

INDIAN AGRICULTURAL UNIVERSITIES ASSOCIATION



**PROCEEDINGS OF THE
THIRD REGIONAL MEETING**



**3rd Regional Meeting
on
Value addition in Agricultural Products**

13-14th February, 2007

**Tamil Nadu Agricultural University,
Coimbatore - 641 003**

**PROCEEDINGS OF THE IAUA 3RD REGIONAL MEETING ON
VALUE ADDITION IN AGRICULTURAL PRODUCTS HELD AT TNAU,
COIMBATORE ON 13TH AND 14TH FEBRUARY 2007**

The IAUA 3rd regional meeting on Value addition in agricultural products was held at Golden Jubilee Hall, TNAU, Coimbatore on 13th and 14th February 2007. Vice-Chancellors representatives of the Vice-Chancellors attended the meeting. There were six technical sessions and the details of the sessions are as given in Annexure I and the details of papers presented are given in Annexure II.

The inaugural function was presided over by Dr.M.P.Yadav, President, IAUA. Th. Jatindra Nath Swain, I.A.S Special Secretary and Commissioner (DPAP), Chennai was the guest of honour and the Vice-Chancellor Tamil Nadu Agricultural University Dr.C.Ramasamy delivered the special address. Dr.P.Santhanakrishnan, Registrar welcomed the gathering and Dr.R.P.Singh, Secretary, IAUA proposed a vote of thanks. Some of the points highlighted by the dignitaries in the session are fortification during value addition of the agricultural commodities, strengthening infrastructure for value addition changing high growth agriculture into sustainable agriculture, planned use of natural resources, increasing private investment in agriculture, food processing and value addition to reduce price fluctuation and increase the number of agro industries and including agriculture as a subject at the school level.

TECHNICAL SESSION – I

CONCEPT AND SCOPE OF VALUE ADDITION IN AGRICULTURAL PRODUCTS

Chairman : Dr. AAlam, Vice Chancellor, SKUAS &T, Srinagar
Co-Chairman : Dr. S.S. Kadam, Vice -Chancellor, Marathwada
Agricultural University, Parbhani
Rapporteurs : Dr. K. Ramamoorthy, Dean, AC& RI, TNAU, Madurai &
Dr. N. Natarajan, Professor (Agri. Entomology),
TNAU, Coimbatore

The Chairman initiated the session with brief introduction on Indian Agriculture emphasizing the need for improving the rural economy and the importance of village community participation on seed to seed activity. He acknowledged the role of green revolution for the Indian Food Security. Losses after the harvest during the transit at farmers, traders and public level storage are enormous. Against the background ICAR initiated research on All India Coordinated Harvest and Post Harvest Technology by identifying CFTRI as a lead centre and ICAR Research Stations and SAUs as partners. However this programme did not address at farm level. Now that the Central and State Governments are keen to promote post harvest technology for supplementing the rural income. Prof. Alam further indicated that by minimizing the post harvest losses, the farm income can be doubled.

First Key note address on **Concept and Scope of Value Addition in Agricultural Products** was presented by Dr.P.K. Chattopadhyaya, Dean (Hort.) BCKV, Mohanpur. Value addition is transforming a product from its original state to more valuable product to increase the employment opportunities for rural community thereby increasing the economic status of the farmers. This will meet the growing needs of the consumers besides increasing the farm gate prices. West Bengal farmers have been benefited by mango fruit processing for pickles which are being exported.

Second key note address was on **Role of Microorganisms in Value Addition of Agricultural Products** by Dr. J. H. Kulkarni, Vice Chancellor, VAS, Dharwad. Microorganisms playing major role in food processing has been recognized from time immemorial in India. Value addition through biological means will facilitate transformation of the products to suit for world competitiveness as they are eco- friendly and economically viable. Yeast being the most important microorganism, is very much useful in value addition of food, feed and beverages. Biofuels, bioenergy, biopeptides, biopolymers and nutraceuticals are other valuable products of the microorganisms. Fermentation is the cheapest and energy efficient process in food preservation and value addition viz., biofermenting of decomposed pomegranate and corncob waste in poultry industry, for export marketing. Microorganisms facilitate salvaging waste foods to useful products and increase the nutritional value. Some of the microorganisms are useful as medicines and also serve as nutrients like vitamins. Dr. Kulkarni while highlighting the importance of these organisms, pointed out the recent use of improved strains of microorganisms by biotechnological means in developing the biofuels, bioenergy, biocolourants, antibiotics, nutraceuticals, pharmaceuticals etc. On conclusion, he stressed the need for strategic action by integrating microbial techniques with industrial technology by means of public private partnership.

