on the other hand, in addition to being proficient on the above aspects, should have knowledge of computer software, plan, design and analyse experimental data, project management and reporting skills, data acquisition through personal computers etc.

The SAUs may be required to seriously consider establishment of a faculty upgradation and Human Resource Development Cell to attend to the needs outlined above.

Performance Appraisal

Performance appraisal, monitoring, evaluation and mid-course correction initiatives are viewed with suspicion by a majority of the faculty as a tool or a weapon to control recalcitrancy. It is unfortunate that in none of the SAUs or other institution this aspect has been given the importance which it deserves. The casual attitude towards performance appraisal and accountability has bred in discipline. The crux of the matter when comparisons are often attempted between developed and developing world is that accountability in public service is conspicuous by its absence. It may not be out of place if I observe that most institutions are ticking because of the toil, tenacity and dedication of a few individuals whereas the rest pack their bags after four. Even during the limited

6 to 6·5 office hours much time is lost in talks, endless gossips, discussions and for coffee breaks. Accountability is the key to progress of institutions which is reflected ultimately as the power and progress of nations.

Infrastructure for Faculty upgradation

The SAU's should seriously consider the need to establish a Faculty upgradation and HRD Cell. Resource allocations should be judicious with larger investments for improving basic technological infrastructure. The Library facilities need to be moderanised as an immediate need. This will enable access to information and knowledge is power.

HUMAN RESOURCE DEVELOPMENT

Faculty upgradation and Human Resource Development (HRD) are complementary to each other. In this brief discussion, aspects related to HRD activities of SAU's alone are attempted, but not the whole gamut of Human Resource Development activities on a larger perspective such as human resource needs of the country in agriculture and allied fields of activity.

The human resource development programmes are expected to meet the institutions requirement for academically well qualified and motivated people to achieve the mandates of the organisation in the short-term and be prepared to face the challenges of the future dictated by innovations, growth and developments in science and technology. The HRD initiatives of any organisation should necessarily include career management programmes, which should be integrated with performance appraisals and reward components./ In a nutshell the HRD programmes must ensure that the organisation has the right people it needs with the requisite skills to achieve its strategic objectives and goals.

The approaches essential for HRD are :

* The identification of needed skills and implementation of appropriate training programmes to meet the organisation strategic requirements.
* Follow-up of the effectiveness of HRD initiatives adopted by the organisation.

The basic requirement for HRD programme is that the organisation should have a strategic plan which can be translated into human resource action plan. the HRD plans define requirements both in terms of numbers and quality and include the additional skills and expertise which the organisation requires because of developments in science and technology, as also the changing economic scenario of the state in particular.

The Human Resource Development activities include two major components (i) Training and (ii) Development.

Training : The training component bridges the gap between what a person can do and what is expected of him to do by the organisation. Training, therefore, builds on this foundation by

enhancing skills and knowledge required to improve performance in the present job or develop capabilities for the future requirement.

Development : Development is modification of behaviour through experience. It provides for people to do well in existing jobs and prepare them for greater responsibilities for the future. The development of human resource builds organisational strengths, helps overcome weaknesses and ensure that the organisation has the right expertise to do a right job.

Human Resource 'Development' operates at all levels of human activity in an organisation. The Development activity needs to be programmed by an organisation in such a way that appropriate training is provided at the right time and also broaden employees responsibilities, expertise, skills and abilities by entrusting them with new tasks and responsibilities. At a higher level, Management Development Programmes operate to identify talent, improve skills, widen expertise and help people to assume greater responsibilities.

Yet another phenomenon peculiar to the realm of higher education in India is the discipline oriented 'caste' system. For example, a particular discipline does not like the participation of any other discipline, even if a research project demands an inter-disciplinary approach to tackle a specific problem. This is one of the serious bottlenecks coming in the way of Human Resource Development. The professional societies have an important role to play in inculcating the concept of inter-disciplinary research and technology development because the strict boundaries between various disciplines no longer exists and even widely varying disciplines such as Botany and Physics, Biology and Information Technology have overlapped.

The spin-offs from HRD activities are many. More importantly it provides the organisation with human resource having the requiste skills, expertise and managerial capabilities to achieve its strategic objectives. The initiatives reduce significantly the learning time of fresh recruits and enable them to reach the performance levels of experienced and effective workers as quickly and economically as possible. The efficiency and effectiveness of existing employees are also improved. The HRD activities will assists people to develop their intrinsic strengths and capabilities so as to enable the organisation to meet its future human resource requirements. The HRD initiatives have to be regarded as an investment and if it is properly allocated and utilized, the returns are worthwhile and regarding.