Invited paper on **New Technologies of Agroprocessing and Post Harvest Engineering** was presented by Dr. D. B. Kuchhadiya, Director of Research, IAU, Lunagadh. Saving a loss of 10 -40% during the post harvest period could be possible by proper storage and adding value to the products. Use of nanotechnology and biotechnology for value addition was emphasized. Promotion of linkage of SAUs with industries by Government policies is essential to encourage the value addition for export markets. It was further suggested to establish Quality Testing Laboratories with well trained manpower to ensure quality of value added agricultural products and also create awareness on the new technologies by establishing rural agro-processing units.

The following recommendations emerged during the discussions session

01. Development of microbial technology based value added products to increase export opportunities.
02. Value addition based on the demand and supply chain
03. Linking the production with processing technology
04. Development of Human Resource on latest technologies for value addition.

TECHNICAL SESSION II

POST PRODUCTION MANAGEMENT OF TROPICAL AND TEMPERATE FRUITS

- Chairman** : Dr. C.R. Hazra, Vice-Chancellor, IGAU, Raipur
- Co-Chairman** : Prof. Anwar Alam, Vice-Chancellor, Sher-e Kashmir University of Agricultural Sciences & Technology of Kashmir, Srinagar
Dr. S.S. Kadam, Vice -Chancellor,
- Rapporteurs** : Dr.S. Natarajan Dean (Hort.), Periyakulam &
Dr.T.N. Balamohan, Professor and Head.
- Panelists** : 1. Dr. S.A. Nimbalkar, Vice-Chancellor, Dr. PunjabRao
Deshmukh Krishi Vidyapeeth, Akola
2. Dr.D.P.Ray, Vice-Chancellor, Orissa University of
Agriculture and Technology, Bhubaneshwar

Three papers were presented in the session.

Prof.Anwar Alam, Vice-Chancellor, Sher-e Kashmir University of Agricultural Sciences & Technology of Kashmir, Srinagar presented the paper on postproduction management of tropical and temperate fruits.

A very clear picture about postproduction management and opportunities for export of tropical, sub-tropical and temperate fruits was presented by him. He mentioned about the post harvest losses of fruits and enumerated the reasons for post harvest losses and ways to reduce through technologies interventions and infrastructure development.

He emphasized on the measures for the promotion of fruit based processing industries, which will also address unemployment problem and entrepreneurship linkages between financial and academic institutions. Further, Research and Development should be based on the demands from Industries.

Jamphan Singh, presented a paper on "Post-harvest handling of cut flowers for export which is one of the emerging areas of export". The issue was discussed in detail about the factors like genetic/inherent, pre and post harvest which affect post harvest quality of cut flowers. The information regarding selection of varieties, standards, management practices and post harvest handling of individual flowers was presented in detail.

The 3rd paper was presented by Dr.C.R. Hazra, VC, IGAU, Raipur on the processing of medicinal plants in the perspective of increasing global demand for organic food and medicines. In his paper, he explained the wealth of medicinal plants in the state of Chattisgarh. He also enumerated the methods of extraction which are being used by the tribes of Chattisgarh for Medicinal and Aromatic Plants.

The panelists Dr.S.A. Nimbalkar, VC, Dr.Punjab Rao Deshmukh Kishi Vidyapeeth, Akola while stressing the need for post production management of tropical and temperate fruits, reiterated the need for standardizing the maturity indices for different fruit crops for better storage and marketing. Similarly, Dr.D.P.Ray, VC, Orissa University of Agriculture and Technology, Bhubaneswar, also put emphasize on the need for packaging and also role of supply-chain management in fruits and vegetables.

In the concluding remarks, the following are the future thrust areas to reduce post harvest losses and augment the export of value added horticulture products.

1. Research and Development Programmes should be need based and focused to address the issues emerging out of domestic and export markets. Development of varieties for specific purposes shall be continued to meet the demand. Post harvest technology research should given thrust to develop technologies for export of fresh as well as processed products.
2. Laboratory facilities for quality control in State Agricultural Universities and Development Departments to support export of fruits and vegetables should be developed.
3. Creation of common infrastructure for the benefit of farmers for grading, packing and packaging, and for storage is essentially required and it can be achieved by sensitizing the policy makers.
4. Human Resource Development for research and development and entrepreneurship training in post-harvest management should be given priority.
5. Encouraging co-operative/contract farming with buy- back arrangements to initiate market-led production.
6. Evolving systems to maintain supply chain of good quality products by stakeholders to the consumers.
7. Maintaining cool chain for the post-harvest handling of cut flowers around 5°C with appropriate packaging to get better prices in the international markets.

TECHNCIAL SESSION – III

AGRICULTURAL EXPORT COMPETITIVENESS- POLICY ISSUES AND EMERGING CHALLENGES RAPPORTEUR'S REPORT

Chairman	:	Prof S.A. Nimbalkar, Vice-Chancellor, DPDKV, Alcola.
Co-Chairman	:	Prof J.H. Kulkarni, Vice-Chancellor, VAS, Dharwad.
Rapporteurs	:	:Dr. Veeraragavathatham. Dr. M. Chandrasekaran.
Panelists	:	Prof S.S. Kadam, Vice-Chancellor, MAU, Prabhani 2. Prof VK. Suri, Vice-Chancellor, CSAC&T, Kanpur.

Key Note Address was delivered by Dr.C.Ramasamy, Vice-Chancellor, TNAU and the following papers were presented in the session

1. World Trade Organization and Agricultural Competitiveness of India.
2. Dry Land Agriculture - Emerging Challenges and Opportunities for Value Addition.
3. Supply Chain Management and Farmer Empowerment.

The major issues presented and articulated were

1. India, the largest producer of many crops including mango, banana and other, still lags behind in export.
2. Slowing down of Total Factor Productivity that pulls down exportable surplus.
3. Falling rates of growth of agriculture GDP.
4. In-spite of its declining share, the influence of agriculture sector contribution to GDP on total GDP is considerable.
5. Slow growth of productivity of fruits.
6. Higher customs duties equivalent to bound rates for major produces limiting the scope for enhancement of customs duties.
7. Stringent Sanitary and Phyto Sanitary Measures of many countries and poor quality of Indian produce.
8. Increasing cost of production.
9. Declining investment in Agriculture
10. Predominance of dry land agriculture in terms of area and share in agricultural production.
11. Lack of skilled manpower to handle post harvest practices.
12. Lack of promotion of value added products from dry land crops
13. Lack of Quality testing laboratory facilities
14. Poor or lack of post harvest handling / marketing infrastructure
15. Lack of suitable varieties for processing and low percentage of processing.
16. Too many intermediaries but lack of value addition in the supply chain
17. Supply side constraints including Institutional and Infrastructure constraints hampering value chain initiatives

The following recommendations emerged from the session

1. Investment in agriculture sector including agricultural research needs to be enhanced substantially to increase Total Factor Productivity and achieve 4% growth of the sector *per se*.