The Sate Agricultural Universities have the major responsibility to prepare the country to enter the 21st century. The country's economy being largely dependent on Agriculture, the manpower in the SAU's should change in consonance with the rapid strides in science and technology related to agriculture and allied sciences. The Human Resource available in the SAU's will determine the quality of education imparted to the students who have to be tuned to understand the current situation and future trends and realities. If this is not accomplished, insipite of large investments in infrastructure, extension support and scientific institutions, the country's research, extension and Agri business sector will continue to suffer.

CONCLUSIONS

Human Resource Development in State Agricultural Universities in India is of enormous proportions. The 28 SAU's, four deemed universities and the one Central Agricultural University have a sanctioned scientific staff strength of over 22,500. The Universities put together have more than 160 constituent colleges with an intake capacity of 9700 and 5900 students in UG and PG programmes respectively. The total enrollment works out to about 45,000 students. In addition, the ICAR institutions employ 4200 scientists. Thus, the India Agricultural Education and Research System is one of the largest in the world. A casual attitude towards Human Resource Development and non-allocation of adequate budgetary support are preventing initiation of appropriate HRD programmes. Compared to the situation existing a decade ago, the rapid strides of information technology offers unlimited scope for gaining access to information. It is now possible to access information on any aspect of science and technology without moving out of the confines of an institution. This unlimited opportunity has to be exploited by making needed facilities like a computer, E-mail or Internet facility accessible to the faculty in SAU's and Scientists in research institutions. They should be coerced to be computer literate and capable of utilizing Information Technology and Office Automation facilities.

The opportunities for continuing Education are unlimited because of the rapid strides in information technology. This should, however, be not to the complete exclusion of Interpersonal interaction and academic exchange programme as they are irreplaceable. They can be complementary to each other.

The country has to march forward utilizing the opportunities thrown open by a liberalized economy. The country's relative strengths and strategic advantages have to be fully exploited. The Human Resource in SAU's and Research establishments have to be exposed to the emerging opportunities offered by newer technologies and in frontier areas of science. The future stress in HRD initiatives can be oriented towards Biotechnology, Remote Sensing, Information Technology, Agri business, Ecological agriculture, climate change and applied electronics. The emphasis should be an blending traditional knowledge and frontier technologies so as to enable the personal working in SAU's and Research Institutions to render assistance to Indian farmers to increase productivity, inhance profitability and at the same time insure sustainability. The faculty in SAUs and ICARs Institutions should be trained to appreciate the needs and nuances of domestic and export markets, and apply technological innovations to make agriculture and allied activities more profitable and suitable.

The overall scenario of higher education in the country suffers from several weaknesses. There is a phenomenal increase in demand for opportunities for higher education, lack of academic standards, outdated curriculum,. wide disparities in academic standards and improper management of higher education. To make higher education responsive to emerging challenges and needs of the country, the faculty have to interact with industry and trade. They also should be aware of the needs of the development departments of the Government, non-governmental and quasi-governmental organisations.

The entry of mediocrity in institutions of higher learning has to be prevented as it sets in a chain reaction leading ultimately to fall in academic standards and the resultant in discipline among the faculty, staff and students. A recent development in the field of resource utilization and Human Resource Development is to identify core competencies and take steps to harness these competencies to the fullest advantage of the organisation. This approach prevents wasting of the resources on areas where the organisation does not have comparative advantages and competencies. Every SAU has specific comparative advantages which they should strive to promote. In this endeavor Human Resource Development assumes a lot of significance. Human Resource in areas where the organisation has core competency need to be developed. Which make the organisation effective in serving the needs of a region or the State.

Faculty upgradation and Human Resource Development are therefore very important in the changing scenario of technological development and scientific progress. It is all the more relevant for the SAU's to take specific initiatives for Faculty Upgradation and HRD as these institutions serve the needs of the farmers, up and down stream industries, commercial organisations, line Departments of Government and NGOs. The SAU's are vital links in the progress of the Nation.

ROLE OF AGRICULTURAL EDUCATION IN MAKING GREEN REVOLUTION EVERGREEN*

At the outset Dr. Mehta pointed out that enormous facilities have been created in the country for UG and PG education in agriculture and allied science through 28 SAUs and 4 deemed universities, one central Agril. University and three Central Universities with Agriculture facilities in which 9500 and 4500 students at UG and PG level respectively are being admitted annually.

These graduates have contributed much to the agricultural growth that the country has achieved after independence. As a result India not only became self sufficient in food production but also entered in competition in the export market of the world. However, time has come when we have to reorient our education programme in the country including the courses in the emerging areas and new facilities in the fields of agriculture for making green revolution evergreen in the 21st century.