2. Promotion of use of eco-friendly inputs, precision agriculture practices and participatory technology development for sustainable increase in productivity and production. This is essential to increase the exportable surplus.
3. Breeding strategies should focus enhancement of quality in terms increasing shelf life and suitability for processing.
4. To exploit the agro-ecological diversity of the country, programmes should be evolved for production/export of agricultural produce from different regions during the off-seasons in importing countries. The APEDA and SAD's can work on this and the State Departments of Agriculture, Horticulture, Agricultural Marketing and State Agricultural Marketing Boards can implement this.
5. To enhance the competitiveness of the Indian agricultural produces, cost of production must be brought down by increasing yield per unit of inputs through facilitating adoption of improved practices and reducing the yield gaps
6. Training must be given to farmers on GAP, pre-harvest. management and post harvest handling of produce to match importing country standards
7. Programmes should be implemented for promotion of value added products out of dry land crops.
8. Existing programmes for creation of infrastructure such as cold storage, marketing, quality testing facilities and processing should be continued with higher outlay to ensure quality and food safety to penetrate export markets.
9. Agriculture must be treated as agribusiness and all incentives must be extended for its promotion
10. Credit availability must be enhanced and all procedural bottlenecks must be removed in Institutional lending besides creating awareness among farmers to use crop insurance programmes available.
11. Segregation and regimentation of export crops must be made to facilitate their promotion.
12. Formation of grower's association must be promoted and made democratic to empower them to negotiate on price
13. Promotion of supply chain management to reduce number of intermediaries and facilitate value addition in the chain must be taken-up.

TECHNICAL SESSION - IV

ISSUES AND CHALLENGES OF ANIMAL PRODUCT PROCESSING TECHNOLOGIES

Chairman	:	Dr. M.P.Yadav, Vice Chancellor. SVB PUAT, Meerut
Co-Chairman	:	Dr.Dharmeswar Das, Joint Director (Acad), IVRI, Izadnagar
Rapporteurs	:	Dr.A.Sampathrajan, Dean (Engg.) TNAU, CBE-3 Dr.K.Thangavel, Professor and Head, PHTC, CBE-3
Panelists	:	1.Prof.C.S.Chakrabarthy, Vice-Chancellor, WBUAF&S, Kolkata 2. Dr.Dharmeshwar Das, Joint Director, IVRI Izadnagar

The technical session had three key note addresses followed by the panelists discussion.

The Chairman of the session highlighted the perishable nature of the live stock products viz. milk, meat, poultry and fish and the need for the development of ecofriendly processing and value addition technologies. The level of processing in milk is 15%, fish 4% and meat and poultry is 1 % only and there is a lot of export potential for the buffalo meat to the Middle East countries. He has emphasized the importance of utilization of by products like blood, bone meal, whey, casein etc.

Dr. T.R.K . Murthy, OSD, National Research Centre on Meats, Hyderabad, in his key note address on "Prospects and Retrospects of meat processing in India" has highlighted the importance of live stock sub sector and its changes over time and new realities of the marketing. The level of processing in different food processing sectors are 1.8% in fruits, 37% in dairy products, 21% in de-boned meat and 10.7% in marine fisheries.

During the year 2002-2003, meat products worth a value of 8771 (US \$ 000) were manufactured in India. Buffalo meat has the highest share in the Indian export of animal products followed by dairy products, poultry products and sheep and goat meat. Lack of realistic data on Animal handling, pre and post harvest losses, processing and consumption pattern, poor infrastructure, absence of private public partnership and weak supply chain are the issues requiring attention. Process optimisation of traditional meat products, development of quality standards, preservation, processing, packaging technologies are some of the researchable areas.

Dr.R.Prabakaran, Director, Centre for Animal Production Studies, T ANDV AS, Chennai, has presented the paper on **"Prospects and Retrospects of Poultry Processing in India"**.

Poultry Industry is providing employment to 2.6 million persons and poultry meat and egg are the most economical source of animal proteins next to milk. Eventhough India occupies fifth position in the world poultry meat production, third in the egg production, the per capita consumption of poultry meat is 1.8 kg against the recommended level of 11 kg, per capita egg consumption is 42 against the recommended 180. Only 5% of the poultry bird is scientifically processed. Number of processing plants for poultry meat and egg processing are being established in India, and the capacity utilization is only 25-40%.

There is a great scope for value addition and development of functional foods with less fat, cholesterol, calories and enrichment with omega 3 fatty acids and antioxidants like vitamins.

Dr. J.C.Katyal, Vice Chancellor, CCS HAD, Hissar, Haryana has presented a key note paper on **"Stagnation in Agricultural productivity Breaking the barriers"**.

Indian National policy on Agriculture envisages minimization of regional disparities and a 4% annual growth rate in Agriculture, and India need to raise the food grain production from 205 to 290 m. tonnes by 2020. Dr. Katyal has highlighted the importance of elements of productivity growth viz., high yielding varieties, fertilizers, irrigation, standard agronomic practices responsible for the green revolution. Investment in Agricultural research and education played a fundamental role in infusing science and technology driven growth in Agriculture and the total funding increased from 2.46 billion rupees in 1961 to 38 billion rupees in 2005.

Causes of Stagnating Agricultural growth rates like natural resources degradation, climatic change etc. have been highlighted and strategies for breaking the yield barriers have been suggested.

Prof. C.S. Chakrabarthi, VC, WBUAFS and Dr.Dharmeswar Das, Joint Director (Academic), IVRI, Izadnagar gave their remarks as panelists.

The following are recommendation emerged out from this session.

1. Development of National Strategies be made on augmenting animal productivity, production, consumption and marketing of animal products.
2. Realistic database on meat, milk and egg production, handling, transportation, pre and post harvest loss, marketing etc. may be created.
3. Development of cutting edge technologies on animal products processing and preservation and value addition may be considered as priority.
4. For value addition and preservation of animal products besides generation of newer biotechnological tools, ITK should also be considered for refinement of techniques.
5. Consumer friendly animal products with low fat, low cholesterol etc. may be considered as research priority.
6. Infrastructure support in terms of modern slaughter houses, cold chain etc. utilization of slaughter house byproducts for use as a value added biologicals, pharmaceuticals and animal food.
7. For export oriented meat production, buffalo male calves management with high input ration be made for increased growth rate for marketing.
8. Incentives for quality assurance mechanism should be given with social awareness Issues.
9. In poultry sector, improving infrastructure by both public and private sector in areas like cold chain, processing equipments, distribution net works etc.

10. Priority should be attached to production of locally acceptable, cost effective value added poultry products, paying attention to reduce losses in post harvest technology and efficient utilization of byproducts.
11. Development of HACCP, GMP protocols and quality standards for animal products viz., milk, meat, poultry, fish etc. with establishment of reference and testing laboratories be made.

TECHNICAL SESSION - V

NEW TECHNOLOGIES OF AGRO PROCESSING AND POST HARVEST ENGINEERING

Chairman : Dr.J.C.Katyal, Vice-Chancellor, HAU, Hissar
Co-Chairman : Prof.V.K.Suri, Vice-Chancellor of CSAU&T, Kanpur
Rapporteurs : Dr.K.Rangasamy Dean (Engg.)
 Dr.L.Narayanan, Professor and Head, F&APE
Panelists : Dr.D.B.Kuchhadiya, Director of Research, JAU, Junagadh

The session was chaired by Dr.J.C.Katyal, Vice-Chancellor, HAU, Hissar and Co-chaired by Prof.V.K.Suri, Vice-Chancellor of CSAU&T, Kanpur. The rapporteurs for the session were Dr.K.Rangasamy, Dean (Engg.), Kumulur and Dr.L.Narayanan, Professor and Head, Food & Agri. Process Engineering, AEC& RI, Coimbatore.

There were two key note addresses and one invited paper presented. Dr.K.Sridharan, Dean (H.Sc.), SDAU, Saradarkrushinagar presented a keynote address on "Establishment of a center for "Value Added Fruits and Vegetables in Public Private Partnership Mode" on behalf of Dr.R.C.Maheshwari, Vice-Chancellor of Sardarkrushinagar Dantiwada Agricultural University, Gujarat.

Dr.D.P.Ray, Vice-Chancellor, UAT, Bhubaneswar presented another keynote address on "Role of Packaging in Supply Chain Network".

Dr.S.A.Patil, Director, IARI, New Delhi presented invited papers on Genetically Modified Foods in India: Issues and Challenges.

Dr.D.B.Kuchhadiya, Director of Research, JAU, Junagadh was the Panelist. In his opening remarks, the Chairman of the session traced the history of food processing to the manufacture of Siddha system of medicine in Southern State particularly in Tamil Nadu. He also emphasizes the recent technology, Nano Technology and bio-technology as new technologies in the Food Processing field.

Dr.K.Sridharan, Dean (H.Sc.), SDAU, Saradarkrushinagar mentioned in his key note address that agriculture has to transform into Agri Business. He talked about public private partnership in revolutionising the food processing sector. The partners to this scheme should be Agri. Universities, farmers organization and financial institution.