Dr. Mehta pointed out that the expectations from the agricultural graduates in the country to meet the need of the people have grown over years but the SAUs are facing severe resource crunch to equip the graduates in improving their skills. At the same time privatisation of education is throwing new alternatives in the field with collaboration with foreign universities. As a result the education programme has changed from a closed system to an exposed system over the years. To effectively utilise this sudden expansion, a time has come to reorient the agricultural education system in the country for foods and nutritional security. For this Dr. Mehta pointed out the four principles to be followed while undertaking the reorientation i.e. faith, focus, follow and finish principles.

To achieve this Dr. Mehta, emphasised on the following areas to bring out the neçessary changes in agricultural education programme :

The Curriculum Development must keep pace with

(i) Changing development

(ii) Need of the stake holder

(iii) Skill and entrepreneurship development

(iv) Inclusion of courses in new emerging areas such as IPR, IPM, Biotechnology, environmental science, agri. business etc.

Besides these, the course curriculum must be under constant review to change with the changed situation and need.

★ Gist of the lecture delivered by Dr. S. L. Mehta, Deputy Director General (ICAR), Krishi Anusandhan Bhawan, New Delhi-110 012.

There is need for faculty competence improvement for achieving success in new curriculum development and implementation. Dr. Mehta informed that steps are being taken in this aspect through HRD programme. He also point outed that steps are being taken to provide :

(i) access to information by net working

(ii) strengthening of libraries through support under NATP

(iii) providing competence in computer application

(iv) training of trainers through various training programmes in the country and abroad.

He pointed out that even with all these, the education programme can not be improved in absence of proper facilities and infrastructure in SAUs. For this he suggested that there is a need for :

(i) Equipping laboratories

(ii) Modernisation of facilities such as net working e-mail service etc.

(iii) Developing Education technology Cell

(iv) Skill development programme through rural work experience programme.

Human resource is the most precious one in any development programme and hence needs proper management and strategies development to get best out of human. To achieve these, Dr. Mehta suggested the following steps to be undertaken under HRD programme :

(i) provide proper motivation

(ii) decentralisation of facilities and authority

(iii) proper time and stress management

(iv) involvement in decision making processes

(v) autonomy and accountability

(vi) sabbatical leave for inter institute mobility

Dr. Mehta then point out the various new challenges that we are going to face in the near future. There are global competitiveness in new emerging fields such as Biotechnology, Information Technology, IPM, etc.

For this he pointed out that there is immediate need to critically and analytically review our present system and develop centers of excellence in new emerging areas and inter-disciplinary research programme.

Describing the present agricultural scenario of the country, Dr. Mehta expressed that we have reached a plateau in food grain production and our major food grain producing states, Punjab and Haryana have reached near stagnation. As a result, all steps should be taken to focus our efforts to Eastern region of the country for next green revolution.

Summerising the various points elaborated earlier. Dr. Mehta highlighted the major efforts needed to achieve our goal in food production. These are :

(i) Education has to be reoriented in developing capabilities for evolving new plant types with inbuilt potential for disease and pest resistance, resistance to abiotic stresses etc.

(ii) New Plant architecture

(iii) Developing post harvest technology

(iv) Reduced inbreeding in SAUs

(v) Learning how best to utilise the environment

(vi) Modify the personal policies to attract and retain talents

(vii) Develop agriculture education media research centers

(viii) Education technology empowerment to women and rural youths

(ix) Development of distant education system to educate rural farmers

(x) Accreditation of institutions for quality assurance

Concluding his talk, Dr. Mehta expressed that all these are needed to have proper human resource development for improving skill, capabilities, analytical thinking of our agriculture graduates to face new challenges in the next century so as to make the green revolution ever green.

RECOMMENDATIONS OF 24TH ANNUAL CONVENTION OF I. A. U. A. & ACTION TO BE TAKEN

I. Agricultural Education in 21st Century

(i) Promoting vocational education and self-employment

(ii) Skill upgradation of graduating students by reorienting the existing curricula

(iii) Training and development programmes for rural entrepreneurs.

Action— Deans/Associate Deans/Registrars of SAUs

II. Education for Sustainability in Agricultural Development

(i) Suitable programmes to be developed for imparting practical knowledge to graduates to run their farms/agro-based industries independently and there should be close linkage between University, State Department of Agriculture, Agri-based Industries for proper utilization of the manpower.

Action— Deans & Directors, SAU's and Director Agriculture, State Department of Agriculture.