He informed that legislative changes, land acquisition, political support can come from public institutions design, construction, operation and maintenance cost can be shared by the private institutions. He cited a few examples like processing psyllium husk processing unit, castor oil derivatives and modern spices processing. It is felt that these plants require cleaners, graders, colour sorters and other modern equipments which need to be replaced from the old industries and it has to be supported by financial institution, infrastructural development and government policy support.

Dr.D.P.Ray, Vice-Chancellor - emphasized the need for proper design of packaging to reduce post harvest losses in transport and handling of fruits and vegetables.

The role of packaging of tropical and temperature fruits in the supply chain network has increased. There is a need for greater research to find out suitable packaging materials.

There is a new technology of modified atmosphere packaging (MAP) which can be used for storage of temperate fruits.

He emphasized the need for infrastructural development like cold storages, refrigerated transport and Central food processing facilities. The supply chain management also needs to be understood properly by suitably training the farmers and managers involved in the process.

There should be a shorter supply chain removing multi layers from farm to table. Now-a-days it has become essential to adopt food safety and traceability for export of fruits.

Dr.S.A.Patil, Director, IARI, New Delhi in his invited paper informed that in recent times genetically modified foods are attempted in India. Value added foods with nutrients, protein, extra nutrition can be obtained by GM foods. Possible hazards to human and animal health, environmental consequences were the basic concerns with regard to transgenic crops. It is essential that allergens, toxins, and anti-nutrition factors have to be identified in genetically modified crops. There should be a regulatory system established to oversee the biosafety of GM foods. For export market Codex alimentarius and other food safety standards have to be followed.

Dr.D.B.Kuchhadiya, panelist informed that the Bt cotton gives 4 to 5 times increase in yield with pest & disease tolerance. It is felt that the remarks of Dr.Sridharan on the need for design of packaging for fruits and vegetables is apt in the supply chain management.

He also observed that new technologies like pre-cooling MAP, biotechnology, cryogenic grinding protein isolation, etc., should reach the industry under public private partnership.

The Chairman concluded that public private partnership is in imperative and there is no way to escape. It is to be kept in mind the basic parameters to identify the problem of common interest of partners. It should be possible to create synergy and credit sharing. Risk involved should also be properly managed.

The following recommendations emerged out of the technical session V

1. Agriculture has to transform into Agribusiness towards this end, public private partnership should emerge and the Agricultural Universities has to play a vital role in this regard along with financial institutions.
2. There is greater need for proper design of packaging to reduce post harvest losses in transport of fruits and vegetables. Research on packaging studies has to be encouraged. Policies should be framed to encourage transport vehicles with refrigeration facilities. Cold storage facilities for fruits and vegetables are also be promoted through government policies and financial institutions.
3. Most of the existing processing industries are to be modernized with new equipments such as cleaners, graders, colour sorters. This activity needs to be supported by financial institutions.
4. Food safety and quality should be dealt with properly while considering the use of GM foods. There should be regulatory system established to oversee the biosafety of GM foods.
5. New technologies like precooling, MAP, biotechnology, cryogenic grinding, protein isolation should be taken up under public private partnership.
6. Training of farmers and other functionaries involved in supply chain management is essentially needed to keep the value addition process moving ahead.

TECHNICAL SESSION - VI

GENERAL DISCUSSION ON UNIVERSITY ISSUE AND EXPERIENCES SHARING

Chairman : Dr. C. Ramasamy, Vice-Chancellor, Tamil Nadu Agricultural University
Co-Chairman : Dr. D.P.Ray, Vice-Chancellor, QUAT, Bhubaneswar
Rapporteurs : Dr.T.S.Raveendran, Director, CPBG, TNAU, CBE-3
Dr.K.Koodalingam, Professor (PBG), CPBG, TNAU, CBE3

The Chairman while initiating the discussion, emphasized the following issues:

The stakeholders' expectations are growing, particularly Eriophid mite in coconut, white woolly aphid in sugarcane and sterility mosaic virus in cassava and at the same time there is lack of commitment among scientists viz. not interested to work in the Research Stations and giving pressure for getting transfer to main campuses. Research should be improved to cater to the needs of the stakeholders

The funds provided by the state government are mainly utilized for salary and no money is available for carrying out research and infrastructure development. The [CAR is also providing funds for recurring expenditure and purchase of equipments only.

Our Agri graduates are technically good, but they are not aggressive, enthusiastic and communicative. Since there is a multi sector demand our graduates should be encouraged to develop communication skill.

Though there are good hybrids available with the public sector, we are unable to compete with the private sector for want of seed multiplication. He also emphasized that the quality of the bio inputs are not adequate and it requires proper monitoring and quality regulations.

Dr A.Alam, YC, S.KU.A.S &T (K), Srinagar expressed the scarcity of funds for infrastructure development and buildings, since the state government is not adequately funding for the University. He opined that there is no need for new colleges based on new themes like food processing, biotechnology. He informed that the state government adds the burden to the University for extension activities through KVK. He added that no improvement in agriculture production is possible without any investment in irrigation facilities and agricultural sector by the state government.

Dr.S.A.Patil, Director, IARI, New Delhi expressed his view that the tenure of the Vice-Chancellor should be enhanced to five years for effective implementation of improvement activities in the University. He emphasized that a vision document should be prepared and should be presented to the Prime Minister.

He insisted to bring corporate culture within the University to create competition among scientists and scientists based revolving fund for agribusiness management. A book should be published compiling all the successful technologies of the Universities and made available by the IAUA.

Prof.C.S.Chakarabarti, WBVAF&S, Kolkatta emphasized the national economy could be improved by intensive research in animal husbandry.

Prof. V.K.Suri, Vice-Chancellor, CSAV&T, Kanpur

- ☐ Emphasized the significance of modernization of agricultural institution through enhanced plan outlay under non-recurring.
- ☐ The University should be provided with adequate human resources by filling up the vacant positions.

Dr.J.H.Kulkarni, VC, VAS, Dharward recommended a flexible system of admission for graduates of Agricultural marketing and cooperative in the Agricultural Economics Masters Degree in other Colleges.

Like agriculture graduates, horticulture graduates should also be admitted in the CFTRI for higher studies.

Dr.M.L.Madan, VC, DDUAS&T, Mathura, UP.

- ❑ Stressed the importance of agriculture in all state government activities enhance Vice-Chancellors need to be involved in the planning process of state financial allocations.
- ❑ Financial allocation has to be made under separate budget head for agriculture research and education.
- ❑ In all SAUs, attention must be bestowed to conduct large scale demonstration of new technologies to showcase the activities.
- ❑ The cess amount being generated through agricultural produce, processing and marketing, should be diverted back to agricultural research and education.

Dr.J.C. Katyal, VC, HAU, Hissar remarked that we should represent to the policy makers on the achievements made so far and the needs to achieve the remaining things. There should be representation from the SAUs in the planning commissions for suitable planning and allocation of funds for agricultural research and educations. He also emphasized the importance of out sourcing technocrats from outside region for a better system functioning. More administrative and financial autonomy by the Vice-Chancellors are to be encouraged while dealing with the funds allocated by the ICAR.

Prof. S.S.Kadam, Vice-Chancellor, MAU, Parbhani stressed the need for strengthening regional research stations and KVKs by providing sufficient infrastructural funds and incentives to the scientists working there.

CONCLUSION

Recommendations emerged out from Plenary Session

1. A delegation of IAUA comprising Vice-Chancellors will meet the Prime Minister and other members of planning commission and appraise the achievements in the field of agriculture including animal husbandry and fisheries and also the future expectations during the XI plan period. The group will also focus the budgetary requirement for the XI plan period for upgrading agricultural research and education. This has to be given top most priority.
2. A book on the successful technologies evolved and success stories of extension may be compiled and IAUA will publish and circulate this book.
3. It was decided to seek more funds from state government as well as from ICAR. The present allocation by state government is just adequate for meeting salary and pension commitments.
4. Most of the SAUs are functioning in old dilapidated buildings and the basic infrastructure housing the laboratories are outdated. Current research demands are heavy and in order to reimigrate the agricultural research and education, special financial allotment under non-recurring has to be sought from Central and State Government's to modernize the basic amenities.