(ii) Programmes be strengthened for research on integrated nutrient management, (IMM) integrated pest management (IPM), integrated weed management (IWM), integrated farming system (IFS) and location specific agricultural package of practices.

Action— Director (Research), SAU's & Director Agriculture, State Deptt. of Agriculture

(iii) There should be uniform course curricula in all SAUs and All India uniform test for admission through Regional Centers should be conducted.

Action— Deans & Registrars, SAU's & Directorate of Education, ICAR

(iv) There should be a close link between Agricultural Institution, Doordarshan, All India Radio and Local Press for technology transfer.

Action— Director Extension of SAU's/Directorate Extension, State Department of Agriculture

III. Partnership between State Agricultural Universities, ICAR, NGO's & Industrial & Commercial Enterprises

(i) There should be close linkage between industry and NGO's as partner in research and transfer of technology.

Action— Director Research & Director Extension of SAUs

(ii) School of Agri-business be established which will have linkage and support from private sector.

Action— Deans & Registrars of SAU's

(iii) Biotechnology and such High-technology area should successfully be developed alongwith export oriented courses in the University.

Action— Dean/Director Research SAU's

(iv) Researches on tissue culture technologies in the area of banana and sugarcane for export production be strengthened.

Action— Directors (Research) & Deans of SAU's

IV. Inter-University Mobility of Teachers & Students

(i) Programme related to mobility of teachers and students be strengthened for quality improvement and increasing national integration.

Action— DRI-cum-Dean (PG) and Registrars of SAU's

(ii) Teacher's Home should be created in SAU's for maintaining the family welfare of mobile teachers. ICAR should take a lead in the formulation of common understanding for framing rules so that the earlier service benefits can also be credited for new opportunities in other SAU's/ICAR Institutions. Moreover there is a necessity for providing some incentives in terms of educational benefits.

Action— Directorate of Education, ICAR

(iii) Post-doctoral fellowship be increased for short period under centre of Excellence for advanced studies.

Action— Directorate of Education, ICAR

(iv) Inter-University transfer of students may be entertained in any Semester of the academic years.

Action— Directorate of Education, ICAR

(v) National Eligibility Test (NET) may be given preference at the time of recruitment.

Action— Registrar, SAUs

(vi) Mobility from ICAR to Agricultural University and Vice-Versa and SAUs to SAUs be encouraged.

Action— Directorate of Education, ICAR & Registrar SAUs

V. Manpower Planning

(i) Efforts should be made to restructure and reorient education in SAUs with tilt towards trade oriented courses of specialization to increase chances of employment of students from SAUs.

Action— DRI–cum–Dean (PG), Registrar SAUs and Directorate of Education, ICAR

(ii) There should be some percentage of reservation for women, based on the nature of duties at the time of recruitment in both the State Agriculture Department and SAUs in the country.

Action— Registrar, SAUs and State, Department of Agriculture

VI. Agricultural Education for Women

(i) Home Science courses be revised and courses like Bio-technology and Information Technology be included in the course curricula.

Action— Dean Home Science SAUs

(ii) Name of Women's College of Home Science need to be changed to College of Agricultural Technology & Nutrition for Women's or College of Women Resources Management.

Action— Dean, Home Science/Directorate of Education, ICAR

VII. Role of Agricultural Education in Making Green Revolution Evergreen

The curriculum development must keep pace with

(i) Changing development

(ii) Need of the estate holder

Skill and entrepreneurship and inclusion of courses in new emerging areas such as IPR, IPM, Biotechnology, Environmental Sciences, Agri-business courses curriculum must be under constant review and changes if needed based on situation demand that should be encouraged.

Action— Directorate of Education, ICAR/DRI-cum-Dean (PG), SAUs

(iii) There is a need for faculty competence improvement, for achieving success in new curriculum development and implementation.

Action— Directorate of Education, ICAR & Registrar of SAUs

(iv) Well-equipped laboratories, modernisation of facilities, developing educational technology cell, skill development programme through rural experience programme, are some of the important infrastructure development in SAUs which need priority attention.

Action— Directorate of Education, ICAR Registrar/DRI-cum-Dean (PG) & Deans, SAUs

(v) Education need to be reoriented in developing capabilities for evolving new plant types with in-built potential for disease and pest resistance, resistance to abiotic stresses etc.

Action— Deans/DRI-cum-Dean (PG) SAUs

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Published by Directorate of Research, Rajendra Agricultural University, Bihar, Pusa-848125 and Printed at Tapan Printing Press & Stationery Works, Patna - 800 004