5. It was resolved to impress the ICAR to permit intercomponental adjustment during fund allotment particularly, for repairing old buildings or construction of new buildings.
6. The Vice-Chancellors of Agriculture Universities have to be involved in the planning process of state financial allocations as agriculture forms the major activity of our country.
7. Financial allocation for agricultural research and education should be made under separate budget in the states as well as centre.
8. Filling up the vacant scientific positions may be given top priority.
9. Certain percentage of teaching/ research personnel in all Agriculture Universities may be recruited from other states in order develop healthy competition and avoid inbreeding.
10. The duties of the scientists working in KVKs have to be defined without overlapping with the work of the development Department.
11. The tenure of the Vice-Chancellors has to be increased to five years from the present three year period.

Recommendations emerged out from Technical Sessions I to V.

1. Development of microbial technology based value added products to improve export opportunities. New technologies like precooling, MAP, biotechnology, cryogenic grinding, protein isolation should be taken up under public private partnership.
2. Creation of value addition potentials based on the demand of the improved supply chain to link the production capacity with processing technologies evolved by continuous research backup.
3. Tailoring the research and development programmes in order to cater to the standards of domestic and export markets through establishment of laboratory facilities for quality control in State Agricultural Universities and Development Departments.
4. Sensitizing the policy makers on creation of community level infrastructure for grading, packing and packaging, and storage, and promoting grower's association to empower them to negotiate on price. By undertaking the human resource development activities on latest technologies of value addition and post harvest processing capable entrepreneurship at village level may be developed.
5. Efforts to be taken to encourage co-operative/contract farming with buy- back arrangements to initiate market-led production.
6. Maintaining cool chain for the post-harvest handling of cut flowers around 5°C with appropriate packaging to get better prices in the international markets.
7. The investment in agricultural research has to be enhanced to increase Total Factor Productivity to achieve 4% growth of the sector per se.
8. Promoting the use of eco-friendly inputs, practice of precision agriculture and participatory technology development for sustainable increase in productivity and production of exportable surplus by bringing down the cost of production and improving the competitiveness of Indian Agriculture.

9. Through innovative breeding techniques the shelf life and processing suitability of the fruits may be attempted to be enhanced.
10. For exploitation of the agro-ecological diversity of the country, programmes should be evolved for production/export of agricultural produce from different regions during the off-seasons in importing countries. The APEDA and SAD's can work on this and the State Departments of Agriculture, Horticulture, Agricultural Marketing and State Agricultural Marketing Boards can implement this.
11. Implementing suitable programmes for promotion of value added products out of arid zone dry land crops.
12. Credit availability must be enhanced by improving Institutional lending to convert agriculture into agribusiness besides creating awareness to use crop insurance programmes and encouraging public private partnership.
13. Adoption of suitable national strategies on augmenting animal productivity, production, consumption and marketing of animal products.
14. Creation of realistic database on meat, milk and egg production, handling, transportation, pre and post harvest loss, marketing etc.
15. Cutting edge technologies on processing, preservation and value addition on animal products by integrating newer biotechnological tools with the ITK may be developed.
16. Synthesis of consumer friendly animal products with low fat, low cholesterol etc. need to be concentrated.
17. Provision of infrastructure support in terms of modern slaughter houses, cold chain etc. and utilization of slaughter house byproducts for use as a value added biologicals, pharmaceuticals and animal food.
18. To improve the export oriented meat production, buffalo male calves management with high input ration be made for increased growth rate for marketing.
19. To improve infrastructure in the poultry sector, public private partnership may be encouraged in areas like cold chain, processing equipments, distribution net works etc. to produce locally acceptable, cost effective value added poultry products with due consideration of the post harvest losses and efficient utilization of byproducts.
20. Development of HACCP, GMP protocols and quality standards for animal products viz., milk, meat, poultry, fish etc. with establishment of reference and testing laboratories.
21. Food safety and quality should be dealt while considering the use of GM foods. There should be regulatory system established to oversee the biosafety of GM foods.

